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TRANSCRIPT
>> We will be starting in just a minute, we are waiting for AV signals. Okay the hand signal welcome, I am really pleased to be here all together In Silver Spring. I am the chair of the hydrographic service review panel. My cochair all right.
Somebody in the room is on muted. We have an echo.
Welcome, please to get together in Silver Springs. I am Julie Thomas, Senior advisor for the Scripps institution of oceanography. I am also the chair of the hydrographic service review panel, and Sean Duffy is serving as cochair. Thank you Sean.
I would like to take a moment, to recognize and warmly welcome Dr.'s been read for the under secretary of commerce for ocean and atmosphere.
We have Nicole above a NOAA administrator. Rachel Dempsey, for navigation, observation positioning. And Rachel, we are pleased to have you with us as your first HS RP meeting. Okay, we also acknowledge, the deputy high drug refer of the Navy, we appreciate your attendance, sorry I did not get to greet you prior to the meeting. We will catch up at break. Admiral Evans is the director of the office of Coast survey. The national high drug refer of and OAA, and the officer for the HR SP. We also have Juliana Blackwell director of the survey. Derek Snowden, that you are.
Who is serving as the acting director for operation of oceanographic products and services co-ops. Captain Andy Armstrong is with us represent the University of New Hampshire hydrographic center. As cochair. Welcome all tran eight members, stakeholders and colleagues. There are approximately 165 participants on the webinar, and I think we have 50 people in the room. So I would like to welcome everyone. I look forward to your participation and comments. We have two tran eight members who will be dialing in remotely. And also Captain, Captain Cruz are becoming tomorrow.
Admiral Evans I turn it over to you now we look forward to speakers and sessions it is yours.
>> Thank you Julie, it is my task to review some ethics rules so this is required reminder on at Vicks for the HS RP members when you participate in an HS RP public meetings you serve as a NOAA a public meeting in your personal capacity and subject matter experts. Remember you do not represent any group industry or other entity including businesses you may be affiliated with. Please remember to take off your regular work at and replace it with the NOAA hat as you provide expertise and comments and guidance to NOAA and the administrator, thank you for the service for strengthening the hydrographic and navigation observations and positioning services portfolio.

We greatly appreciate your vision and your help.
Next notes on public comment, thinking to the participants were provided comments in advance, the stakeholder staff and other joining the webinar, I encourage her public comments and input. If you have a comment, please type in the webinar under questions that. It will be read into public record, and put on the screen if time permits.
All of the comments from the meeting, that are on topic, will be included in the official meeting minutes.
When comments are received in advance, they will also be shared and highlighted at the meeting as well. And become part of public record. I welcome and encourage comments from any group or individual, during the public comment period.
Lastly, reminder about privacy and disclaimers. These sessions are being recorded and transcribed, posted to the NOAA HRSP website. The speakers have provided their written permission to do so. Your individual permission is required for use a photo, video, and voice on audio. It will be obtained and disseminated on the meeting website and accessible to the public.
You can decline by abstaining from speaking or dropping off of the webinar. Last, a procedural no, on emergency exits. There are no emergency exits in the room, but you can see the signs a and if you permit see out the main doors there are emergency exits. And restrooms can be found directly across outside the meeting.
With that I will turn it back to you.
>> Thank you very much Admiral, you will find the member and speaker bio and your advanced material on the web. So we are going to start out with the HRSP member introduction. Give name, organization, job title, and what you actually said.
We will start with the remote members first. Is Nicole online? No, okay. We will go on to tuba his tube online? No, neither one can make it, Alex. I think he is in an airplane right now all right. Alex's online? Are right. Alex are you there? We will come back to the Alex will put them at the end. Mary page do you want to go first please?
>> Mary page Abbott, past chief commander United States power squadron. I reside in Sanibel Island in Florida. That is where I work.
>> Cassim
[Away from microphone]
>> Thank you yes, my name is Kassem of Dula, Chief scientist's I work with the officer [Indiscernible]. Baltimore County, technology group at HRSP and I work from my home in Maryland. Looking forward to this meeting in the discussion thank you.
>> All right, Alex are you on now?
>> Yes good morning I am can you hear me?
>> As we can.
>> Good morning, my name is Alex Cruz, Senior harbor pilot for the island of Puerto Rico. Unfortunately I won't be able to go there today I will go there tomorrow. Looking forward to the meeting.
>> Thanks Alex we look forward to seeing you too. Sean?
>>

>> Yes good morning Sean Duffy big-league coalition maritime coalition based in New Orleans on the banks of the Mississippi River and yes we have low water issues.
>> Lindsay G, semi retired consultant, and I work in both New Hampshire and Hawaii. Representing both here. Thank you.
>> Hi good morning Deeann Hargrave geoscience manager for Atlantic shore offshore wind. It's residing and working from my home in New Hampshire.
>> Hi good morning and McIntyre eighth year last meeting here on the panel today. I join the panel. As a maritime pilot on the Columbia River in Oregon, retired from that and now I am a business director for the San Francisco bar pilots. Working out of San Francisco California.
>> Great thanks there are actually a few who unfortunately this is their last meeting we will acknowledge and talk about that later in the meeting. Eric and we are glad this is Eric's first in person meeting. We are happy to have you have picked
>> Be gentle with me I am a rookie. Eric Pease, vice president of the lake areas Association which represents the U.S. flag fleet on the Great Lakes, based out of Cleveland Ohio.
>> Hi I am Ed Soddy I joined eight years ago along with a couple of other folks here. And this will be my last meeting. I am mostly retired, and I am also newly on the ocean research advisory panel. So I get to do this for some more years for tran one that is zero that's right NOAA, so I am looking forward to that.
>> Very important position. Gary.
>> Good morning Gary Thompson I work for North Carolina management and chief of the North Carolina geodetic survey this is my last year at the meeting.
>> Good morning Nathan Wardwell managing partner JOA surveys. I reside in Anchorage Alaska. This is not my last meeting very excited.
>> Thank goodness. Okay, Captain Armstrong is the nonvoting member.
>> Good morning I am in the Armstrong I am the NOAA codirector of the NOAA University of New Hampshire joint hydrographic center. Nonvoting member the other codirector is not here today he wishes he could be. I will have to cover for him as well.
>> Thank you hi, [Indiscernible]. I am the cofounder and CEO of GSE plots on sustainability adjunct professor at the University of Houston pleasure to be here good morning to everyone.
>> Good morning Juliana Blackwell director of knowers national -- troke one geographic survey stationed in Maryland.
>> Derek Snowden acting Director for the Center for operational oceanographic products. I come from the office and I live here in Silver Springs.
>> I used to be one of the directors in the regions I've known Derek in my previous role. His nation to have you had to join us. I would like to thank all of the NOAA staff who was helping us today with the meeting.
The audiovisual people, they will be helping with the public comments and other meeting assistance. As the regular team thank you for keeping us on time and in shape.
>> I certainly echo the chairs thanks to the NOAA staff and support staff who have worked on the logistics content of this meeting over the last several months. I have a variety of staff

provide subjects in administrative support to HRSP. Approximately 20 troke one staff all the work of HRSP and can assist you with expertise throughout the year. I would like to particularly recognize a few people including and Butner Nathan Littlejohn, all of what we do here is built on work over many years now I like to particularly thank Virginia debt learner who stepped in into lens will roll over the last six months or so while Lynn was on Lisa thank you Virginia. We certainly appreciate your and Hageman in support of the mission learning more with you with great meeting planned looking forward to the discussion.

I like to kick that off with a pleasure of reading a letter from Senator Benjamin Cardin of Maryland. You have a copy of the letter in the folder. I'll read it into record. It reads dear friends, pleased to extend warm welcome to everyone attending the NOAA hydrographic service review panel federal advisory committee meeting. Thanks to Ben Evans forgive me this opportunity. For over 50 years NOAA has done the important work of offense in the understanding of the natural world through his research programs and scientific initiatives. NOAA only provides much-needed monitoring and analysis of the climate, but also uses the products and services to support the economy, affecting more than one third of the GDP.

Passage of the inflation reduction act, bipartisan infrastructure law, NOAA has become more empowered to be, climate ready nation that is well prepared to face weather events. Proud to vote for both of these pieces of legislation. Providing billions of funding for know what to ensure that you continue your crucial mission. This public meeting gives a valuable opportunity to discuss maritime products services and data needs while meeting with stakeholders and partners of your work. This feedback will inform NOAA service activities to better serve Americans are typically those living in maritime in coastal areas.

I commend the federal advisory committee for hosting the meeting, and continuing your work to better serve our communities. Best wishes for wonderful event. Sincerely Benjamin Cardin United States Senator.

>> [No Audio]

>> Did you hear what I just said? Please repeat okay. We certainly appreciate the comments from the senator, and his support of NOAA through legislation and his effort to keep science and climate at the forefront. As you may know the HRSP is engaged in resilience and radially discusses the data backbone. You know the light has gone off again on this Mike. You can hear me?

During the next couple of days we look forward to hearing from an OS about that navigation portfolio services. It is my pleasure now, to introduce Dr. spin rad. A warm welcome to you. As mentioned, he is the under Secretary of commerce for oceans and atmosphere. And the NOAA administrator. He is responsible for the strategic direction and oversight of the agency. Including developing NOAA portfolio products and services.

To address climate crisis and enhancing environmental sustainability, and posturing economic development. Creating a more just equitable and diverse NOAA workplace. It is over to you.

>> Thank you Julie two quick comments. First that is actually Nicole's job. And I did not want

her finding out today that I am taking her job. The other is that I love seeing the note from Senator Cardin, I think we all agree that he and his 534 other colleagues will ensure that we are actually working on Sunday.
That has taken a lot of time from the government they need to sort out what happens in the future. Rest assured the mission essential functions including our hydrographic survey and everything we do it troke one are going to continue as strength regardless of what Congress chooses to do.
This is a treat for me, this is like coming back home to a community that I have long and strong relations with. I actually work for a long time as a civilian in the Navy. In fact, then Lieutenant Matt or Bash and I were together at the office of the oceanographer of the Navy.
I was delighted that in 2002, then NOAA administrator asked if I would like to come on over to head of the National Ocean service. I bring it up because that was the time Congress was deliberating around the establishment of his body. The HRSP.
I had the honor of being in a job that Nicole is in right now, the inaugural meetings of the HRSP. And we were able to find some of the agendas from those meetings. I thought it was kind of entertaining that, the agenda that I look at right now, includes a discussion on Hydro survey priorities and capacities.
The NOAA and UNH Hydro center by retired Captain Andy Armstrong given that presentation. As well as discussion on things like ports. And I bring that up because, these are tough problems. It does not surprise me at all. We were talking about the same things, technology has changed a lot, a lot has changed, and I want to try to take a limited time that I have got today, to frame for you the world that we are in right now, last time I had the opportunity to talk.
I should have started by thanking all of you for your service.
Especially those who are stepping down shortly for your many years of service.
I will make sure we double your salary in future years in service here. It really is an extraordinary comfort contribution to expertise and effort.
I want to make sure you know how much I appreciate that. Two years ago, if you had told me, certain things were going to happen the next time I came to address the group, I probably would have been in disbelief, I made a short list of some of those things. We did not know the bipartisan infrastructure law would be passed. Nor do we know that that was going to result in a $6.3 billion single injection of new resources for us. It came in, it has been an extraordinary challenge for the agency. To build funding opportunity announcements, spend plans, request for proposal. But I told the team all along, there will be a day shortly, those are at the door, are now getting proposals and able to make investments in key programs, and that is where we are right now. We are recapitalizing a quarter of our seagoing fleet.
A fleet by the way, I am proud to point out which is larger than the New Zealand Navy. I do not tell the Kiwis that, I have never been in a situation I been with NOAA since 2003. I've never seen a situation we were actually building to purpose a quarter of our fleet. I have established the goal for us to be at net zero, by 2050 with our fleet, that is new, other

interesting things, the globe has now signed a treaty on biodiversity beyond national jurisdictions. Neat the United States assigned on last week. That is extraordinary implications for mapping and charting for global ocean. The 30 by 30 initiatives, plural. Two of them.

They are driving a lot of what we do those are in formulation when this administration came and picked so the first of course which I will say more about his 30 gigawatts of offshore wind bite. The second is we conserve 30% of the land and oceans. By 2030. Deep sea mining is in a different place than it was. Probably not where it needs to be I would say. But there is some forward motion in terms of establishing international protocol. Marine debris, is in a different place. So there's 2.0 act was passed, which establish mechanisms for bringing in more resources into the research and operational activity Association. And then one that is not necessarily on a list of happy news is we just, we keep track of a billion-dollar disaster you may see at the end of August we surpassed 23. Twenty-three billion-dollar disasters in this year alone, with four months to go. That number was already a record for any given year. That has implications for the work we do out here. So that kind of framing, I have tried to establish a couple of key priorities with in NOAA for the next several years.

These are things, issues, strategies, that I identify from day one. And one of the first one that I identified, and I just so proud of the work Nicole has done in your team has led in the buildout of the new blue economy. That is the concept of information and data and environmental intelligence driving economic development. In fact, the poster child for us in that regard is offshore wind. The work that is being done. I'm no kidding last night when I got home, I got the latest issue of Marine professional, I'm sure many of you receive it. In their the cover story is on entitled in search of deep water win. There were two quotes that I thought were particularly relevant to the group. The first having a site to test turbines is crucial to ensure they still can stand the pressure of life at sea. And deliver on energy promises. Those statements characterize our role.

Be able to withstand the pressure of life at sea, it means that you have got to know what that environment is. You got to have the charts, you got to understand currents, you got to understand the physical dynamics of the area. In his statement that you deliver on the energy promise. I interpret that to mean yeah that is great, so you have a potential for wind here. But will it be hear from five years, ten years, 20 years from now with climate change? The offshore wind example, is a place where we can help foster economic development is classic. We can talk about poor resilience in terms of things like the administration's net zero goals. We are building I talked about recapitalizing for recapitalizing a quarter of our fleet. We are building out three major. Facilities we just cut the ribbon on Ketchikan it will building facility in Newport Rhode Island, and we announce a contract for Charleston South Carolina. Buildout.

As you can imagine there's a lot of Hydro survey issues with that. The other important aspect on the economic development is are we going to have the workforce? One thing to say we have all the great projects. Another thing to say we have terrific research, another thing to say we have good relationship and private sector. What are we actually building

our NOAA Corps yes we actually have legislation. That cap at 500 NOAA core offices, 325-330 right now we have work to do there. And then there is the training aspect for the civilian workforce. I had the opportunity to visit Northwestern Michigan College, where they do a Marine technology program and they told me each one of their graduates is required as part of the program to list in the two week period, the hundred job vacancies which they feel they are qualified.

He said they never have a problem with the students come up with the 100 jobs that they can apply for. And obviously, examples like the UNH joint Center, which we just had the opportunity to visit a couple of weeks ago. And announce the buildout of a new facility with the 10 million-dollar award thanks to Senator Shaheen.

Are examples of the collaboration between us as feds, academic community, to try to build of the workforce I would also.out in this new economy of economic development arena. I am truly trying to say we sit in Department of Commerce which means, working with economic development administration, it means establishing a whole new relationship with the U.S. patent and trademark office we've never had that before. Bottom line never had a PTO, a woman and Kathy came and said my patent examiners are being asked to assess applications for all sort of environmental stuff. And they do not know what to do that?

I said that is interesting our environmental sciences are being challenged with questions about intellectual property rights. For folks who can spell IP. We now have established a formal relationship that can only be good. For economic development and private sector buildout, all of that is this new economy pillar.

The second is climate ready nation. I will not spend a lot of time on that, because in my class discussion with you all I emphasize that pretty heavily. A lot of the money that has gone into the inflation reduction act are going for areas like coastal resilience regional challenge. We have almost 600 million going to that.

Foundational data shoreline mapping, national spatial references.

'S office he critical to all of that work. Aside, I will share with you and this gets us to something that we were talking about earlier before we started the formal discussions is that the for that particular tranche, that particular effort like I said $575 million. We have now close the books on RFP. And we have received over $16 billion worth of proposals. Of 30 to one ratio of proposals to available resources. That tells you what demand signal is for this type of activity.

Couple other things, big emphasis on diversity equity and inclusion. It translates to equitable delivery of products and services the question for us is, are we making sure that what we do in the development in the survey were, and our weather forecast. I would providing services to all communities in an equal and equitable manner.

I put a big emphasis on our 2X research to operations, commercialization, applications regulation. So you will see a lot of effort, and things like Juliana's team working on robotics is an example, where we see work moving from the research into direct applications. We will do a lot more work with ID IQ contracts, and there there are some very specific areas, we just have a couple minutes, I want to do a quick flyby on very specific technical areas

that I know some of which you can have deeper dives on here and the rest of the meeting. Data as a service, whole new world for us. Now I think it is fair to say in closed survey there is decades of working with the private sector, in this regard we have not learned a number of lessons.

The weather service is the same thing. We are now seeing interesting challenges. As an example of data as a service out we positioned right to deal with this burgeoning group. Now 40% of the exhibitors are did as a service. That is a changing world. AI, AI in terms AI ML and deep learning. I will cluster them altogether. Those are areas of investment for us obviously because we are a generator of large volumes of data. I am trying to make a push on how we might use new technology like compressive sensing, will we have a sparse and coherent data, and a lot of times Hydro survey is sparse and incoherent.

Can we use AI techniques can we use compressive sensing to fill in the blanks in an intelligent way if you will the other thing that I am looking at is the use of generative AI. So if we put out, a rule with respect for mapping and charting for example put it up for public comment we will get 10,000 comments at least.

Can we use generative AI as a means for addressing this. NOAA in the cloud. If I had it my way, we would probably not buy another piece of hardware for our computing. Because I have been at no were too long, I retired from NOAA twice. We are going to get it right one of these days but every time I come back I hear you know we need $10 million because we gotta buy more computers to put them in Fairmont or Boulder or Princeton, yes, I get that but the rest of the world is looking at extensive cloud -based computing we should do the same thing.

Digital twin, I know you will talk about that this afternoon. I will tell you we had fascinating discussions about using some of the very special GIS capabilities that they are developing GIS is at the heart of everything that we do how can we use all developments in digital twin? More effectively for testing out our systems that I think the NGS contribution to the digital twin community is really a good example of how we might undertake that.

Last thing I will talk about, I'm over time. His IP development, I've talked about the fact that I would like to push this agenda within NOAA.

You can count the number of disclosures the number of licenses exclusive and nonexclusive. On probably two hands. That we have undertaken. To me that is silly. I know we are developing IP, I want to make sure that we are protecting it appropriately for a whole bunch of reasons. Not the least of which is the financial reasons, protection against cost and downstream cost.

Also it is a great recruitment and retention tool, it is a great way to foster economic development if we are making IP available for start ups, and it is good for the repetition of the agency as well. My challenge, for all of you, and this will be my closing thought. Is in the context of everything I have talked about the new blue economy. Climate ready nation, equitable delivery of services, as well as these technical pioneering areas AI, cloud, digital twin, what are we missing? What you think we should be doing? Who should we talk to? We do use the opportunity space in the Hydro service agreement?

For that I will close where I started, thinking all of you, for your contributions your

intellectual contributions. And let you know I am serious, I would like to hear your challenges, because that is how we will be able to make the argument to sustain the kind of resource both we seen in the agency in the last several years. Thank you.
>> We have time for one question or two, our HRSP members, you have any burning questions you want to ask Dr. SpinRite right now?
>> Hello Dr. thank you for that address, specific question, on commerce, and economic development and opportunities that NOAA can support industry. Can you elaborate on that space? As in your vision, how do you see NOAA supporting the industry and making us more competitive and energy and global security aspect?
>> Yeah thanks for that, I think there is a few areas, I alluded to most of them but I will do a deeper dive. So, IP protection is one, what we can offer is an avenue, not to suggest that you don't already have connections to the patent and trademark office. But because of enthusiasm among counterpart Kathy. We can if you will, raise to a higher level attention on issues associated with IP protection development.
I would love to take to Kathy a list of new IP developments that we have been working with the private sector partners. Believe they should get the protection they deserve.
The other is in talking with economic development, administration they have a number of grant programs for startups. And have been I would say under invested in the general environmental. So having that discussion is a another one.
The third that comes to mind of course messed is part of the family of the Department of Commerce, what they do boils down to standards and technology. So, taking if you tell me that they should be a focus and attention on this aspect for example of digital twin, that is tied to standards.
We can take that and say we would like this elevator for further discussion. Just off the top of my head those are a few examples.
>> Can I add a little more so thank you so much. So, the ports of the gateways for trade. For economic prosperity, development, energy security. Every aspect of it. How do we provide data from NOAA in a way, which makes it more competitive and more optimized? That is the, that is where I see loss of energy.
I was going to throw it out there, Houston ship Channel waterway had 811 billion dollar impact on the U.S. economy. That is just one port. Yes biggest waterway and biggest board. We have a lot of opportunity to impact and to optimize that as a competitive advantage and as a national advantage. How do you envision that HRSP helping in that space?
>> So, you have touched on two connections that we have God. One obviously is IH old plays with respect throwing holy water on whatever it is done. That is the international standard. The other interesting connection, one I did not mention earlier in the response. Is the International trade administration. They are also a part of NOAA. The head of IT a and I, I are going to be at prop 28 in eight weeks. Having a discussion about the commercialization in the overseas market for the full spectrum of new economy products and services.
Hydrographic products and services are part of that. Engaging I TA to the standards of I HO is a start.

>> Thank you very much. Dr. Spinrad, A going to be around for the break I knew your pate schedule. Great. Great, because I think there is some more questions but we will hold them to talk you in person afterwards.
We really appreciate your long history with HRSP, and really now that you have come back and promoted you look at this. Speaking about promotions, Nicole you are next on the line. We are so fortunate to have Dr. Spinrad in the cold today. She needs no introduction I have been on the HRSP for five years you made every meeting is fantastic to see you again. We appreciate your discussion.
In the questions that you bring to the group. We know you have a strong grasp of NOAA navigation services and focus on coastal resilience we will turn it over to you. You want to come and appear or sit there. As you might miss it?
>> Not at all.
>> Good morning everyone thank you Dr. Spinrad, for your comments and flying back from Biloxi last night you are always in motion. I thank you for taking time with this group today. Thank you to Julie Thomas our cochairs, and to Admiral Evans for kicking it off. It's wonderful to be here.
Thank you to all of HRSP members who are being here in person. In Silver Spring. And I know that Silver Spring is not Hawaii.
But just to remind us to maintain the aloha spirit throughout the proceedings. While you receive your honorary HRSP LDI, I want to thank you in advance for your participation over the next three days. I would also welcome all of you there NOAA inter- agency private lecture. And to my colleagues to the fall of 2023 meeting of the hydrographic services review panel. Not in Hawaii but we will fake it.
I do appreciate everyone being here and active engagement pick we truly look forward to public comment, discussions and input I have worked with a lot of federal advisory committees over my tenure. As I have said to you I believe this is one of the most effective I have seen in action.
A heartfelt thank you to those outgoing HRSP members. You have all made such an important contribution to this body thank you so much. It has been six months since we saw one another in Puerto Rico, and I do not have to tell you it has been a busy six months for an OS.
It is extra busy among other things that we have been working very hard as the doctor mentioned in implementation of IRA.
Just to reiterate, maybe bring it into context. About half of those historic pieces of funding legislation, on which we are about $3 million each. About half, I'm sorry $3 billion, I can't get you to sing billion. About half of each of those came to an OS. So double and then double again, we were toppling budget in a span of just a couple of years is fantastic and is also an incredible burden, on our team in our offices in our programs and as we spoken about before, those funds were not spread evenly right? This is not meet looking a gift horse in the mouth.
It is a signal to appreciate for you all the programs in our budget folks and policy votes have been doing over the last couple of years to get that many out of the door into the

hands of focusing on coastal and community resilience. This is also of course very good news for coastal and community resilience. And in different and complementary ways.
I can assure you an OS in across NOAA we have been strategic as a we possibly can be, about where to direct these funds. And how to use them, whether it is for supercomputing capacity, building better climate forecast, improving our aging infrastructure and fleet recapitalization.
It is truly an historic operation for us. I can tell you within an OS we have done our best to make the very best of those dollars. We are actually leveraging what we know to be true about community and coastal resilience pick which is to say, and lost on others.
It is the foundational data set like the ones at the offices, that come to these meetings providing that you advise us on they are so fundamentally important for community and coastal resilience.
We do not let a moment go by when we are not making those connections. I certainly get a lot of questions about that but we are not going to fund this foundational data program. I am like okay I am not sure what your resilience will be built on but let's talk about that a little bit more. We also are using IRA funding to really beef up our ocean and coastal observation programs. And you may have heard of our ocean -based climate resilience accelerator notice of funding opportunity.
We recently put that out to the tune of $60 million, to provide startups and other blue TAC data first services all kinds of programs that are coming into the space. To partner with accelerators to get training, resources, and the opportunity to really bring their data and resilience dues to market. We are excited about that as well. This time yesterday I was giving a keynote address at ocean 23. The MTS or Marine technology Society for ocean conference in Biloxi, and we were talking about this very thing, that engagement was very different is a it was all Mike the. But, one of my I really did drive it home one of my phrases was, you know we take ports for granted by the way. The hundreds of people who are building products to make more advanced more operationally efficient, more sustainable, and more climate resilient. I did drive home the port issue a little bit the other day. As a part of an economy, that is something that we contribute to the ocean enterprise. And of course as doctor Spinrad noted. And I can tell you we saw so many vendors on exhibit hall that are hawking their wares in the space. And they are amazing. What we saw. As we did that. Of course I talked a lot about money. When I was at the podium, I was a fan favorite, as I said to Dr. SpinRite everybody love me. I tried to temper the new resources in the space with it is not enough, it is not the duration, that we would like to see, it is not evenly spread the kinds of products and services we know and acquire to get to resilience so I tried to be pretty real with those people but also send signals to the crowd that there is work in the space for that and invite them to be with NOAA and that.
Having Rachel here, is very exciting for me and you will get to hear from her.
As we really try and make sure across NOAA we are building foundational informational infrastructure that we know that we need to bring these other programs right alongside at the expenditures that have been public. The coastal resilience. These accelerators they do a lot of work in house to up our game in places that are more of interest to this crowd.

Let's see, what else is going on? A lot. One of my priority activities has been to make use of inter- agency space.
For the first time in my career I have seen, not just by word but by deed, real commitment from the White House down to the agencies to work together, and when it comes to climate service and climate resilience, and some of the technological advances sump everything is happening so quickly I think what we are seeing in enter agency spaces, is everybody really gets it, we are going to have to move at pace. And complement one another if we are get important things done.
So I have been making use of interagency space. One of those areas I want to bring to your attention, as I was recently appointed chair of CMTS, U.S. committee on transportation system coordinating Board, I am very excited to, stretch my wings and that will, you will hear from the acting CTS director, a little bit later today. And in the coming weeks I will have an opportunity to lay out my policy objectives for the next year. Not going to be huge or lofty, I will tell you, that I have not wasted any time in laying groundwork with some of the other federal agencies pick something that we might be able to do together. You hear the doctor talk about climate ready nation. Now think climate ready ports. Gaining traction already with in CMTS. Wish me luck I will update you as soon as I have something more than a tagline to talk about. I will also, just say if there is a lot of other inter- agencies that try to bring these conversations to and you might be surprised at some of those. For example working in South Florida, Everglades restoration, working on the coral reef restoration pick
Those rooms are not only an opportunity to integrate talk about different things in the interest, but also directly to say do you have this and that data when you do that thing? And that is a wonderful opportunity to build those relationships and remind others that NOAA has so many diverse things that we are working on.
So, let's talk about Rachel. Wait she is right here. Rachel Dempsey is our first ever deputy assistant administrator for navigation observations, and position. You may not have notices, but I smelled even bigger, my biggest smile is when Julie mentioned Rachel at the top of the meeting. But I just can't help keep on smiling. We are very glad and thrilled that Rachel has decided to take on a new career a second career, after retiring from the Navy. Some people would rest on their laurels of nearly 30 years of service.
Not Rachel, we are so excited to have her on board by so excited I suspect she feels some days we are shooting her out of a cannon. But I cannot imagine more strong ideal artillery to have added to NOS, I will give you a sneak peek of what she looks like on paper before you get to know her. With nearly 28 years as meteorology officer in the united states Navy. Rachel brings application and expertise significant experience leading large diverse organizations. She also possesses a background in cyber operation and a network's defense back on. And anything else for us she is the right person at the right place at the right time. She has hit the ground running.
sorry to put so much pressure on his shoulders right up. I just want to sort of take us back, many of you to earn talk about the position before the sum we thought about long before we knew Rachel, and building on the history and the foundation of what the navigation

observation positioning portfolios have built. They have created in the world has created a greater demand for what NOS does. My first conversation of coming to NOS, got me thinking about diversity of the mission at NOS. It is not feasible for individual AA, and DAA, to understand everything from Geodesy to marine biology.
It is very difficult. Even if a leader gliding over the surface of those things. You were not able to dig in advocate, and represent, and really understand the needs and the cultures of those programs. Like I think they need and deserve.
Bringing on this second DAA, enables us to do that. Paul shows who you have met, and hopefully got to know. He and I were already dedicated to the entirety of the program that is just not what they require and deserve, and I am really looking forward to Rachel and Paul to dig in. Essentially we bifurcated the organization.
Rachel will oversee the type of programs that you're interested in. I really look forward to giving breathing room to go deeper into the subject matter and to fight harder for the progress.
To bubble up to me the kinds of things that really require my deployment in my ability to advocate for the programs at that higher level.
I appreciate for her engagement of HRSP. And you are getting to know her and her getting to know you. I will also note I have said this before we are very close to releasing our first NOS wide strategic plan. We have never done this before. I want to make sure you understand, it is not troke nine wide and it includes everything that troke nine does. We chose on the things that we want to do across the offices again to play our strengths. And complement one another.
Nothing changes in the strategic direction of the individual office and programs.
It is a sick know of what NOS will do to be stronger across the program. I'm looking forward to getting that on the street and you'll be the first group of folks to get it. I once again invite you all to roll up your sleeves, you really need to get in the conversation. That doesn't allow the full movement of your brain. It is wonderful to see everyone. I will be here half today and have tomorrow. I am going to try to join you tomorrow night. It's good to see everyone.
[APPLAUSE]
>> They so much a call. We do have a few minutes to panel members have anything that you would like to address? Nicole right now? Nicole I am interested to see when you do your climate ready ports, I'll that comes about. Just knowing a few of the challenges around us in Southern California, particularly with the military at Coronado, and Long Beach can be very vulnerable with erosion it will be interesting to see and I look forward to that discussion in the future. And the strategic plan will be great to read, I like the emphasis on those topics that you chose. And how you have done that. Do you have a question? Okay, one more thing the accelerator, the accelerator request that has gone out. That is going to be a norm is, to put up with an NOAA to provide oversight, and just to process those. And I realize, what a big task that is I commend troke one, and NOS for taking this on. I don't know how to comment on that? But geez, that is like a lot.
>> Yes thank you it will be a lot, one of the exciting things, and it cuts both ways with the IRA and BIL, we were able to fortify and double down on tried and true and known

programs which is satisfying because they work and we know and we are partners in the space. We also have used some of our latitude to smooth things as well.
It is a nice complement to that. One of the ways that we are going to make sure that we get the accelerator portion right, is to work with marine technology society and expand on our dialogue with industries that we have been having with them, so we can hear from a wide range of stakeholders that produce these products. They use these products, they are thinking about being in space and investing in the products. About what they need from the NOAA and what they think the market opportunities are if they just had this pic or if we just did the other.
I think that is going to be important. We have information from the first round of dialogue in this industry but we want to go deeper. And we want to hear more from them so we can kind of move with them and help them forecast the future but also hear from them about what they see and that includes making the data more accessible. And making different data accessible and that type of thing.
I really hope that we are able to develop a positive feedback. So that is not one time we here at one time we say. And that is a serious part we want to create a repeatable process. For being in dialogue with these companies. So we can be as agile as we possibly can be. That's a hard thing to do for a federal agency to be agile. So that is one of the things that we would like to do, and hopefully in that new space. That will benefit the accelerators.
>> Yes if I could very briefly at one point, both for BIL and IRA that was coming out the word was used was transformational. What is transformational? Interesting because the second question to us was what is the big bold new idea that you got starting with a clean slate? My answer was it does not work that way for us. Transformational for us is taking the things that we have always done that we know we are good at and putting it on steroids. Actually making 100 million-dollar investment in accelerator. Or a $600 million investment in coastal resilience.
So what you are hearing is doubling down on what we and our partners like you all have been good at for decades, and finally investing significant amounts of money.
>> Great thanks for the clarification, I like the thought that you will improve the continue relationship and it will not be a one-time thing, and you will continue that going out there.
>> Yes thank you very much Nicole, it is refreshing to see the vision from leadership. Very sure in. And I assure you that it will work. Dr. Spinrad and Nicole has presented. For us to be competitive every increases resilience. And transformative issue mission. I just want to make sure that we intend a dialogue manufacturing. Those are important anything we do. Have them at the table, because it takes a village definitely. And we are in the right direction for that. And you cannot deny it. Nobody else can appeal it, nobody else can do it, we just need to maintain that.
Don't do it by yourself in a closed door. Always open the door. That is the secret of survivability and resilience for any agencies. When I talk and what they mention like what we are missing after thinking about all of these technologies and issues.
Who do we need to talk to? Those are people we need to talk to. Academia, manufacturer and coastal. They know more than what we do as an agency and so it's not enough just to

benchmark these technologies. This is troke one I'm talking about. We need to moderate that especially the envelope. That extra step.
I don't want to try this but to bring everybody around the table and moderate that discussion to push us to the second stage and phage of the technology. It is very important. If not done in moderating that discussion nobody does. That is my advice thank you very much.
>> Will more common?
>> I just want to thank you for that. I like to talk to you more about maybe some ideas that you might have in terms of academia and manufacturing, I do think that in some of this in some respects to make sure we are not just launching new folks into either and saying good luck.
I think I am trying to think of a good way to intersect this group, with the new convening so that we are going to have with MTS and I would like to get back to you on that, because you may have suggestions for folks to those meetings that we have not fought so thank you.
>> Thank you both for really is inspiring discussion and I want to applaud your comments about and improving your relationship with MTS, I just want to speak for my own personal experience growing up in the industry. With MTS in the Navy, funding all kinds of great things like AU fees, our ovaries and whatever. I think it is good for the industry.
The fact that you are going to try to accelerate that and interact maybe unplugged the Navy and plug in NOAA is not a bad thing. The fact when we saw each other in February at oceans, one of my complaints was there was no university participation you had scripts that you read University with 50,000 students. Everything in the L.A. area there was nobody there and I think that was a really bad oversight not to include the academia and all of this thanks.
>> Thing said.
>> I did hear, I was not able to attend but I did hear that MTS held a student for the night before I arrived in Biloxi.
I know Carl Goldman was there participated in said it was really good to get the students in the room and getting an exchange with them so I think they heard you.
>> Great we love the students anyway. All right, if
>> Thanks again for the insightful messages. I have a question, regarding Nicole, you talked about enter agency coordination, it is so key in a lot of over the years we talked about Army Corps.
I am curious what is happening in the space of enter agency coordination with be zero EM and the emergence of the offshore wind. Huge volume of NOAA like data that is being generated from large swaths of ocean. As well as thinking about the example of say the Netherlands where the government does a whole lot of front and data collection and analysis for blue economy opportunities offshore wind being one of those and provides those two industries and to investors into advanced renewable energy opportunities. Thus like shortening the timeline and de- risking decisions both taking and understanding the environmental impact the full understandings of what we do is new in decisions that we may pick so we can reach the goals the 30 by 30 goals these objectives I am curious there

about your thoughts about that.
>> I would be glad to talk about the goal relationship a lot of that into ships mostly with the national Marine fisheries, except for some of the intersections programs we had some rough starts with relationship when Liz Klein came on as the director we said let's reset and see how the relationship works. There was a lot of incorrect assumptions being made with respect to processes especially on things like incidental harassment authorization or incidental take associated with North Atlantic right whales pick so the first thing was to get on the same track on the permitting. I would actually argue the data and the information exchange is on a pretty good track they understand that is our job so when it comes to Thursday mapping and charting, they know exactly what to come, they understand the authority that we have in the space it is really mostly been around fisheries permitting around even things like what sort of time frames are allowable and flexibilities are allowable for piledriving.
For building platforms, we are in a much better place we do personnel exchanges, we develop strategies for mitigation. Here we were two years ago I remember getting a phone call from irate Gina McCarthy telling us we need to get our act together. I think we have our act together now the other part is. I will argue the White House argue needs to make sure it gets his act together. And I think we are in a better place there. John Podesta through his role as been very effective in making sure all of the federal players are having active dialogue and I think the other thing quite honestly this administration we got a clear reading for how priority this was it was hard to determine where that fits in the general play of where we should invest our time the president made that clear. The offshore when 30 by 30 initiative. Between all of those things working out the kinks on the into agency relationships understanding the priorities associated with those. And getting the permitting. I think we are in a better place. I would just simply had the recent discussion about the challenges offshore wind. In the challenges are mostly tied to their not really know related. That's not good news for the industry. But it is good news for certain us into aspect is not about per. It's not about the supply chain. It is about tax structures and economics issues. Not to oversell it, but I think we have got our act together really well now in terms of permitting schedules understanding with the driving forces for each of those.
>> I want to give Rachel enough time, we will hear her speak before the break, and so will get to your questions, but Rachel would you like to talk from there or appear.
>> I will talk from there it is perfectly fine. Good morning everybody thank you doctors been read for your comments. It is good to see both we appreciate your time Julie and Sean thank you for so much for cochairing and for leaving our team thank you to all the members welcome to Silver Spring. I've met some of you looking forward to meeting all of you, and I also want to express my thanks to those board members that are going to be leaving us after this meeting we appreciate all of your faithful service over the last many years thank you so much for that, I want to explain my role as deputy administrator for positioning really quick to give you kind of an overview of where I sit. So when I arrived I took over the portfolio of NGS team, the obscene, and OCS team. So directors are still in place, I just get to add another layer of advocacy as Nicole alluded to to really bring

attention and support to this important foundational group of offices. I also had the opportunity to oversee the and OS information management office, and my background in cyber this is some that came late in my career.
But it was eye opening while I was there, and I am brace and understand and very much embrace for us to make sure that in the light of our deliverables, to making sure that data can be accessed by the end users that it is in a secure space, that is a great opportunity for me, I wanted to give a few highlights from the things that I have done since I arrived in April, the team as given the opportunity to travel all over the place and eat a whole lot of constituents and stakeholders. I have met with the advisory committees engaged external groups such as Marine information services of North America. Maps, a APA and of course with the San Francisco bar pilots in the Port of Baltimore and so many other folks. I am making my rounds, and I think it is so important for me too get out there and meet others, especially when it comes to the ports. Each port is very different. Each port has its own set of challenges. And you know, we don't have a one-size-fits-all solution. So I am coming to see you I promise. Recently, I also made a trip out to Boulder.
If you have not been out there NGS as a great footprint out there as does list.
One of the things I got to see directly receive direct funding from PIL was foundation reference stations. I got to Table Mountain. And see port stations as well as many others, and heard from sciences about how incredibly important things are. And prepping us for completion of national spatial reference system. So, also had the opportunity I think it was locked. But I think it was a little bit of good timing, that I was there, coincident with every four years meeting to standardize the imagery management. Internationally. So they were representatives from Germany, France, Spain, Taiwan, and many others were coming after I had that. And that was really a fascinating organization to see that work. And so I greatly appreciate that. I also want to talk about how important it is for us to hear from you in engaging in supporting and OS's new strategic vision, and gather your thoughts throughout the week. I want to offer a little bit of perspective to myself. I work need to partner with you specifically regarding Xhosa resilience in the new economy is needs to grow. Okay? We've already done a lot but I think there is much more that we need to learn from you. As a former Navy warfare commander.
I have a great appreciation for references the doctor me this morning regarding application of information, data, and environmental intelligence. Okay? These are really critical to solving the challenges that I have seen during my travels over the last six months. These are wicked problems. Hard to solve. Right now we have great sensors that are out there and they are applied in a way that we always apply them. We need to start thinking about how else we can use this information how we analyze it, how we apply it to other problems that we don't know exists. What I want to give you as a reference and I already talked to him about this, is the quarter stock.
When I went to Monterey I drove up to San Francisco. And her team, relate a story about the Port of Stockton in her timeframe. You all remember heavy rain from the rivers atmospheric rivers that we experienced last winter.
The tremendous amount of snow that occurred in the mountains. So at the time I was

there it was spring snow is melting. All the water has to go somewhere. So, where it went in this case was down the mountain into San Francisco Bay along with silt from hills.
A cause basically a spit, that closed off the Port of Stockton. As they were awaiting emergency drainage one ship had been trapped for 30 days. They had two ships offshore that still were not able to. Understanding why can't they go somewhere else that doesn't work that way. Learning this. I'm thinking what else can we do? To help think I had. And notify or prevent or be able to support that foreshadowing. It is about information it is about data.
I also want to touch on the people part of this right? And I know you guys talk about this a lot, I went to throw my hat in the ring too. We are energy office crisis you all know this, I will continue to knock on this constantly. I know that Juliana and Brad and the whole NGS team and I know our partners are right in line with us here, they have been partnering on their own along with NASA to try and recruit folks, we have worked really hard to go into Old Dominion University. Where people live water every day, and reach out to our minority serving institutions down there. We have established a new pathway internship program that will start in fiscal year 24.
This is a drop in the bucket. There is so much more that we need to do, I would implore you to continue to think of ways help us understand the thoughts and moving us forward to recruit more people because they're desperately needed. Wrapping up real quick, regarding recommendations from H from HRSP. What you recommended and what was replied on our behalf. It is really good to see the reflection of that throughout the agenda that we have this week. Sustaining our core services in communicating and advocating for the services sustainable operations at NOS, Xhosa resilience activities. I would remind you of Xhosa resilience panel that I get the opportunity to you know monitor tomorrow. And I am looking forward to that. I really hope that you would take some notes away from this this is important to us. The effective chart roll out as well as digital twin application which I am fascinated with this is a wonderful opportunity for us. With that, I am running out of time. Interest of such. I will turn it back over to Julie thank you.
>> Thank you very much Rachel we appreciate that.
>> Okay I know we have questions, but I want to let the Admiral talk first to finish up and ranch up we will take Debate and we can take a question? All right. Okay. I know that having questions on scope.
>> Yes thank you for the briefings, we really do appreciate it. It is great to hear what is happening. You have all touched on I guess, on the workforce development, and I think that is key, and we will talk about the crisis later. The goes beyond just Geodesy is all foundation. I say that my career 40 years ago as an engineer. And here I sit and how does that fit into it? I think in the workforce development generally we talk about students bringing them into that early on, and those that get to the and they are qualified.
It is kind of midcareer and ongoing development and I see some things that are happening. But I don't think from the perspective of the community and industry it is not just NOAA. I know you don't want to lose people, but I see it as a community and maybe that's part of government role. And how do you set that?

One of the areas of certification and standards and all of those things and I think that is an area where NOAA can take leadership in that. It is really important for people to be to go from that technician to professional. And having that transition.
I just wondered? How do you generally see all of this role for NOAA in this community and this workforce development.
>> That is a great question. I wanted to defer to Julian. I know from some of the work that she has been doing, they have been reaching out and offering training. There has been a lot of gatherings of students, to work on surveying. Online training I think that is offered on regular and through some of the community meetings. I think that does meet some of the new career points. I appreciate that. In order for us to get to fall, it cannot just be one approach. We have to capitalize on those folks that are already in or touching the business. Offering the training, like you said, but first finding out where those certifications and trainees is?
How do we apply them so they are accessible to people? I would also offer that I think that we need to we need to advertise a more. I want to point that when I went out to Japan for a meeting. Every hydraulic roofer that came from overseas, everyone of those students, when they arrived at UNH, their G Odyssey class they did not they told their instructor they did not know what Geodesy was before they looked at the door. That is a problem. That is clearly a problem. This is kind of why and my mind, one of the big pushes needs to be early. So that they understand what it is from the beginning they understand the importance from the beginning. Your point is taken, it needs to be a multi prong approach. Thank you.
>> Lindsey I would like to fall out on that as well, I we would hear from more this in the program when we talk about the new center of excellence for operational and ocean and Great Lakes mapping. I think you were, for the awareness of the group we had a forum on this and UNH. As part of the program review back in July. Which included academic public sector also a broad suite broad spectrum of the private sector as well. We are the mess is unclear. And I think that is one of the key pillars of the new center of excellence. And I think it also is an area which it is ripe for public and private partnership as you suggested. I think that is an area that the public will dig into.
>> Can I just make one call up to follow up. Getting the students and once you have the students in the biggest danger is we lose people from the community in the industry. They seem the path it is like NOAA stepping back and having the role of the path. In a long typical four. These are many people in the U.S. is the fundamental undergraduate personally. The undergraduate survey programs that are lacking. In this way most of the of the commuters that we see have foreign people like me here.
>> Thanks this will be an ongoing talk to the next couple of days. We discussed in past meetings, it'll keep coming up.
>> Yes thank you. Thank you Rachel, and glad you brought the example of San Francisco Bay and the mudslide. As I mentioned we've been struggling with segregation of custom from modeling. We have a great opportunity to connect trouble to the three debit program. It is very [Indiscernible]. We have disconnect when we talked about resilience on

our side we are really talking about sea level we had a big disconnect pick we need as an agency, and it will give us greater opportunity. That strategy, one day today just connected. Data through the three nautical mile of sonar. That would be great service. My humble request since taking off this position whatever you do, increase support for NDS and Giuliana. Thank you. As industry engineering and surveying we cannot survive our business without the services. Kudos thank you very much.
>> I know they have a question but were going to in the break time if we keep talking. So hold it and we will get to it at some point. If it's not it's a during the break. I will turn into over to you.
>> Thank you will keep the comment brief. I will say again how glad I am to be here for the fourth HRSP meeting as a designated federal official the third in person. I always enter these meetings with trepidation. And then leave simultaneously invigorated and exhausted. This meeting is no sign been exception to that. It doesn't have the same tropical feel but thank you Nicole for helping us to that. But I do want to mention a couple of vintages of holding the meeting here in Silver Spring. One is the fact that so many of the colleagues from NOAA and other federal partners are able to be here. We don't always see that staff component in the field. I encourage panel members to engage with staff members here in the audience.
Secondly I think it is evident, I am deeply appreciative of the participation of NOAA senior leadership both today and the leader sessions. Again another advantage of being here is we have access to the entire leadership chain of NOAA and we don't typically get that. We usually get one member and one perspective. But I think you heard this morning, integrated vertically integrated perspective, and vision which to me at least is exceptionally informative thank you all for being here.
I will also say again thank you for the HRSP members being here. Your time is valuable, we deeply appreciate your advice and engagement. And it was alluded to your recommendations they have real impact not just on the agenda of future meetings, but on the actions that we as NOAA and the services within know what we take.
I was going to give an overview of the agenda you have it in the folder. I encourage you to take a look. And I will close by saying I look forward to discussing these issues of real national importance. Recommendation for issue paper, and the members of eyes to the NOAA administrator. I encourage everyone who was listening would like to make public comment, to do so at the appropriate time thank you.
>> Great thank you very much, we are going to head and take a break, first of all let's recognize the three speakers.
[APPLAUSE]
as the admiral stated we are fortunate to have them for this introduction to the meeting. We really do appreciate it. Let's take a break 15 minutes we will see you back then thank you.
[Break]
>> Could be go ahead and take our seats, we will get started with our next session, thank you.

>> Okay thank you all very much, excited for the next session, who will be the directors reports here, very excited to have the start of each of our meetings. Admiral I will turn it over to thank you.
>> Thanks Julie, and I think we are waiting for the clicker to advance slides. But I will say, it is a pleasure to speak with all of you today. It is certainly incredibly invigorating to come off of the heels of Dr.Spinrad, in Rachel and others. That is not that talk, I did a NOAA environmental leadership seminar series talk a couple of weeks ago. Which was online and reflected on some of those same themes if you are interested in hearing my thoughts on that you can listen to that. That is not this talk.
There has been incredible work and progress yes since we last met it will be a challenge to get this in in 10 minutes. I will dive right in. I do not have a clicker if I'm assuming if I say next line someone will advance the slide. So I will start with two of the most recent things, which perhaps our mode -- the most significant. So after a year of work, 2023-2027 strategic plan was released in August. I outlined this in Puerto Rico I will not go into too much detail.
Other than to say and reiterate, this plan relays our course to complete the transition from a solely product focus organization to one that is focused on data and products and services primarily navigation but also others. That those data and services enable.
This plan lays out how we will meet fundamental challenges to deliver the products and services to users who need it, and the right format, in a timely fashion. I hope you have had a chance to look at if you haven't there is a QR code there on the screen. We are very proud of it okays you have not noticed. I am particularly proud of the Coast survey personnel spending so much time and effort into it. And our thanks reviewers and other programs and other staff that give us feedback to make it there.
Another major document released in August, was the updated nautical charting plane you see it on the right. This is a more tactical document within the overall strategy, it describes continuing work to meet the needs of mariners and other uses of nautical charts now and in the future. It consolidates and updates information from several other documents which we have now retired.
None of these goals and activities in these plans, could it be possible without the coast serving force. Big changes on a leadership team's I will highlight here. As everybody is aware Dr. John Nyberg, there are one of the directors of the organization. He took this coast -- this post on December 1. Great interview with John on the website that leads out the vision that he intends to pursue as director. I encourage you to go find it.
Closer to home the captain has retired after 30 years of service. From the NOAA commission core.'S and that time a bunch of that time was spent in co- survey most recently as chief of the chart division. In his place is Ms. Julia Powell who was with us today. She moved from navigation services division over to Ament CD. She spent the majority of her career at MCD. She's digging in and moving out quickly on the priorities laid out.
Fortunate to have Matt Kroll deputy chief of navigation service division. Graciously agreed to step in as acting chief until the arrival of the captain next spring. He is the currently the commanding officer of the NOAA ship Thomas Jefferson.

I look forward to introducing them to you in the future. I alluded to this earlier another big update. Is that we have established a new center of excellence for operation ocean Great Lakes mapping. This is core capability for survey and for NOAA. It improves no NOAA enterprise Eagle operation of expiration. As well as public sector academic and private sector partners.

I will gloss over this for now. I talked a little about it in San Juan. I know Andy has a lot more to say about it. Focusing on things that we do right now. Even though strategic plans are fresh. We are already delivering results on several central goals. First I am glad to report ongoing progress on building out the national map of metric source.

Multiyear metric I single authoritative up to date model of symmetry in U.S. waters. It will support the survey planning process. Also the general public via the now coast. The team continues to work on the Mississippi River and mid-Atlantic regions. With expectation of wrapping up the East and Gulf Coast by the end of the year. One big change since we last spoke we made a strategic decision based on stakeholder input to prioritize the buildout of MBS in Southeast Alaska, once they are complete. We expect that by 20 for a productive year for MDS, we have significant capacity coming on board that is funded by the bipartisan infrastructure long. We've also dramatically accelerated the process.

Tradition paper chart footprints to regular grid at fixed scale. Completing this is essential for making the chart update workflow more efficient enabling transitions S101, starting in 2026. In improving functionality of the NOAA custom chart two. Earlier this year we realized the pace that we were at we were not going to finish grading until the 2030s. So by radically rebalancing resources, we are now on track to complete this work in 2026. And as we continue to make significant steady improvements to the NOAA custom chart tool. This is the interface where users can print a paper chart product to arrive from data. We intend that this would stand alone navigation product for regulation mariners. Custom charts can be an important to to augment official. Significant feedback on this interface and product, including from HR including from HRSP members, and shortly after Puerto Rico grew released the second version of the tool. The most significant update is users can now save the work. And reproduce the charts that they have set up.

Just two weeks ago we released an update to the tool, which improves how simple how bullies arbitrate. We continue to work with [Indiscernible] on this as well as Hydrographic office around the world to make further improvements. Lastly I will note just in the last month or so we crossed the halfway point in the cancellation of traditional paper charts. We remain on track to complete the retirement of paper chart by the beginning of 2025.

Turning to our field work.

2023 is been a productive field season with unique projects. I will try to hit high points in the interest of time. You can always see a full report of the work on the coastal survey website. QR code on the left. One of the most significant things we did this year, was a series of hydrographic training cruises above the NOAA -- back to NOAA ship Nancy Foster. We offered see time in the NOAA fleet last spring. Too late to stand up a traditional survey in the so-called Hydro ships were all full. The operations branch consisted for hands-on training for undergraduate. To help meet the immediate demand for journeyman level

ocean mapping and hydrographic practitioners.
For May -July there were four 6-7 they legs that hoses students and members hydraulic a few participants, great opportunity to try out some of the ideas from work first generation, that we intend to operationalize under new center of excellence feedback was positive.
Another interesting project were extra reserve is performed at Chesapeake Bay in Albemarle sound. This was provided to provide high resolution data in shallow water estuaries. Certainly provide valuable chart updates. Primary application of the data, is improved symmetry for marine modeling efforts.
This will support more accurate storm surge and navigation forecast, and improve the performance of freshwater models of the weather service which are bounded by the saltwater models that we develop and operate. So this utilizes NOAA ships and contractors and utilize navigation response teams, small boats systems, really a great example of the benefits of a broad sweeping tool.
More traditional hydrographic survey project performed by Thomas Jefferson and Fairweather. Also had great results this year. Unfortunately, like most of the NOAA fee, severely impacted by staffing shortages. Widespread problem in the maritime sector, the contractors are experiencing similar constraints.
Into silly attrition in the fleet is less than industry average. But it is still significant in hiring remains a challenge in this tight labor market. NOAA Ray near spent the season of the richer campaign conducting integrated mapping and research in the waters of American Samoa and Pacific in remote islands. As you may have heard early September ship experienced a fire at sea. The crew was able to extinguish the fire, no injuries, they were able to get the shift back to American Samoa under her own power.
However the damage cannot be repaired, the ship will be towed back to Hawaii for further investigation in next steps.
Obviously we are concerned by this, we monitor the situation closely. And working closely to recover the mission.
Under an RT, very busy season I have shown here some of the samples of the diverse projects all over the comp country they have been engaged in. Seattle, working in Washington state at the request of the Quinault Indian nation. As consist of the tribe in finding the fish habitat in the lake. That's new for us. New London, old work in the Northeast and the Great Lakes including the sanctuary program. Big Hydro two, engaged in estuaries surveys. Also doing a number of surveys in Chesapeake.
Fernandina Beach team completed work in South Carolina and Georgia in the Florida Keys. Stennis is in particularly high demand because they are equipped with the systems in the survey launch. They have been all over the place working everywhere for mobile River to Chesapeake to Great Lakes.
And I should mention the response survey in Florida, after hurricane Idalia at the request of the Coast Guard. And teams remain on standby for the remainder of the hurricane season. I will skip the FY 24 field season update in the interest of time pick will of time to talk about this in the next meeting of the spring. A lot of plans in the pipeline I will say. I do want to take a moment, to conclude highlighting our extension internal engagements. Both

internationally and here it on.
I wish I had time to go into into detail of few of these activities. But you just have to guess at what we're doing and what we're up to from the pictures. I want to emphasize we are pursuing a deliberate strategy to build awareness of what we do, particularly here at home, working with organizations such as the American Association report authorities.
Sharing a story as widely as possible with partners in Congress. There is a lot more to engagement strategy that can fit inside the Beltway. We have got to get out to meet with stakeholders and international partners. The pictures on the site demonstrate those efforts.
Internationally, the Hydrographic community is under pressure to transform to the next generation of electronic charge. Even at the same time many of the smaller states still lack the resources to produce an article charge. The U.S. is working with the states through the eye HO and regional hydrographic commissions. To ensure that none of the states are left behind.
International engagements are also a four or more we can collaborate with more mature hydrographic office just to get challenges. Bidding together to derive paper charts and tackling more existential challenges such as decarbonization efforts that were mentioned. In fact that topic will be the central technical theme of next year's Arctic regional hydrographic meeting. Which Norway will chair and we will vice chair.
However, I will most critical engagement is with coastal communities in ports right here in the United States. I know I am over time. I want to take a moment to talk about good example of that which is the trick that I took to Alaska in May with members of the co-service that.
Incredibly busy week, meeting with stakeholders, partner agencies, Alaska native tribes, Juneau, Anchorage, and known. Despite having spent more than half of my NOAA career surveying Alaskan waters.
My exposure to the people in the group said that survey were for benefit, up until now have been limited. And the connection of photographers who produce these charts that these regency's can depend on. It's important for us to bring the lead of the team that supports Alaska with us into the state.
Alaska is a huge state, we hear a lot of different input, a lot of diversity in opinions. The most powerful take away for me, was frankly the skepticism. What we heard from the Alaska native tribes in Nome, we spoke to them about the increase mapping we plan to do in the region. And they are worried increase mapping may bring unwelcome development which further impacts the resources that they depend on for centuries.
This is eye-opening, because I think our the NOAA model is built around fundamental assumption that geospatial data is a public good. Which would be produce in great quantities and made available. So the experience of talking to those citizens and tribal members certainly made me think that but it has prompt me too think deeply about how sweet engaged with those partners and communities. To build ownership in the process of outcomes.
That is the thing that you cannot learn by going to a place, you have to go and spend time

and here the people that you are trying to serve. In closing I hope it's clear I'm proud of what we've accomplished in the last six months. Exciting time at co- survey and a lot of opportunity and address significant challenges. And despite these achievements, we are certainly not slowing down, I'm looking forward to discussion this week. He recommendations thank you for being here.

>> I will go ahead and jump in, in the interest of time. Thanks for the opportunity to provide updates to you all. On what we have been doing in the past year. And a look ahead to what is coming and I want to make sure everybody can hear me in the back okay is this good? Awesome thanks.

All right, let's go to, so those of you who have been on the panel or in the audience have heard about modernization of that national spatial reference system. This is a long process. We are making excellent progress. Just real brief, the national data that we currently use and developed in the 1980s, prior to the advent and operational GPS.

With GPS and everything that we know from satellites, we note much better with the center of the earth is. We know much better where all things are and we need a national spatial reference system that makes use of that, and provides that information to stakeholders. So we are updating the data along with all of the data tools and products and services that go along with her. This one is for accuracy, access, and alignment of geospatial data everywhere. In the united states and territories.

It will enable alignment of all types of data in support NOAA's goal of a climate ready nation and also supports NOAA's goal of equitable access to the information, which will spend more than one quarter of the earth when we are complete.

One of the major milestones of getting the work done is the collection of gravity data from aircraft. Airborne gravity. The short-term for this initiative is graph D. The separation of gravity it depends on that. We have been tracking this for 10-14 years. And slowly making progress through the help of a number of partnerships number of aircraft, nor resources, just in-kind support for getting this work done, I am excited to say we have completed one 100% coverage of the additional lines that we expect to do for the survey, this year, this month actually, and with all good service what you get the data you take a look at it and go we need to go back there into a little bit more work to make sure everything is up to part with data quality. While we have one 100% in collecting all of the area, both the mainland and Alaska. The Aleutian Islands are covered this year it was a challenge. The Pacific in the territories, making sure that we are providing a national spatial harbor system to all of the areas that we are responsible for. Not just those that are easy to get to. So, yes, we are done yes we have cleanup work to do which will continue into the next year. Really quick the basis of the airborne gravity data will be the basis for the datum, in the products a new Geo model. That will be based on gravity data and gravity is going to be a theme forevermore and what we talk about above the national spatial system pick which is no this collection is a key.so we can continue to develop the next products that we need for the modernization effort. So nothing can't be done with all people right? So another big effort that is underway that is shared with our partners in areas within the federal government and outside as well. The crisis in the United States, and the fact that there aren't enough

U.S. citizens that can't apply for positions that we have available, we have to look for other ways to reinvigorate the field of genetic sciences. And related scientists in mathematics fields that we need in our workforce.

There is a community of practice that has been initiated you will hear a lot more about we have what is happening with community practice how do we partner to improve the field of geodesy within research and workforce perspective, and solving big challenges we have that looking ahead in the technologies that are available in the future to solve the problems that we don't know that we have yet. Or solve the challenges that we are trying to improve on. Thinking about the San Francisco example blame it on gravity that is gravity's fault knowing when that gravity and how it changes depending on where you are helps the modeling of whether it's water or something thicker than water. Silt or mud or whatever, it is important to have a base map of gravity depending on where you are and what is under the cross. Who were not thinking about what those things that you don't see that are really important in measuring and mapping and positioning all things. Land see and hear. So you will hear more about the community practice related to that I'm also excited to say this year there were able to award $4 million in grant funding through geospatial modeling grants.

That announcement came out of the awardees this month as well. Scripps, Michigan State, Ohio State, Oregon state, all recipients of some of those funds this year. It will help us, it is a drop in the bucket is but it will help stimulate research opportunities, opportunities to grow epidemic programs focusing on geodesy in universities. Supports graduate student work. Some of them are nation efforts that are still working on. We are excited about the number of applicants we had and unfortunately we were only able to award for these four groups at this time. It was mentioned earlier Rachel got to go and watch gravity being mentioned. Maybe that's not exciting, but it you have unique instruments something that you can see. How do you know if you are measuring right? How do you know, if you got an instrument that is so delicate it can measure things what do you know if it is right? You bring the instruments together as many as you can and you compare them.

You go well, I am not sure who is the most right but we know how things differ from each other and we do this from a series of measurements over time in a very specific place. So NGS hosted this international Olympics of absolute parameters. Unlike the Olympics everyone is a winner because you all come out with information about your leader that you can use in your measurements and we take them back home to the 20 different countries that were involved in the participants that were part of the measurement. Really quick, couple highlights that I have to share with you today on the and SRS modernization efforts. This year we were able to complete the state coordinate system in 2022, develop a partnership of the states, and make those available on Alpha site. They can still change we are putting them out there so the partners can look at them and see what they do for them, the industry the major geospatial industry can take a look at them and figure out how they are going to enter this information into their software.

These definitions are out there and there are about a thousand of them again across the U.S. and are available now. In are being utilized by our partners to see how they are going

to give us feedback there also has been a huge push to get more information into the users of our data through a number of things like opus projects.
Reading things in trade journals, and we want to continue to promote maker products and services in alpha or beta in we can have feedback received before we finish up our final product. Skipping through a number things that are ongoing now we plan on ruling out a new NGS research plan, beta release of course station pages for Tivoli delivery system.
The data X change or GDx will place the GV X format. Those know what I am talking about a moment go into details. Beta releases of adjustment program transformation engine pull parameters and also alpha reference coordinate adjustment sometime in early 2024.
These are things that are coming. Hopefully like I said as soon as those are available we will get those out for people to test.
We are also going to be dynamic heights and having the tools so that can be used in water management efforts. Continuing on with the list, the coordinate function to describe the dynamic nature of stations in the network over time. Because again nothing stays the same, and changes is different depending on where you are and what is influencing it. Even seasonal changes. So we are doing better with making sure that those functions are available for our primary cores in the network that we manage. There is also going to be an L4 release of the Geo model collection of all the data coming up in 2024. A number of data updates like new model for Texas and Louisiana coasts. Having users be able to include the uncertainty of their own mapping data into the equation. And then again foundation cores.
Contract work finally begin FY 24 utilizing a number of the funds including PIL funds. As I've mentioned we will do some replays to make sure we get holidays and any of those stragglers that we have in getting the airborne gravity field and so we didn't have a grades one 100% coverage of our effort.
Looking ahead collaborating with other agencies in gravity collection in particular Canadian Rockies and continue to roll outs in 2024 and beyond our products Domino style on the data saved a number of these things rely on something before them. So as we continue to make progress we will continue to roll those out. Hopefully culminating in 2025 midyear official announcement more than eyes SRS pick modernization never ends. There is always more to be done. We look forward to serving in that capacity and getting feedback from you all and others on how we do that better. Briefly two more slides. Two or three more slides to talk about highlights of the coastal mapping program near and dear to a number of us in the room. Just want to highlight the fact we had 25 task orders $30 million a share. We were able to utilize. Funding from another supplemental listed here. Partner funds, looking for the joint opportunities were people are seeking to collect data. And how do we partner and make the most of our dollars work for us and deliver the information back out to the public. So others can use it too. Collect the data purchase data, and looking at some of the river areas to support the national water model the national water center and modeling efforts. Also with USGS in particular response to hurricanes in Alaska.
Continually lots of things going on, coastal mapping programs. These are just some images associated with things that I mentioned. Also again looking at data and how we can evaluate that and utilize that for informing changes in land formations and modeling et

cetera. So a lot of great efforts underway here including response to things such as Hurricane Ian, Hurricane Nicole, Maui fire in hurricane Vidalia and most recently hurricane lead. We are keeping our mapping folks busy and they do an excellent job always. Within know and partners helping us get the most out of what we have. Resource wise in getting information and data products and services out there.
[APPLAUSE]
>> All right good morning everyone thank you for having me my name is Derek Snowden. I am the acting director of co-ops right now. So this will be a nice to see if I was paying attention to any of the early briefings that I got. All right I will run some updates that have happened over the last six months with the product line, some of the core observing systems and system of development. All right, perhaps one of the recent accomplishment and one of the things you most proud of over the last six months is updated to the high tide flooding outlook. This is mythological changes to how they are made. And also with these visualization changes, both annual and monthly products spatially and down into individual stations. That is pretty exciting. The seasonal bulletins have been replaced we provide a regional summary, three months temp oral scale, that has been replaced by a monthly product now, and the direct estimate of the number [Indiscernible]. In each month. Looking out about a year. I want to emphasize the date of the powers these visualizations is available for BPI, so are proud to make that available for the people to take that into the visually's and subsequent analysis system.
Diving deeper into those two things I mentioned mythological changes we have now incorporated for what we know about the annual cycle of five flooding at select stations I think this is a done at 60 of the 200 stations we cannot do this everywhere yet. And at on that sea level rise estimates. See level rise change scenarios. And then another term that this represents large-scale oceanographic features and how those stick around over time. Monthly following we can take the estimate of for a year end that will be updated each month, so each month we will have the most recent estimate of the number of high tide flooding days. Accompanying that are descriptive text on what this means for you and how you bring this home to a narrative form.
The annual high tide flooding Outlook in addition to quantitative estimates of the next year also shows you how that might change over time periods of 22050. Based on those projections. Here is a sensory development project. Get a little bit more information out of existing projects. One of the things we hear about a lot is the need for adding more dynamic information of climate on top of the static sea level estimates that the sensors can give you. So through some care clever processing we get an estimate of waves set up and short environments and that is more information relevant to things like coastal erosion in the sand dunes and that sort of thing it is a development project that is being reported right now as we speak at the meeting. So there's folks down there talking about this new research. Looking forward to see without success.
This is a fun project grown out of a collaboration. Adding cameras web cameras to select stations to provide visual context of what the data means when you are observing. It brings their own for people who may not be savvy with the underlying data types if you see on the

left the upper panel on the left is Charlton -- Charleston South Carolina, hopefully you can see the blue and red dots that show the time of high water at that spot. And the WebCam shows high or high water with that means in that particular location. Starting to cover the marshes the water is right up to the bottom of the dog. Fast forward a couple of hours as hurricane Idalia is going over South Carolina it we get to peak water level, and you can see the dots there. Actually just a couple minutes before peak level. Nevertheless you can see the large complete covered and well, that's what you see. Yeah, and so like I said this is a great way of bringing some of the date of home for people who may not understand. It's a good data set for future products. We can dig into imagery and start to pull out vestments of recurrence. And changes of that stuff so it is a promising technique in addition to being in a spirit to. Boards updates so in the past year we have updated six different for systems adding new sensors and integrating new senses that already existed into the importance data management system for installing new sensors. Additional water level stations that sort of stuff, that has been accomplished over the last year. We are not withstanding, days per weeks away to clearing our 39th in oral harbor, operation. In partnership with the U.S. Navy, hopefully will be able to finalize that pretty soon, and that a lot of planning and testing and design the next port hopefully the 40th port in Seattle Washington sometime. That is the observing system updates. We also have been doing a good deal of public outreach community outreach to solicit public opinion on the port program itself.
I think we have had 11 stakeholder engagement workshops in the firm helped us organize and survey the community. Looking at two main questions, trying to document what a fully built out port system is this is an opportunity for individual stakeholders to go and play with the GIS to and put a dot on the map and say that's where I want visibility sensors, or that's what I want that sensor. It quantifies what a fully built out port system website. And then we are starting to solicit information reports governance. This is a difficult program to maintain viability for the long haul. We are trying to think of different ways to assess ways they can be governed and supported in the long haul, we are starting to assemble the data, we don't have a preliminary report him but we are starting to get like I said some literary information actually I'm not going to say that I forgot what we expect to be done.
Sometime in the him the national current observing program has an active seasonal last two years, the top three campaigns Columbia River, Delaware Bay, Savannah River are in various stages of completion I think the senses are out of the water for most of them. It takes about a year from the senses are pulled out of the water to develop new title predictions. So that data processing is underway. In those three locations in updating the title and the tide tables in the next six months. The Charleston harbor deployment is planned for 2024. The next and water engagement. This is a little bit of a teaser for a new website and for modeling discussion tomorrow. But we have been working with some partners in an OS. This is a collaboration of updating the co-op's website this is exciting to be able to dig into all of the time series that you see and compare them with each other and compare them with models if they exist in the area. And bringing our website to the 21st century. So, this is slated for the 1st quarter of 2024 for beta release. I'm sure you will hear more about that. The background there the estimates operational and dates new and

updated models that we hope to operationalize in the next five years or so. That will be discussed tomorrow. I will in there.
>> So, good morning everyone. So I am reporting for the NOAA UNH and Center for coastal Ocean mapping. To date rather than talk about some of our research efforts I will talk a little bit more about the new center of excellence that was mentioned a little bit a go. This will be in three parts. I will talk a little bit the joint hydrographic center. There are a lot of folks fairly recently, on to the HRSP may be have not have that. I will talk about the center, then a little bit on the UNH perspective. Many of you may have seen some of the press release information a little while ago. We were fortunate enough to have the doctor visit UNH, and make the announcement of this new award to the University of New Hampshire for ocean mapping facility, to support the center of excellence.
It was reported in Marine technology news and another trade journals. And through press releases from Senator Shaheen and other members of the New Hampshire delegation pick We are happy about the publicity that it received in the interest in the center.
So the joint Hydrographic center is an institution that has been around since 2000. We've grown quite a bit of the building where we started. We added a new wing to open the center, based on a $1.9 million earmarked for Senator great.
The University built a center and we filled a piece of that new wing. Very quickly a little bit later we added another wing. We became authorized under public law are 111, the ocean mapping coordination act otherwise known we continue we went from being an Aramark to a competed center with congressional authorization. And we have competed a few times the University of New Hampshire has one of those competitions, and operated the center since than just recently a new wing. It was added to the building. So the place has become a bit of a maze for visitors.
We are now in the middle of the last competitive awards cycle, the series started in 2020 and will go to 2025. Okay, the joint hydrographic center has these goals of the development of technology and expanding constituencies for ocean mapping pick and importantly educating a new generation of hydraulic rivers and ocean mappers. This is with advanced degree programs, this was an advanced education program that is built in the center. And so over that time period, we have been successful in getting a lot of people into our profession. As the PhD's, two of them were NOAA employees or became NOAA employees, a number of Masters degrees, we graduated three NOAA admirals. And through the scholars program that Rachel mentioned, we have graduated with certificates on ocean mapping 120 students from 50 countries. And we have had our graduates go to NOAA, private sector to academia, to Corps of Engineers throughout the hydrographic community and so, we are pleased that we are able to make a contribution across ocean mapping. One of the features of the center the center for coastal and ocean mapping part of the joint hydrographic center UNH entity.
Is the industrial Associates program. And so through the University of New Hampshire center for coastal ocean mapping has made a grievance. These are all formal agreements with a large number of industrial Associates to look through the list you'll see the important software companies. Most of sonar manufacturers, most service providers in the

industry.
In this program, these companies have early access to view an ace research, and in turn, they provide with something of value, that something depends on what the particular companies do, this is not a money changing operation, this is a sharing of intellectual property. And services that the companies have. This sets up you and aged really well for the new center of excellence. So they added that a number of specific of examples of our 20. There are some key pieces of hydrographic software in this list. Some importance hardware that have been developed have with me too date one of these new crowd sourced symmetry black boxes. Just the box that just crossed, if you make it your self it costs about $10 if you buy the commercial version it will be about 200. That price is expected to go down.
Then, we also had a strong history of practicing co- development of software with our NOAA survey processes and a suite of tools. It is really a great example of that in
>> tools is an example of collaboration with National Science Foundation. So here are some of the partnership these are ones that are focusing on unaccrued systems. I should point out that throughout this this is not just you and age but working closely with co- surveys, OER, and fisheries. So the center itself, charged in th appropriations report to work across NOAA an partnership. working across troke one offices to improve deepwater, NOAA to work across mapping and deepwater and shallow water and coastal mapping capabilities and did all of these. We will be supporting existing goals, and existing programs, and filling in some of those unmet needs, that the organization has.
We will support a strategy, and we will support the requirements in hydrographic services improvement act. Coastal ocean mapping and integration, that was PL 111 whose name I could not remember a while ago. And then 2030. -- seabed 2030, generally improving our ability in Coast survey and related services, to do the work that we do. So in particular, we serve as a focal point for transitioning developments, in mapping platforms, sensors, concepts of operation into operations.
This is the are 2X that was mentioned. And this is an opportunity for the center to mitigate the risk of entering into new lines of work and new technology.
So we have a program here that can try these things out and work out Concept of operations and they get turned over to the fleet they will be ready to go. So applied training is the second pillar of this. But we are not doing advanced degrees in this part of the program this part of the program is career long and career -based applied practical training for professionals and the mapping community. So private sector, and other partners all of those parts of the community will be customers for this. We are also going to pick up agency wide capabilities to provide technical support for ocean mapping technologies. Which is key to operators in the field in increasingly diverse platform that the mapping community will have. So we have an existing organization that is charged with doing this they simply don't have enough resources. We will be complementing these resources. We will not go out and take over the job of anybody else and coast survey, we will supplement the work that is being done, that simply does not presently have enough capacity to do. And then importantly, public and private partnerships we view this, not as a independent

thing. It will span across those other three items that you see up there. So our charge in our legislative direction, is to leverage these partnerships to do these things that we need to do. We looking forward to working with private sector and we appreciate HRSP push on coast survey to get this up to the top of our list. We've got a lot of support so far. The abnormal mentioned the joint hydrographic center and the annual review where we heard a lot of need for applied training in public and private partnerships, and in fact since then since you mentioned the center we approach UNH part of the ecosystem that will of him develop around the center. We get strong support across the agency, or AR, they are really supportive is making this much more possible and effective. So quickly a plan of action. This year we have awarded $8 million initial installment on a 20 million construction grant to you and eight for the facility, and we begin supporting applied training and initial staffing, Shelly Devereaux is here working with me, on both training and mission support. And Julia Wallace who may be listening in is picking up the training part. We have got a team working on this. Next year we will release a another 6 million installment on construction grants.

Start ramping up our capabilities. Fiscal year 25, same thing, and then in 26 the construction will be over and all of the 10 million funds will go into operations of the center programs. So a little bit on university view of this. They view this as a piece of a innovation hub. It are calling it the edge new innovation neighborhood. UNH is a tier 1R1 research institution at land and sea and space grant institution. With campuses in Maine campus in Durham. This house is going to be a new feature of the University of New Hampshire it will include facilities for innovation, tech transfer, entrepreneurship, all of the things that go with the new economy. We expect to have high tech companies in here, training and skilled workforce. With a real intent of having the economic and social impact. They will take an area of the campus, that is sort of outdated, and sort of a crumbling parking lot and turn it into a new state-of-the-art center, that will include retail, R&D, internships, housing for students, hotels for folks coming to training and just having an overall area that sort of supports innovation and ocean mapping and it will be the keystone of that innovation hub. So we will be the anchor Tennant sort of speak in the edge. Here are some of the facilities were run another time. Happy to talk to you more about that as we go. And already folks are signed up. So exhale, that builds the drafts are coming to you and issue set up manufacturing facility there. To make the vehicles in the United States. And then have direct access to United States customers.

We are thrilled at that we are off to a good stop and we are looking forward to a really helpful and she program thanks.

[APPLAUSE]

>> We appreciate the comments from directors it's important for us to see and not only is an important but is interesting to see what has been done since we last met. We appreciate it. Moving right along we have one last presenter before we do break no questions. Go ahead. Go ahead.

>> An easy one, from the data, did you guys find any weird anomalies or strange gravity holes or spikes or whatever you call them? Lake you know, ancient invaders?

>> It is a lot more detail, so we have more information at higher resolution, I am not sure there is anything that we don't expect. It is stuff we did not have before. So nothing super secret here that I would you know, that I could not share. But we can talk more off of line.
>> I know we all have questions, these are for people that we will have for the next couple of days. Let's hold the questions we are running a little over time it is my pleasure to introduce Brian, okay. He is the acting Executive Director for the U.S. Army Corps of Engineers? For the committee on marine transportation Rachel did mention him this morning. So were pleased that you could join us.
>> Thank you for that thank you for your time and Dr. Spinrad mentioned it was a homecoming for me or I was born from holy cross hospital about a mile from you, my dad's office was two blocks away. So homecoming for me in Silver Spring another homecoming is 2007 was the last time I actually attended a HRSP meeting from the Coast Guard, with my colleague and a colleague from the Army Corps of Engineers and we present on a project that we had to disseminate navigation safety information using the automatic identification system and we will continue to work on that that is interagency. As was mentioned interagency in a presentation this morning, and I am going to talk about interagency here. That is the bread and butter of the committee on marine transportation should systems.
It is a cabinet level inter- agency maritime policy coordinating board. I will get into the details here. So I am going to cover the background of the CMTS and focus on three areas that we are working on that I think would be of interest. We are behind schedule. I will be quick.
CMTS established in 2004 and charted in 2005. In the legislation was in 2012, formalize it. So we are established by Congress and details are up there, and what the purpose is to do how we organize his cabinet level committee chaired by the Secretary of transportation. With members from designated members from 15 other federal agencies. That day to day at work is done by the coordinating team.
Which was as the first of August we will have our first meeting on Monday. It has members from approximately 20-30 agencies and departments from the federal government.
They make up as I say the coordinating board we also have a staff level working group to kind of follow up on the work and that we have a small staff of the executor to be the next -- executive Secretary. They the maritime administration public transportation. Currently the acting director. We also set up teams we stand up for a long-term to address various issues or specific working groups and Tas teams to address specific items of a shorter term. The working groups turn into the long standing integrated acting teams.
These are the current interagency teams that we have in place. And for the remainder of the presentation I will talk about the work of three of them that are of interest to the screen. I will notice we stood up the covid-19 working group of the pandemic. It is essentially a vault into the maritime and PS workforce. Integrated action team that have several areas of interest. And things like that we were thrown into importance by the pandemic, but Argosy of always been important and continue to be some pic
The first thing I will talk about is the future of navigation integrated team. He is the cochair

for Noah, the Coast Guard and Army Corps of Engineers. And they work on coordinating federal efforts around navigation technology dissemination of information creation and dissemination of information products. They are working on S100 implementation, coordinating that. Also just last year, waterways harmonization which is an interagency effort to to clearly identify waterways, each Encina surprisingly had its own way that they looked at it. Corps of Engineers. For infrastructure and surveying and charting for example. So, this was a way to tie it all together it is quite an accomplishment to have that done. And it is being implemented now throughout the agency. The next team this is a task team that was stirred up at the request of Bureau of safety and environmental enforcement. With the development of offshore the Biden administration goal of 30 by 30 that we heard earlier. Companies are starting to find things on the floor seafloor, that could interfere with offshore wind development and one of these things that we refer to explosives of concern. That were either fired or lost or don't up until the 1970s going back as far as the Civil War or even before. And so these are things that are being found, the companies want to know what do we do with these? So they win and said what we do? And he said we don't have authority for that. The EPA do you? The Coast Guard you? It is very unclear what the authorities are for dealing with these devices out there. They came to the CMTS and said we would like to stand up the tennis team to address is pick a long story short, this team over the last two years developed guidance to the industry on how to deal with these. These devices as they are found, we held an inter- agency tabletop exercise this year, we publish Federal Register notice with announces to get input from industry and the public. That close early this week. So we are evaluating the comments that you see.
Revised guidance and will run another tabletop exercise this time with him to see. To come up with finalize guidance early next year. Finally, we have our maritime data I a T. This was spun off out of the first team that I mentioned, the navigation technology, not surprisingly, more and more data, this group of AC is familiar with that. And there is a lot of issues with interagency coordination and collection processing dissemination, storage et cetera of data also there is a lot we wanted to avoid a lot of duplication of effort. The group looks and leveraging each other's capabilities working on sharing data and issues like that. Real quick overview of some of the work that we are involved in and some of how the CMTS works. This is the almost entire list of the staff and contact information. One person is missing is our intern. Who is in the back room here today. So, thank you again for the time, and how I look forward to questions for discussion after was thank you.
>> Does anybody have one quick question for Brian that you want to ask now? You're going to be around for a little bit okay great. Do you have an issue, if you have it go ahead and ask.
>> Awesome thank you so this is exactly you guys do amazing work thank you so much. Coming specific to AIS and the challenges we have with identification and spoofing. If you would throw some light where you are working on that.
>> CMTS
>> And CMTS specifically is not working on that. But the short answer is we have to live with that because AIS was designed the way it was. There is new technology is being

developed, that we will be more secure and have high band with pick and the ability to be encrypted. To some anti- spoofing and jamming. That's the short answer.
>> Okay, in the interest of breaking I think we will go ahead but please feel free to catch Brian and take advantage of the knowledge and expertise. And, I welcome you all back here at 1:00 p.m. We will reconvene. Thank you very much.
[Break] >> Good afternoon NOAA will be getting started in approximately 2 minutes, please find your seat and get settled thank you.
>> All right, we will be starting in just one minute.
>> Good afternoon everyone thank you very much for making yourself available online for the little. The topic of the panel is being circulated around. Within the technology group for over a year now. We have different attempts to do it, but we want now we are all set to introduce you [Indiscernible]. Probably most of you [Indiscernible]. We just wanted to bring awareness and most importantly [Indiscernible] understanding digital twin. We have the speaker here the group we work on they support us on that. For the last year we have been working on it. So some of us will speak. I think for the sake of time, because our time is so limited, we will have Andy Roberti interviewed themselves. -- introduce themselves. My presentation if it can be started.
Thank you very much, just the introduction to digital twin. This is the adjunct a model that we are going to cover. Digital twin definition, NOAA services data science and future direction and Q&A's. We will leave it at the very end if there is time.
So what is digital twin? The simple definition for it is making it clear to everybody. Is the dynamic, up to date replica or representation of a physical object, asset, or system. So, anything that you emulate in digital form, really that is what digital twin. It has to be alive, it has to be updated every time. The misunderstanding that we have the last ten years for it. People associated with 3D model simulation.
Which is all related to it, or part of it. It is an important element of digital twin. But this is not the one, we created a digital environments that mimics the reality of that whatever we are doing shared asset for example. So a complete collection of data in a single place. That is important, because we have the asset, if I have a fleet one of NOAA fleet for example. That digital twin will have from the landing stage to the design stage, to construction stage, operation and maintenance all in one place and updated many times.
So whoever manages it, they have access to all of that without segregated silos. It is involved with the flow of real time from sensors and more. 3D simulation, that is in full important. Connection between and the lifecycle. To inform decision-making and support predictive capabilities. It has a huge benefit to any operation. So when we look at digital twin. We like to know the closest one the big thing is of the ocean. Agencies. So digital twin of the ocean, virtual representation of the ocean with the physical biological properties and ocean observation. Ocean models, with the purpose of developing the decision-making.
So that is going on. And we have an opportunity to participate in it or on our own turf for example. So, digital twin benefit in my opinion to know what transform asset lifecycle with maintenance and performance data. Lives in dynamic, easy to access and manage objects. Prevents trapping of digital data in static files by transferring all data related to the entire

asset lifecycle.
Is designed to operation, and minimizes asset management challenges caused by analog, unclassified and disconnected data. That is every organization problem. I am not singling out NOAA. But that is how we run our Live now. Went we manage a project. We are trying to move to this new concept for digital. And know what services and data is tremendous. And nobody can substitute it, nobody can't match indefinitely. And I just want to walk you through on activity or services. NOAA provides federal agencies with their tremendous amount of data and services.
Foundational data for example, you have many times commerce in all of the services we have it definitely successfully, and we get. None of it user foundation data. In nabbing data streams and users. Walks are level currents and ocean and daters and users. That is what we talk about now is modernization maybe because all of this modeling especially related to the climate and sea level if you don't have accurate data in projecting and vertical data, nothing is going to work the right way. And here is the beneficial besides the public and this is all federal agency benefits from NOAA services. The problem with involving in offering this massive amount of data, it doesn't come without challenges.
Always the more you do the more you're going to make full and you're going to make mistakes. So the past dictated challenge and processes and arising from this large amount of data. Lack of digital transformational readiness within NOAA stakeholders. The uses for example. Clarity in understanding the future directions for data in data science.
There is a lot we are not sure about. We need to clear our head about it definitely. So if I look at NOAA fleet of ships and aircraft. I'm not talking about just you know like the ocean in data. We are talking about the fleet that they have, digital is a great concept to manage it.
So essential resource and managing a lot of this. Use in a conventional way. Today's conventional asset management is challenging as it is. Based on analog, unclassified and disconnected data records. Slows asset operational readiness. Lose track of asset lifecycle due to lack of revision tracking of maintenance and performance data.
But the future is now, whether we like it or not. We are going to have to, hit it in the head, before it is too late. Global initiative requires data management caused by two stable easy to access data based on AI driven data science in a lateral expect that's a great place for NOAA. I just attended it last week AI, workshop, or physical science there was a great workshop, so when you talk about AI, and digital readiness, we just need to push the last 5% of the 95. To declare we are using digital twin. Data updated and served okay sorry class where the data and enter ability with digital twin. Accurate Global positioning using common data and accuracy system and that's where NGS comes in. As an organization to be ready with the organization effort. So, if I talk about modernization and spatial reference systems, physician, most of you are aware of it, but maybe not in-depth where Giuliana and her team are trying to market to provide more correct and consistent data for economies Alaska and Hawaii and all territories. It will be independence in efficiency and GS [Indiscernible]. Vertical data. All locations for specific dates. In which year. Those are in advance we need that we need to be ready to move to digital twin in GS one of them,

American society [Indiscernible]. You need to measure that as a standard and method data, and supports higher data and new data, so digital tran offers the Pro service consistently updating data models including all NOAA data services. Here we are on the cross roads definitely. The time is now, a or B so they too can to new and tools you can do it, and you can keep going to jump into the future of digital transformation by addressing and that's what we need to take serious.

So, if we do that, if we go to the right not to the left. We have to drive. Digital twin is not reactionary. I mean, we have to plan it right. Martin data construction and practices it is a whole data science. Founded on AI driven data science. And operability between data and digital twins. So it has to be fined and accessible, and reusable. That is the foundation. In the system and principles to demonstrate just the worthiness of the data. It has to have transparency of the data, user focused system's inability with that I and I hope I give you everything that you need. We can I mean, since we have 3 minutes we can take now otherwise we will continue and to the pool of questions. All right I will just continue then. Now I introduce he is the cold chair of technology group. And he will he talks about money. When you talk about the new do you know how solid he is and that concept of economy and money. So he will introduce economic value of digital.

>> I will take this is sitting down. I feel the content is better thank you so much Dr. It is an absolute pleasure. So we heard some great cuts this morning. Where we heard apex policy, we heard what we want to achieve. And how we want to go about it the larger principles, and digital twin actually free aligns with that.

That is where I want to take you. Which are the areas that could impact. We talked about optimization. We would like to modernize the boats in the U.S. however that we know. One support is built trying to change it is very expensive, very difficult, it takes a long time. And of course, we do not have the money for it so how do we optimize what we have to the maximum earning capacity? Because it is directly related to economic security as a nation. How does digital twin help, it will lead to more machine learning, AI, and it will lead to future simulations where you will be able to forecast only once we have captured that real-time data, and work with it is where we moved to the next state. That is something that we need to consider. The available of supply chain, we have had challenges all of us have seen supply chain destruction can do during covert. And just general twin works towards real times transparency I think I am getting an echo somewhere. So real-time transparency is key because that's how you optimize if you cannot optimize that it does not work. Informed decision-making you cannot raise your hand in the win and say this is what the weather looks a. -- like.

That indeed it decision making is key for us that's what's critical. This also has a direct impact on safety and resilience. We have had accidents in our supply chains especially maritime supply chains, which have not been addressed over time. This is sort of an international problem not a national problem, even at eye level. Wheat you will be surprised that even as a UN agency, they do not track accidents and fatalities. It is perhaps one of the few agencies that does not do that.

While this can directly impact greenhouse gas emissions by net 02050 as Dr. SpinRite said,

to reach there, we have got to address we got measure to manage and how we manage that local climate. Because it is dynamic, like Vancouver and Los Angeles and Long Beach that area, which is naturally sort of caved in. If you have extra omissions coming and it has an impact on local air quality. All of those factors come in, and coming to commercial impact, we were just giving some numbers, the Port of Houston has an impact on over $800 billion per annum on the U.S. economy just one port. The total ports go into the trillions. That is the economy that it has just as a job number it impacts 1.5 million jobs in the U.S.

There is a huge economic impact and a jobs impact what we are doing work over here and what result this will lead to. And that is what we are trying to optimize, that is what is behind in this place. So looking at port optimization economic impact we already spoke about. That has a direct impact on GDP fall comes in November in the Port of Houston and Galveston that one away.

Mode streets start to stutter at the moment the Port of Houston and that general get shut down. If we didn't have it there that both would not shut down. Ports like Rotterdam are working around the clock why are we not doing it? Employment like you said it's over 1 million jobs just for one port. Imagine the larger impact. The shelves of Walmart and Target and Costco in Sam's, it never went beyond that. And when the ship got stuck in the Suez Canal. Going back about 30 years maritime clusters were not so popular in the U.S. that concept was not so popular. That is one of the reasons that it did not congregate into the local region.

It was more in Europe and in Asia it started catching us up, perhaps around 200095 and 2005. And today we have very well defined maritime clusters. Why I am highlighting that is, the port activity introduces in 22 other ancillary industries which directly impact the port, and that again is the job generation the economic data, the economic support. And that is what countries that's what impacts the economy. We also realize that we have a security problem. Today, we are hashing out our dominance of the oceans. For our security forces for defense forces and we realize we are falling short on maritime transportation, and we are now reinforcing it which is sort of neglecting over the last 20 years. So there is a direct impact on this on strategic security as well.

Before security goes and others go. Coming back to greenhouse gas emissions. This is real-time data this actually has been there we worked on a project for this for the Port of Sydney in 2015. Eight years ago real-time data. So you could plan which ships were allowed to come into port into what capacity they would be working, because the emissions would impact the local economy. Depending on weather conditions you could accurately measure that and work that forward. Following that model and to some extent. The Port of Vancouver pick so it is some opportunity for us. When we see opportunity to match synthesize sustainability it doesn't just mean reducing greenhouse gas emissions. It means people, planet, profit. It takes care of all three of them. So there is a clear commercial advantage and commercial resilience in this because it optimizes the profitability of companies inventions over a longer period of time that is what sustainability we talk about here. And distilled twin enhances that. Knowledge sharing in education, that's what we are

doing, we have been after it and working with universities, the more we spread this the more the data comes in, the more analytics can happen. The more analytics can happen, more research will have been better products will come out. In the data that you put out, and there are so many companies to value add on that. And put it back on the market. It is a great classic example. This is another opportunity to work in the space that will help us optimize our own resources, and the wealth of data being generated by Noah -- NOAA. And last but not least data analytics and research, if we don't do that has to be data driven and science driven we will see you later.
>> Thank you good job. Now we will move to the next six figure from the senior project manager and he is going to be online but to present his digital twin of the ocean
>> Thanks good afternoon everyone apologies for not being able to make it to the East Coast today. The whole way for much of slides to show up as was mentioned, I am a senior project manager professional services division. Some he didn't know Carly's over the years have been here for about 20 years, and in the time working on large data collections and data discovery problems and finding how data can be integrated from different sources and different organizations. For the last ten years of being supporting the Port of [Indiscernible]. With the Port of Rotterdam, we have been doing a lot of work around understanding how ports work, and how ports could work in the future, and that has led to a lot of thinking and discussions around digital twin. I will talk here about some aspects of digital twin also I was sprinkled in some of my experiences with Rotterdam today from where I can. As an example of an organization applies this to the operations.
Okay thank you. It has been said before there are several megatrends if you will that are shaping our future.
Some of them are in technology space some of them are climates for the real world or social issues and so on. At least this technology trends like machine learning and big data analytics and sensors drones et cetera, they create all sorts of new opportunities, to understand and then address the problems we are facing in terms of resource management or autonomous everything. From a vessel to a vehicle to drones and other processes and things that can be supported by autonomous devices. All of these require holistic and collaborative approaches. What we are seeing is not a single agency manages all of the information manages all of the processes and can effect the change that is needed to understand control and adapt to these large trends.
This is where digital twin comes into play. I think many of us will have digital twins in the slide decks. The way we see it, is digital twins is a digital representation of the world and includes objects and processes and relationships and behaviors. Part of this is all is what we have been doing for 50 years, and creating maps of the world and understanding supply chain and logistics processes and understanding land use management and all of these other processes into the world. How can we present those how we understand those processes what do we do some development in this area in the system there and how can we make sure that what we are doing, has minimal negative effects on the systems.
As it said, GIS creates digital twins and has been doing this for many years. By integrating different types of data from different disciplines and different organizations. Using

different data models, and all sorts of other sorts of differences. Location has been this integrating piece of all of these different data sources. So, for us, understanding digital twin of the physical world actually has been very natural with us, I mean, us in the industry. We have worked with landscape management organizations for many years and have worked with building a management system to do indoor GIS and the dynamics of climate control inside buildings. Optimization, and so on.

Utility companies build large views and digital twins of infrastructure whether it be aboveground, with telecom and utility organizations or, water utilities that manage infrastructure underground. 3D will be part of digital twin, and of course Smart city has been a term that has been around for quite a while, where the city would tell you where to park and visit this particular office building and you could make a reservation for parking spaces just like you can make a reservation for a dinner table. As you can see in the slide there is a gap here, this is where a lot of opportunities. Next line please. The gap that I put there, it is to be filled with a digital twin of the ocean. And of course the ocean is a unique space, because it is inherently a three-dimensional space. Have a map of land can be seen in 2D, and we can see a lot of different things. In understanding the processes, and the behaviors and the physical characteristics of the oceans inherently means we need to think in three dimensions.

When it is around ecological Marine units, or doing analysis, and ocean data in three dimensions, you can see that that becomes a good problem to attack with our digital twin technologies. In the next few slides, I have a few digital twin of the ocean. Next line please everyone of us as a digital twin in the house it is the thermostat, it is measured temperature and controls the heater and close air conditioning is his success as the temperature in your house and adjust what you need to do more recent not just on off, they can actually learn about your house, how long does it take to warm up to a certain temperature? And optimize that heating in the cooling of your house based on that information.

It since the real world they have a model of the process that they are implementing temperature control in this case, and then they can a fact actions in the real world. They can turn on your heater in your head conditioning and so on.

Digital twin of the oceans, will be multidimensional. Your service status may be zero dimensional. The thermostat at my house is a problem, it is in the hallway, it doesn't see any sunlight, throughout the day. My kitchen area it receives a lot of sunlight, it is facing west, so my kitchen may be warm, while my whole way is nice and cool. The thermostat may not come on. That sense of location, is really importance in building a useful and working digital twin. The diagram on the left we have been working on integrating the land and water signed off of the port. By building a topographic integrated layer. This is important, to understand, not only where ships can go with symmetry where they can lower, but also understand the structures that are separating the land and water side of the poor.

Those are our new things that we need to do where we need to integrate more roles of the physical structures and the keys and the jetties and so on, with sensor data measured data.

The symmetry is surveyed every day, it is updated every day so that vessels and vessel traffic operators exit managers and everyone with their different purposes have the same view and active purview. Digital twin, will be time-dependent if you think about the process some processes are really understanding current relations such as the dashboard of left. It shows current conditions around a large area it gives indication of different types of measurements. If you are in traffic control situations. In the Port of Rotterdam even in the middle you might be interested in solidity as this place there.
Effects buoyancy and buoyancy affects how much cargo actually can a ship move into and out of a port. So, the Port of Rotterdam is looking to optimize that by minimizing under clearance while still maintaining a safe level.
Every inch, every centimeter as anyone say in Europe, of additional cargo space and depth that you use, it means additional revenue for the port. So those are our short-term simulations that are being made. And then they are influencing traffic operation decisions. Can this vessel with these drafts, actually enter the port. Now maybe they should wait an hour or two, because the tide is rising, conditions are more in favor in two hours, the vessel may still be several miles away from the port. It may actually inform the vessel to slowdown, so you don't end up at the port too soon. That type of optimization requires a lot of innovation with different data sources, vessel locations, solidity conditions and also of course regular conditions. Those all need to be known for the current situation, as we see on the left, but also the next 6-12-48 hours. Because these vessels are large and they are coming on schedule.
And then of course there are long-term models, that really understand climate scenarios. See level rise and its application of the sea here. What does it mean if the sea level rises under certain climate models and scenarios. What is the difference between those predictions and forecasts long term. Timescale will be a factor in the spirit digital twin will produce and analyze big data. On the left you see an image taken by a drone very likely, and that will just analyze it using machine learning to identify catfish. You can do this for catfish of course and you can do this for vessels and you can do this for other phenomena in the ocean, or around the ocean and learning requires a lot of data as imports and it will produce a lot of data in the data it needs to be managed in the right way. We have seen print editions on sensor data.
I was watching the presentation on the ties with the video next to it of the marsh. Machine learning can be taught. Machine learning models can be taught to recognize that the marsh is flooding. So these I see a video left and I see a tide curve on the left and the video on the right. The two actually can inform and learn from each other. The port of Rotterdam again the Trent analysis is actually shift movements around the port the port collects every vessel movement they have databases that go back 20 or so years with vessel historic tracks and this information can be used to understand where our high-traffic areas? Areas presented in red. And does the pattern change over time, it doesn't change during the week or during the day. And what does it mean for chip safety or for let's say increasing capacity of the port, and that's one of the aims that they have over a ten year period. Others are increasing ship traffic and what does it mean can we actually handle additional cargo loads

and additional vessels whether they are seagoing vessels are in land vessels.
Do we run into bottlenecks? I worked with the Port of Seattle Tacoma on some consulting work and there is a large issue when a large cargo vessel arrives at the port and cargo get shipped out of the terminals it affects traffic patterns in the city around the poor, heavily and that is because a lot of the real at the same level as Rose. In large cargo trains pass by. That marks traffic and so on. So the effects of one process the arrival of a ship in a port has impacts on other processes. Traffic flow in the city, that kind of integration is a key of any sort of digital twin.
Sometimes organizations talk about maturity levels. I think actually the name is we have been misleading. The thermostat it at my house is pretty mature. The technology has been around for many years and it works fine apart from summertime in the kitchen. So, we see it as more a difference and let's a scope or use cases of digital twin. GIS has for many years captured and visualized modeled the real world. And we see those as digital twins. But it is analytic or static or dynamic. And we do dynamic analysis of real-time data feeds that come into our systems and so forth. Send me autonomous and autonomous are I would say further developments, but if you are familiar with supervisory control and data acquisition's that is a technology that is been around and controlled and sluice is for many years.
So some of these things are mature, their different areas of digital twin. So some of the digital twins that were, like the thermostat it works on its own content it collects its own data it does its own model and it affects his own cities in terms of temperatures and so on. Over the years we have also seen organizations include data from others. A port needs to understand what happens at the terminal. Rotterdam does not actually operate any terminals. For the port to understand how efficient is this particular container terminal? How many containers can actually process during the year. They need information from these terminal operators. So this creates a need to include content from others. In the geospatial world we have this concept of a geospatial infrastructure. Sometimes you might see something similar, and labeled as a data fabric or a data mass. It essentially is the establishment of trusted relations between different systems and organizations. Where data can be used and utilized from across those different systems to make decisions in a more holistic manner.
We are not talking about the clearinghouse of data. Or download a file. Were talking about tapping into these operational and transactional and real-time systems, that work and operate sort of the environment. Building a system of systems. What that means, integrative holistic approach is that the digital twin of the ocean needs to be been on an operable technologies. We do a lot of work supporting standards, supporting open source technology, by supporting open signs.
Including scientific libraries, we publish machine learning model's. That have been trained on geospatial problems and can be applied to different uses.
Of course, building application programming interfaces pick so you can actually connect to a another system, without having to dial the full file. You can just send it in request and receive the dedicated response that you are looking for.

So arch GIS supports a digital twin of the ocean. And this slide could of read a digital twin of his city or land management. So these support systems that do observing and collect data, we can present in a visualization tape digital twin. Through dashboards and other technologies. We provide advanced analytics of all of these different types of data. Where is 2D, 3D, et cetera or whether it is time enabled, or it is not time enabled. So machine learning models and so on. Then of course sharing decisions with others. Or informing others about the decisions through outreach and sharing and collaborating.
So that is a what we are trying to do and as we build these tools, we can help you do your work better. And Bill in these types of digital twin. Many flavors of many sizes, many areas of implementation. If you are interested, we have created a GIS anyway I was going to make a pitch to a website that collects a lot of data and information about you might say a GIS for the ocean and we are going to make a pitch for the deep ocean collective ocean accelerator which is a workshop organized by deep ocean observing strategy. Which is an international community-based group, that coordinates deep ocean observing and tries to understand deep ocean in terms of conditions and climate change, and response to human service.
They are organizing this accelerator in early October. I can provide you information about how to register for participating. There will be several workshops organize that is on specific topics around the deep ocean in understanding, my distinct colleague and chief scientist Don Wright will be one of those participants in those workshops. With that I thank you for your attention.
>> Thank you very much Martin. Thank you will appreciate it thank you very much. As you see by now, how digital twin based on digital transformation. And we have the section now, coming to presentation, really talking about the run through digital transformation. The experience and NOAA experience. We have two speakers first I will start with cap she [Indiscernible]. Her presentation connecting the data collaborate [Indiscernible].
>> Thanks everyone thank you for the introduction. Apologies my allergy season my voice is a little raspy but we will go get the started today. As mentioned my name is Catherine ripping I am a scientist at one of the Geo data portal solutions. I'm gonna walk through some examples and some of the themes that we are trying to push towards, I am going to talk about up to growth. The presentation is about the efforts several themes within the industry to push digitalization forward.
Enabling more organizations with technology. It is really about connecting the data and connectivity. In how we can connect value information that we acquire today pick and making sure that it is useful and it is future proof for tomorrow.
I will not show any actual digital twins. But alluding to some of the things that Martin brought up as well about integrated approach inching towards it. Okay, with that, we will start. Okay so I would like to talk about the importance of environmental digital twin. And we are heavily focused on the environment around the asset not modeling the asset itself it is about driving towards dated the driven decisions real-time or near real-time insights faster picked getting information faster to the people that are analyzing and making decisions from it is also about public awareness and education, with digital twin

technology, typically things are being brought to the cloud. Things become more accessible more web forward.
It allows more users to access the data, it allows us to launch public awareness and education around the data. Really promoting the theme of connectivity. Also, around regulatory compliance, digital twin can organize compliance involving regulatory regulations pick so it can provide tools for monitoring and recording more effectively and accurately on data that is being acquired in the analysis that is ongoing. Many projects now, not so much a start and stop phase approach, it is all the phases all of the time. And we are constantly evolving the data that is being acquired and adding more data into the story into the involving ground model. Lastly with global collaboration obviously our environmental issues and challenges that we face it crosses international borders, so digital twin gives us the ability to collaborate by providing a common platform for sharing data and those models, but before you get to the point you need to focus on connectivity and interoperability.
Also I'll have the in definition of environmental digital twin echoes closely with what has presented before. It is about providing a virtual replica of the environment or the ecosystem that can then apply simulation to kind of gauge and analyze the behavior and processes of the effects of the data within that simulation. Those models can eventually be used to simulate between it and test interventions, and model of the ecosystem forward in time and observe observation. An example of this is the digital twin ocean that I brought up so far. Before we get to that point, I will take a slide to talk about how it is working towards a digital twin of the ocean. Taking small steps towards that journey. When we think about ditto, we think about how representative between it. Ensuring that we have access to high-quality Geo data. And you have to think about Geo data across poor dimensions. Understanding 3D special volume that requires access to high-quality major spatial and barometric data. Also measuring the complex ocean processes of the time. So we have to have accurate forecasting in high casting the data in being able to model and monitor it and model it over time.
Gathering data about some of ants is not about geologic scents about the genic effects as well. Lastly the living ocean, it's about gathering amounts of data to determine how those ecosystems change over time. I will give a bit of history so we turned 60 this year. That is exciting. We have been acquiring data for over 60 years, and we have lots of internal warehouses. Not one single warehouse of data but many establish warehouses of data, and establish solutions that are able to process or visualize integrate the data in different ways. So it is starting with the growth of the gas industry in the 20th century, we looked at how we can visualize in 3D some of the sub sea assets. Now it is going into offshore wind pick we look at that you did or approach that allows us to organize and communicate more effectively.
By providing some service and data in all spatial data all in one environment, that everyone can access, regardless of what organization you come from, or what subject matter expertise you have.
Lastly with the increase of rain traffic and coastal activity which is a common thing today.

We are seeing sharp increase in ocean infrastructure and with that growing demand on meeting proper traffic and charting for navigation use. But also the growing need to take that data and understand it for coastal adaptation.
Lastly, it is looking at to build to a sustainable oceans, we also have to look at for potential models. Ocean simulation models, building information models, and understanding the marine process and impact. Building information models such as B I am these have been established. So this is taking this subsidy in the peace environment. It's help us to be vital in understanding those coastal infrastructure and how we intend to protect it.
Also the natural environment information model. Organizing Geo data over time. To understand marine and coastal ecosystems better. And then ground information models. Geo data over time but is providing insight into the ground condition in the behavior of the environmental ground.
Lastly looking at challenges of creating and maintaining a revolving digital tran. These are themes that are brought up. Among quality and integration with the topic garbage in garbage out you have to make sure that you are acquiring quality data. And you still have that human center expertise that looks at data and you see and approve it and you pass it to the next system if that makes sense. Focusing on data quality integration. We have seen challenges over the years. Personal experience, was in 2019. When we moved our information to the cloud. We enable the organization with cloud ability. We virtualize the software and got users working in the cloud. It was a huge glow of moment for our organization. With that you have to focus on how we scale. It that is not that you need to apply the power all of the time. And all the data to maximum resolution pick understand where you're at limitations your what is most valuable and needed from the data at that time whether it's coming in from the field of the office. Or is being model for future and with that data security and privacy secures. Data floating around the cloud between systems is about protecting and making sure the data is cap secure. How does all that fit into the road ahead talking about a few themes and I will focus on the work that we do recently. Around our Geo data engagement portal. It is a platform that allows users from organizations to access data in a collaborative way. By providing a centralized cloud repository that can support quality control and standardize management which is enabled from the core described on the left. The integration of data, their interpretation and analysis. Once you have the core and users are using it. For display and understanding the data then you can apply on top of that that we have seen with optimization and design. Not quite simulation but design concepts and working toward symbolization and rounding optimization. Again closed environment and coastal adaptation. An acquisition survey tracking. I will show a few examples of those applied use cases. Largely we work heavily in the acquisition survey side of things. This has been particularly challenging and we have many senses doing many different things at many different actors. In the story of acquiring data and analyzing and presenting. Trying to bring our sensors at the edge online from in a disconnected environment. It is not a bunch of the senses in the water but is also having the staff to access the data that is coming online. Positioning staff and remote centers for example.

Also deploying internal legacy and processing software at the age, and then siphoning some of the data back lots of challenges, really working towards getting the preliminary results to a wider group of folks faster than we ever have before. Largely focused in Marine and land as those two examples show with the geophysical. We do have automated tooling that allows to incorporate streams into primary algorithms. Development of least cost routing and calculations and map constraints. So we can combine the two and produce outputs and optimize route through a challenging area. With potential site identification we see providing taking studies and reports to the web and making them interactive. It's moving the studies to a wider audience. Allowing them to interrogate a wider area a swath of data. Versus before this is my blog I am interested in. I'm only going to collect data there. It is looking at a wider regional view of the area. Applying as we mind more data sending it back in.

So I will give a shout out to Lake Shores, we have a few images featured hear from some of the work we do with them for the past couple of years. It's about providing a wider access to those digital deliverables. That normally or not normally they still are provided in encrypted hard drives. Thousands of pages of hardcopy reports that can be accessed visually. The burden of organizing the data, and presenting it, and integrating it, it is already presented in that way in an interactive by the web. So it makes it easier on boarding experience for a new inter- agencies that come online.

Specifically for [Indiscernible] agencies. Kind of leading into foundation design and routing optimization. Several interactive tools, and analysis techniques tooling. So which is provided with other tooling. It allows us to be 3D ground modeling visualization auto mapping and feature detection. Allows them to interpret hazards and see texture way faster.

It went from six weeks to a few hours. Being able to auto map that data and give a starting point to all of the folks involved in the project.

Also once integration and analysis occurs, providing access to that life ground model which is seen in the 3D subsurface. Better collaboration not only among scientists and engineers but also with many of the projects we work with many engineering groups. So work agile he with these groups and share data and analysis effectively. Lastly, about applying the time element. With time enabled imagery we can arrive at rates of change that help us better understand the foundation in the structure under load in overtime. The last example is on the bottom it's showing a wind farm that over time we are seeing sand waves have evolved. Encroached upon the turbines. Now a couple of turbines or beach. It is looking at the wider regional view of what could be affecting your foundation zone and from the outside forces.

>> Thank you very much. An example on we're moving definitely what we talked about digital acquired building on the modern practices for data, accessible, findable, accessible, reusable. This is great example thank you very much. And now we move to Jim Valentine. With NOAA she is the geospatial information officer. And she will brief us on NOAA's data landscape and transforming data into actionable information. Tim is all yours thank you.

>> Great thank you so much, apology for not being in the room. But yeah, I am the

geospatial information officer, I have been at NOAA for 20 years. I spent the majority of my career in the National Ocean service. But the last decade I have been working across NOAA and the federal partners. In the industry to improve and enhance the way we are taking our freedom and data and making that available to the public thanks for let me be up the sentient -- session. We've covered this already, it is nice that is been mentioned and stated already. Some of the federal requirements for open data, what NOAA is doing to beef up gator governance structure and our approach. To solidify it. And make it real. And especially how geospatial data fits into the new framework. So with the challenges related to the data, we are working towards improving access using open licensing and things of that nature.

They all align well with maximizing the data in these principles. So this is a snapshot of the federal landscape. It is been evolving over the last several years. Legislation and policy wise, a couple of the things that stick out here that are really important. Open data open science. Also the evidence act has been one of the key drivers for NOAA data governments and our focus on some of the things that you see on the right. Like making data available in open formats. Developing policies around creative Commons for open data licensing efforts.

Inventories and things of that nature, another one that is near and dear to my heart that I am in charge, cross e-commerce is our compliance with geospatial data act. Another piece of legislation that came out. So it really codifies what we have been doing already NOAA and other federal agencies. That are required to make our geospatial data open and accessible. It really codifies that and it also lends us to audits by the Inspector General. Which we also comply with and go on a biannual basis.

I would say maybe three or four years ago we had an NOAA, a environmental data management committee. It was more of an ad hoc group. Over the last three or four years, we have worked to kind of reestablish and beef up that committee. So senior management support across the organization now we have the data governments committee. This is also supported by each of the offices by establishing new federal positions called assistant chief data officers. So we have a NOAA chief data officer and then we have a line office that mimics our other organization internally.

This is a huge milestone as far as a senior level by and on how important data is and data management. We have expanded it to be less ad hoc, and coordinate and things of that nature we also have at least a half a dozen tasks groups that are tackling specific technology problems, data or metadata problems and licensing and things of that nature. I think it goes to show that we are really working towards beefing up the governance approach. I just want to know one thing that I will highlight here is what I mentioned, one of the teams that co- lead is really arounds developing guidance for open data licensing especially for internal NOAA source data. There is no reason why we cannot implement the creative Commons or universal public domain dedication. And so it was actually ahead of the game ahead of the effort by doing this in the office of the survey, we now have an approach in a policy and guidance and implementation, whether it is geospatial data or metadata or other websites.

We are really trying to do a better job with the data licensing. This is really just a timeline if you will of what I mentioned before and the strategies were 2018 we established the data office and governance structure, we also federal data strategy and I work on that and we are going to meet one of these in NOAA, so as part of our group several years back under the rear admiral we establish a data strategy as well as a merging technology and a priority for what was needed we have one at the commerce level as well. Both for data and geospatial data strategy and action plan and data action plan. So we are really working hard to do this. And that is the last few years. 2823 and moving forward, we have consolidated our efforts to try to get all of this information in one place right now it is on a Google site internally but this will be a replacement for the public version of our strategy in the action plan and the one thing this is something you can take physically or online and really see if I have a requirement for a metadata or data management plan or XYZ as it relates to data management and these high-level policies and legislation here is what I need to do as a TI analyst or as a data management or a person giving out a grant no money going out to grantees and that nature this is been a big effort over the last year and it is now public and it will be a continuous update as things evolve. So just highlight that. So now I will pivot just slightly to kind of give it to wear my bread and butter is in GIS image spatial world, as you all know at the core, NOAA is a science and data driven organization. Also from a geospatial standpoint we collect data from the surface of the sun to the bottom of the ocean. This means we are also dealing with a vast amount of diversity and data types and data formats as well as and uses that are our customers, to in the right format. So I wanted to go back to what we heard earlier this morning from Juliana Blackwell from the survey. And just stressing the importance of what the spatial reference system and the control is as far as the foundational component for any base map. And so I think the priority here is required to provide authoritative national level federal and geospatial data. And I think it is the break here is with the new and as far as framework coming out I just wanted to make this a priority to make sure we are making this information available from an educational outreach standpoint but also working closely with NGS to develop the tools for this community to be able to tie this or incorporate this into the existing missing data. So General services, we have to ensure that geo- referenced data that is collected and in published is consistent with the framework. So, you may or may not know within the U.S. we have a concept called the national spatial data infrastructure. Nowhere is a huge contributor and required by law for certain data sets. Many of which are appear on the screen. To provide data as authoritative data to the public. So, examples like the GA net control and nautical charts, tides and currents, imagery, a number of these things are all critical data and mandated by law with the geospatial data act to make sure we are using standards and we have strategies for managing these national from her data sets and making them available to the public. All of that is also incorporated into that NOAA data strategy that I mentioned earlier. Related to this morning and one of the key challenges is how to make this data discoverable, and as usable as possible especially for people that are making these critical times right now for local decision-makers to turn this information into action.

I think that is a key challenge regarding and I fully agree with the. So enabling access to authoritative data in-house, many years we have had what we call the NOAA Geo platform. It's how you know how we utilize software as a service and how we use the technology. It is based off of line offices and data stewards and the owners, and then the programs, maintaining and making it available at the way they do and available through this common platform just to give you a sense of how much this is being utilized by the users, we have over 7500 user accounts that is people that have accounts to log in, published update and maintain their content. For the NOAA platform. 13,000 items, of public content that is things like data mapping maps, other applications. They are also publicly available. I believe NOAA is still the organization across all of these partners. That produces the most public story maps. I know, Ben Friedman. We highlight NOAA feature story map from time to time and it comes out from the highest levels of NOAA. We have a ton of story maps that are useful to provide a story if you will. Around the data and around the topic. So it is being highly utilized it is a great concept if you have not heard of it. One of the largest things we have seen from using this technology is well, first I think the visualization component that technology brings to the table and also GIS analyst to use it. It's like creating a PowerPoint. The tools have evolved so much and are available online instead of the desk topic which is how a lot of old-school mapping used to take place. One of the examples I will mention this past year, and GS in the division that collects emergency response imagery after events. They are using a dashboard app. As an operational dashboard for their own internal planning and execution before they are about to go out and map and fly their flights to flag data. They are also using a another app called experienced builder. That shows the footprint of what is planned and acquired. The flight path, and then also direct flights to access imagery once it is collected and uploaded.

>> We are up 4 minutes overtime if he can wrap it up please.

>> Sure, okay. I thank you for this from others. But the challenges of using this new analogy especially enter systems. It leads to increasing data volume. This was mentioned in the abstract NOAA open data dissemination. A great example of public/private partnership. Removes obstacles and moving into the cloud. We have an eight year partnership with cloud service providers Amazon, Google, Microsoft to provide the data. At no cost and readily to use by anyone who wants to use it and however they want to use it. A little bit more of the process for getting the data, and using it and also adhering to kind of the technology modernization but also the fair principles. With no egress. And it is a great example of how they are utilizing their web map applications, pulling and NOAA operational forecast data that is on open data platform and using it through API to get the latest and greatest data out there and taking the burden off of that.

>> We have to wrap it up. Thank you. Thank you very much that is good information.

>> The last segment I promise you this is the last segment of this panel it is very interesting and a great initiative is a joint venture between NOAA and Lockheed Martin. We have two speakers Lynn Mayo, she is the joint venture program manager for NOAA. National environment satellite data and information services. She will give an overview of NOAA and ESD I as joint venture ship.

>> Great thank you for inviting me thank you I am the joint venture program manager. I will give a short presentation. Just talk about the program and turn it over to Lockheed Martin to talk about earth digital twin that they are doing for us. Again short overview of what joint venture is and what made us do the project and about the observation digital twin project. So, joint venture and really some of you may not be familiar with them we operate the nation's weather satellites, which provides critical environmental data. And to do this work, we collect a significant amount of data of the current environmental data, as well as maintaining significant archive of environmental data.

Given the fact that we deal with so much data you can see why having a digital twin for Earth observation data is of interest to us. So, the digital twin is going to become even more important as NOAA transitions to an enterprise satellite architecture. So historically shown on the left, this is mostly used as well as some satellites from our partners to get data. And transitioning to on the right, of getting data from a lot more sources by 20 Thursday will have an enterprise architecture from various sources to meet customer needs. Part of the switch we need to know what technology and data so we can best leverage that data and technology. And that is where the joint venture program comes in. Joint venture is about leveraging technologies and capabilities and data made by others, to see if we can eventually transition into NOAA operations. So the benefit of the joint venture program is leveraging capabilities being developed whether it be by other government Prague partners, academia, our industry how do we leverage that to reduce there was risk. By first demonstrating emerging technology that can reliably meet our operational needs. So we decided to do a demonstration project on Earth observation digital twin. And so digital twin may help us and enhanced abilities for process control saw the satellite ground processing, and how we provide that data to our users. To make the bottom line is the study that we are doing will result in helping us determine if and how a digital observation and Earth observation digital twin and how that might serve our next generation. I need to make clear this is for demonstration. There is currently no plan to adopt and Earth observation digital twin into operations. We are just looking into our options if we decide to do that. And so what is the success of the demonstration project? We are looking for flows scribble digital twin that allows the user or the public, to be able to easily access our large volume of data. Also important that we have a margin visualization to that displays the data in the way that is usable and understandable. That includes providing data at a time to series. It has to to be able to ingest a large volume of data and sources at different scales. As I indicated by 2030 we will get data from more sources. We need to be able to incorporate all of it. And we want to make sure the project is standardize processes with other digital twin efforts, some of you may be aware of NASA doing digital twin.

We want to make sure our reference are coordinated with NASA. The joint venture partnership did select three contractors for Earth observation digital twin project. These contracts were awarded in the fall of 22. Last fall, one-year or two-year projects. So the selected vendors included STC, Lockheed Martin, and or Ryan and they are all doing this demonstration project for us. And that I will turn it over to Lockheed Martin to talk about demonstration projects they are doing for joint venture.

>> Yeah so today we talk about earth and space observation digital twin that we make. Two-year program, and from I am from Lockheed Martin and we are also partnered with [Indiscernible] on the program as well. As Lynn just mentioned know what is looking for a digital twin that is able to display data coming from the five Earth system domains. Across atmosphere, ocean, cryo sphere, land and hydrology, and space weather. You can see the valuables that we prototype for each of these different domains. This is extremely broad. For what they're looking for. And kind of some language from the BAA, it is a one-stop shop prototype for NOAA Satellite ground-based observation along with model output from GFS. At different spatial and temporal resolution. Easily configurable to other geospatial data supposes and algorithms. One more point, they also wanted to do data fusion and integrate artificial intelligence and machine learning algorithms. For the program we thought we had a good solution. Again ingesting satellite ground-based data. As well as model data. Lockheed Martin, our backing component, it is our work course. It is called open roads that are 3D. Data storage management and applies a grid so it is a workflow manager. And we can plug and play any algorithm that we want.

Specifically for the program what we will do, it is spring and all of the data and then we have algorithms using AI machine learning and in order to fuse that data and do an on link detection. I want to make clear just because we are looking current data right now it can also be used to look at predictive data in the future possibly. Again we are pardoned withNvidia. it allows for multiple collaborators as well for caching's and upload this near real-time stream of data quickly and efficiently. Finally, our UI on the front and is called Agatha. Similar to 3D globe it is for D we will look over a two week time period. Current weather data but also having two weeks in the past that you be able to play backup to for this particular application.

All of the software is in current use and we are integrating all of this together for a use case. So I will go through each of the components quickly. So for back and open this is a sample workflow for example with a goat 18 fire product. Bring in that data we would bring that in ingest it normalize it plug-in algorithms as well anomaly detection. Spatially tile it then handed off to nucleus. On the back and we are using Amazon Web services in order to do the processing since this is a tremendous amount of data to coming in from these geophysical variables. Again it is configurable, you can basically plug in any algorithm you want. In order to process the data.

For our tiling and formatting we are ingesting [Indiscernible]. For mess that you are used to, and going into the front and we transitioning USD which is universal see description format. It provides an open and efficient and extensible data interchange. It is generally used throughout nvidia, and other programs too. It allows multiple users for the collaborative effort. And it provides caching service to permit high scaling and access to large numbers of geographical distributed clients.

The business is a diagram of how the omnivorous nucleus fits into the large picker. We have the data streaming in from back and S3 buckets and pull directed from NOAA sources. Going into open Rosetta, we do all of all the back and processing then it is put into omnivorous nucleus. And then finally it is transition into the front and called Agatha. We

should have a video. As that is being transition, we are on a two year program for this pic so we began October of last year, so we are just upcoming to our first year, demonstration that is going to occur and a couple weeks. So we have had a lot of fun with this kind of creating digital twin platform.
Great, so yeah this is the front and you can see sea surface and land surface temperatures. You can see that you are able to pan around and zoom In-and-Out. We will add additional functionalities as well. This is an update from a few months ago. You will be able to put dynamic color bars, you will be able to query for a different data and different layers. So right now we are showing wind direction at 1000 millibars. So you'll be able to interact with the stock in order to investigate and query the data as well as export the data. So, Riding in a lot of additional functionality within the second year. And with the bat from NOAA. We would love to hear any potential use cases for this. With that I will pass it back to you thank you.
>>
>> Thank you Lynn we have a few minutes left for question and comments.
>> So that last project with Lockheed, will and in a year. I think I heard in the beginning there were no plans to I did not quite catch it actually to go operational afterwards? Or I mean is it really like the end? Or is there further development that could go on and eventually make it operational? I don't know the future there.
>> Great question so joint venture program which is what I do is we look at these new emerging technologies and we looked at is it feasible? What kind of research involve? Things like that. Then someone else's decision whether or not it will be operational. So we sure hope it is this one, again we have two other offenders that are looking at this and helping us identify what are the challenges and his solutions and things like that. So definitely our hope is that this ultimately gets operationalize. But I will world is to look at these technologies, emerging technologies, identify what is out there, and what opportunities are involved in hopefully that will get into ultimately something be done with it. That decision will not be made until the studies are done.
>> Okay thanks. I do have one more but. So it was a great presentation. Do you, I just, what I was not clear about was is this an in-house tool that you are using? Or are you other stakeholders in the community that are open that are using this also? Or what kind of dissemination is it?
>> Currently we do is a service that we offer to clients, but we tend to get whether it is direct with one client and many stakeholders involved because there are lots of folks doing interpretations of the project, currently it's a service that we provide, it is powered by enterprise infrastructure that's built on the cloud. And that is deployed we have four notes, one in each region supported globally. A couple instances of the platform running in the states and we have had a couple in Europe, and a few in Australia and the Middle East. But it is not have early prevalent.
>> I was going to ask your experience and what you offer for you compromise thank you?
>> Yes thank you so one of the examples and case study that they are referring to is Atlantic Shores offshore wind. The point that I would like to bring up about that is, the

information that has been gathered for this particular offshore wind developer, is provided to a number of agencies. That includes NOAA, Army Corps, Coast Guard, local agencies the list is really long. And it is enabling it is removing the need for agencies to when they are in a, you know a lead agency and consulting the consultation phase of other agencies. It removes the need for the lead agency to distribute this information which is a terrible burden on the government. I think that is you know one of the managers and one of the directions that this is moving and how it is improving the whole front and process of you know, offshore projects. But it can be applied to pretty much any instance in the blue economy or, elsewhere really.

>> Thank you, I imagine there is a benefits and what they just mentioned. A long list of agencies, to exchange data and make it available with just to move it from one agency with all of the other sections. And on this one you put it in one place everybody can access it anytime without any restriction and you have something?

>> Yeah thanks everyone for the presentations and along those lines, my feeling on all of this first of all it's impressive how many different types of databases that are out there, that I don't think the majority of us are aware of. Impressive to see it being used. I think the real key, the ultimate goal is to make it is probably simple for technical people who deliver this to. But it needs to be simplified enough that anybody can go in there and take advantage of it and that will be the key and feel comfortable with it. Along that line the question to you is can you guys tell that client whether it is governing people or the real client, can't you tell that they are comfortable going in there and just moving around and changing things and working with data?

>> I would say, we get very level expertise from different scientific background sport non-project management or field staff. From our angle we tried to once we have a one on one onboarding with folks they get the hang of it and dive right in and they're like while a lot of information and they get lost in is what we have seen. From our angle we have learned well to be heavy acquisition agents, and be agile with data in kind of a connected and we are keen to work with other partners on how can't we contribute. Not any one agency will solve ditto. It has to be us working together about what joint effort and all of the enabling technologies that we are all developing and the enabling the VA databases archiving building out who we need to work together on integrating more of that. By 2030.

>> I have one of the things we wanted to make sure that the vendors did is make it so we can track down the source of the information. So it is not just people go into a black box to get something out. Comfortable if they could track down what the original source of the information is I think that helps with the level of comfort when you retrieve the data.

>> Just a couple of comments in my background I see this is kind of a digital twin is the latest. This is been building for many years, I come from nearly 20 years of being one of those 3D evangelists. This is now finally useful. Seriously, the things that were done and one of them was with NOAA. We enabled or helped Robbie Wilson built the Tampa model. And visualizations of that. That was in 2001 I think?

What was missing and I didn't see it going forward was because that was a single project that had to be built. And then there was the visualization of it and that was okay what do

we do next? I'm not sure what was happening in that transition, another similar project of what cap demonstrated is interactive subsurface planning for pipeline and those sort of things we are involved in the be P high and visualization environment that brought all of those things to gather and one project that was built for the first deep water rig in the Gulf of Mexico. That was 20 years ago. I think the difference was it will projects that were built and had to be built. And then there was no ongoing use that is where we are transitioning. I think that is the difficulty in they mentioned they built it for the client.
I think the struggle and the challenge for NOAA is then making sure the data is available in discussions about how it is available and used in public and served and all of those sort of things. But then how can people use it in that open sense for a digital twin? Also if you want to be in the proprietary organization and then not share it that is part of the issue right it becomes much more valuable to commercial uses. Then just having a generally publicly available. So I think the challenge and we are going to talk about data that is essential that is the foundation requirement. That I think challenge for NOAA is how you serve it. How it is sort of updated and if we go back to the, I think an example from a core perspective. Some of the services are on a webpage. But we commented last time that transition to API is the future. How is that happening? How is that, that has to be done in some form to enable digital twin concept. It is a real challenge in the question for NOAA is what do you have to do you are not going to build a digital twin it is what you have to do in servicing and all of the data in an appropriate fashion that would be my comment anybody else can comment on that. Thanks.
[Away from microphone]
[Break]
>> Can we take our seats please. Okay, we are fortunate, this is a topic that Gary brought up to HRSP's ago if not more, is been ongoing I am really happy that we have the next session is going to focus on Geodesy and the crisis that is happening. And we look forward to hearing from you.
>> all right good afternoon, and I'm glad we are back here after the digital twin session and I will pivot to talk about the Geodesy crisis. I am pleased to have the group up here. We have Brad Kearse who is the deputy director from NGS, Scott from NGA and Ben Phillips from NASA on the in line. There is a very interesting connection talking about this issue in Honolulu a while ago, Larry Mayer, sparse to talk close to the microphone thank you.
You know, there has been interest in this conversation for a while from the screw. We had a really interesting connection where Larry Merrick reached out to some colleagues to try to get things spinning and that actually came up at a meeting with NGA and NASA. Kind of got the wheels turning. So this is a really very current topic and so I am happy to turn it over to Brad, the scene on the Hydrographic crisis and how the Geodesy team looks at it.
>> Good afternoon everybody we have the late afternoon panel session. Because we have got a crisis on our hand, going to solve it. So you just said the digital Twins, so as Scott and I was just talking about that souls are issue, we can
I want to make sure Ben Phillips is on the one from NASA my is distinct calling care flew out from St. Louis, to be with us, because this is an important part of vision most from the

national security perspective and then Ben Phillips from the perspective the space Geodesy. But also Geodesy comes down to terrestrial side. We work very closely with them. As folks know, I don't mean to go into what the crisis is, I think everybody has seen that. Am I hitting the button here? Is this the one right here? That one God it that green arrow got it thanks. Don't give an aviator a lot of buttons we will hit the wrong one and crash. So everybody is saying this whole issue the paper was out there, when this came out, one thing that was already existing is a partnership between the national Geodesy survey and NGA. Where we went and outlined a lot of things where we should collaborate better from year to year end work to gather closer. Because we have a lot of synergy. They do a lot of the same things but they support the war fighter.

So we developed and am over you it one of the things that was and there is to help develop they call it the tradecraft, which we have all accepted that term. And how we proceed forward together. And we have made a lot of progress over the past year.

I want to think Scott and Fort been on their leadership in us working together. So I will go to the next slide. So last week we were actually all meeting in St. Louis. Scott hosted us out there. One of the things you will see all of the folks in the room a lot of the expertise from research side and Geodesy and federal agencies. Including USGS. You say USGS and Geodesy we have found and they exist in Flagstaff Arizona. There helping map the moon they have been doing that since the 70s I never knew. So we got to meet them, they finally as a said they found it within the federal government so they have been included in the process too. One thing as we were sent in their we would like this is a problem, we need to have a continuity of operations if something happens to this bidding because all of the Geodesy will be gone. Actually Scott was not feeling well went to the six [Indiscernible]. We're just joking there was talk about that. We did not want a bigger crisis.

These four agencies coming together and talking about what we can do together, as for different agencies, that have a lot of the same common things that we do from day to day, from surveys and reference systems, 2G and SS. And then where we go from here to gather. The NGA, head of research, Scott and his group, and a lot of all of the senior division chiefs to talk about this issue. And I think we've made a lot of headway last week. To where we need to go forward from here and some of the things coming together as a plan. At some point, we will bring academia, and even other partners from the commercial side. But right now the most important thing is we need to get the framework from the federal side aligned, making sure that we are going down the same path. In fact Scott and I were talking about who in additionally to invite? I called him up and said we can only handle so much right now we have got a lot of things that we need to talk about before we start inviting in a lot of additional partners. We'll talk about that. Do you want to say anything Scott or Ben? We will do this as a panel discussion?

>> We think from NGA perspective this is a critical issue for us. You know the whole crisis everybody is a where that, we think getting these four groups together covering for different departments and the United States government from the Department of Commerce interior, defense, and NASA. If we could get those Geodesy working together we have our unique mission but there is a lot of opportunity for efficiency. Since it is a very

small group of people, the idea that we can share these ideas are crossed each other and learn from each other is really way overdue. What we have started it will continue to grow and actually end up with some excellent results at the end. This is going to be a continual effort think over the years, we have just kick this off and a virtual sense back in October of 22 I think?
It was our first virtual session. We've had a few sessions. We will just move on.
>> Ben Phillips do you want to at least just add to the kind of 20,000-foot level and then we dig into more details?
>> Can you hear me?
>> Yes we can.
>> Super, yeah well I can just pile on to what they are saying about this opportunity to collaborate NASA has critical role in underpinning and U.S. Geodesy capabilities with observing networks with public and distribution system and that is essential for our mission our observing mission, and beyond. But in particular, the workforce challenge is one that can't be wholly solved, through agency silos. So it is really an opportunity to work together, because geodesy touches a wide range of U.S. sectors. I want to first of all thank Brad and Scott for taking the lead in this community practice and bringing NASA and so we can work on advancing solutions together.
>> Thanks Ben. So, where have we come we have come a long way in just one year of the thought and I would say the first thought came out of Scott let's develop a community practice. So, back and quarter number one of this year, we basically NGA and ourselves got together to understand each other better. That we presented out 101's to each other to say what you doing and what are we doing? To look to see where there are common areas of interest and there are a lot of that. And then we did that in quarter one and quarter two, and then we move forward to quarter three and part of that interest was we need to invite a couple other federal partners to the table one being NASA next. We work closely with the NASA folks we support each other in many different ways, so Ben and Company and his team need to be brought to the table too. So we invited, we did the same thing that Ben talked about in his team about all the things that he does and the great synergies and we had actually that as a face to face in person here. We hosted that here in Silver Spring right down the street. So from that what we forms, was for technical groups of working groups that would break out and work on things, and then for strategic groups and I will go over that as we move to gather. And developing these working groups that they would break out and really started doing the work that needs to be on. And then, there was just going to be a lot of coordination. I talked to Scott quite often in the same thing, sharing everything that we do from the perspective of NASA, and GA, and having a common approach, of areas of collaboration which we were not doing before we would talk to each other. But we were not talking to each other.
About sharing things for going out on field teams together to learn the trade craft together because we have younger folks around. And then in the last quarter and last week, you SGS was inviting their Geodesy to the table. We actually had 65 agencies representatives around the table currently in place, and we have 36 of those in attendance last week sitting

around the table together in a pretty small room to talk about collaboration and all of the teams actually briefed out. Ben or Scott? Would you like to add to the site at all?
>> No, I think you've got it.
>> Okay, anything more of the discussion will come to the next line. So here is kind of the breakdown of where we are in these technical groups, so we all realize we have real collaboration across surveys of a lot of things we are going to do and some of our teams will support some of the NGA teams and learn from each other we will do the same cross collaboration reference frames and modeling which is big to all of us G and SS, not just GPS but looking at all of the constellations. And there is a piece called lunar, so guess what the United States is going to the moon. They got a piece in their portfolios same thing with the NASA folks same thing with USGS. We are participating and listening to what is going on there as we talk about core stations on the moon talking about a new reference frame for the moment that really does apply what is happening here on earth too. So if you can get there we should be able to fix this and make it work right? But also there was a large discussion about back in the 60s how that generated and excitements with young folks to go to the moon. One thing that Geodesy has is a branding issue big time branding issue. But if you can say you get into Geodesy because you can go to the moon and help out with that even though it might apply to NGS or NGA or NASA, and create excitement maybe that helps all of us out all right? So I say that when they first brought it up last week, I am like okay, we are not going to the moon from NGS. But there are things that we do here and practices and methodology that are going to be applied on the moon. Or be applied on Mars as we go there in the future. It is interesting to listen to it. The same challenges we faced many years ago. So, maybe we can use that as part of branding in the future, attracting new talent, coming in the door to say do you want to be a Geodesy? Would you like to go to the moon? Would you like to help him to get to the moon, and that would apply and help out. We have these four working groups and they broke off, they are working together, like I said and they actually presented out last week, where are all the common synergies and what can we do right now there is a lot. What we will share, it was a new team of folks just learning from each other along the way. Hey I have seen your name out there but I never mentioned it. So now we are creating friendships, we create a synergy, and I think we can tackle the problem. Because the good thing is we have all come together to realize it a problem, and we have a plan moving forward. So the acting academic partnerships think we will talk about that that is a huge piece. We have that geospatial modeling grid that were not there, they and I will let Scott talk about it. They have a contract going out to academic institution same thing with NASA if they are working on support for academic institutions a great thing is we are sharing and we are leveraging and we are aware for what we're doing. Thus a great thing we've never done that before and part of that is to get the money into the academic institutions to get them included, so the kids can study or adults I don't want to say just kids. And get that money there. So as you know in most of these academic institutions we have heard it over here, most of them are from foreign countries. What we know we can attract folks that are coming from China or whatever. We need United States citizens, that are going to school that we can go in and

recruit. This is the first part of getting the money there and knowing what is going on. For all the academic heart issues or from our perspective the hard problems that need to be resolved from the Geodesy field. And we share this list. We also shared with the academic institutions. So they can help us out with these in the future. So, the other piece and then I will let you talk Scott and Ben, like I said, we have the heart problems less that we have developed as a starting place. And it is synced up among all of us, and then we are working on a strategic framework for kind of a national framework together on Geodesy and how to resolve the crisis down the road. We have a draft of that right now. The plan is to get that done at the end of the year, to send to each one of the directors. Of where we are going and what we need to do over the next few years to address is.
>> I know I read just recently that they strongly recommended it and supported three main things with this crisis. Educational support, research funding, and government agencies.
I think what we do with this community of practice is covering all three of those aspects. Just at the beginning, so a lot needs to grow a pair
But I think we are there, I think with like, with the geospatial modeling grid. That is a great thing. We were doing this G OS, which is a emerging scientist consortium that we are trying to get agencies and academic universities to work together which is a kind of anything, universities like to work independently, create their proposals pick we are trying to push them we have a series of hard problems that we need multiple agencies and universities to work together. But we had a list of hard problems which barely got some input from NGS on it at the very last minute when we were planning that. What the goal is, to go into FY-24 with more of a consolidated effort and command from a community practice point of view. We still might have different avenues to push for research funding and educational opportunities. We should come at it together from a consolidated front. Like I said, we still might have these geospatial grant options. We might do it but we are starting off as a combined group together. That is a key goal for FY-24. We hope that these hard problems are going to be, we don't expect any of these to be solved right away. It is going to take funding over multiple years, to address some of these hard problems. I think that is a key thing as we move forward. And hopefully you know it is hard to share dollars between different departments. But somehow if we could find a way to bring that together, and group that funding together, it still might have different avenues to execute. But we get that funding together because of this crisis, we have to be able to address this. I think this is a major step forward, and achieving the goal.
>> Ben would you like to add a few comments?
>> Thanks Brad, I think one of the great things about the community of practice is eight working groups, all of these areas are important to all of our agencies. We have membership from each participating agency. Across all of these groups. Over 60 people now. That are engaging in discussion. We have long-standing history of collaboration on certain fronts. We work with NGS and a long partnership on site surveys and we have a formal partnership on supporting foundation accords.
And then leveraging some of those NASA stations you know with NGA, and on the GPS constellation. We have these existing touch points that are significant substance but all of

these other programs touching lunar space.
We have our own challenge problems that are relevant to our mission. This initial discussion and engagement has a lot of promise for efficiency and opportunity. For the collective interest and I want to emphasize Brad's point about excitements and improving our marketing strategy. For recruitment and retention. And indeed there are certain emphasis across certain agencies. But if they are putting out a collective message of excitement, new students An early career folks. To bring them into the field. Without them being directed to a particular mission. In the broader opportunity space for our nation. Then we go and enrich the pool for mulch we all get to draw ultimately. That is an important strategy.
>> Thanks Ben. And if you can see the right side of the slide. Those areas of collaboration as you can see there are themes. Where there is commonality where we can talk about data sharing. Looking at data models in common data models across our organizations. Equipment sharing, that kind of stuff. Software sharing and how we do that and looking at instead of having three different methodologies or three different suppers of that we could look at two. Production and collaboration modeling, it goes on and on. And help each other out from different ways. We have touched on this, certificate program and working together on things of certification through surveying. On our side, and how do we move together? It is used in the community of practice in the group at look at commonality of the organizations. We are already starting some of the professional training and cross training and we have a field team that goes out with the NGA team. On airport service and comparing methodology on how they do things to support things for defense, and if folks don't know it, we do support the FAA. And we have done that for many years on airport data. An share in some of those best practices, we can learn together. And then the cooperative agency the research side. Leveraging each other, what we are doing for research, and making sure that is shared. I know when the geospatial modeling came out. I shared with everybody on the team so they knew. And they were already getting I know Ben from NASA was getting questions about the geospatial modeling grant and comparing it to some of the things that they are working on. As you can see I am excited about this, I love federal coordination. We talked about it numerous times, I know Nicole talked about it. I know Rachel talked about it. We are doing it. We will meet and we will face the crisis. And we will resolve it. I promise you. So, I say that. At least we are talking.
>> So here is what we are doing and 24. So, I know from NGA perspective they are looking K-12 on stem side at many different ways from NGA perspective we have out there I know that asset is too. From the university coursework and degree programs we have several things going on right now. Pathways, we will create pathways like Rachel said to get undergraduates involved, so when I talk on campus there, and you get the applied math person you say what you doing next? And they say I don't know I will go teach Matt. Well, no, you understand these squares and you have C++ we need you to build models. Go on and get your graduate degree. So those of the things that we want to do so we have a branding issue. We want to create the brand we will first it at ODU. We have three foundational organizations that are here, and those folks can get with in those

organizations and be part of it at the undergraduate level to get excited. That is what we need to do is create excitement. And we will do that.
This going to be quite often on the facilities, we will get them on the field you want to go to Samoa? Hey would you go to Regnier, maybe not to Regnier. Maybe the TJ. Sorry. And going out to look at the tide gauge situation and the thing is, what do I say about down there in that area? They have had flooding all we can pick
Those kids understand it, they live they go to class, like where is it flooded that I have to go over here? There is new since flooding here to get to my class. That is true, I will show you a picture from today. In the parking lots that are filled up so they cannot park it is part of their DNA, that I have to learn about the stuff. Plus they have a coastal resilience program down there. Plus they have got things we can work with on the undergraduate level. At and GS we are sending folks and is not just Ohio State. We have got somebody at the University of Nevada Reno, we have got somebody out at Oregon State right now. We are spreading that out, plus we are using their online program too, 2020 program they have folks involved there. And employees that work for us now. University research we talked about that research to employment. Research to employment. Hopefully talking to those students getting some grant money, to come and work for the federal government. And I get it, we need this across of all industry, but we have to solve our problem first. I know NGA has an emerging science program. And graduate programs, and then on the job training. Cross collaboration, working together, understanding it, we will expand their. Do you want to talk about some of your missions?
>> Yes we actually switch from hiring GR assists and majors in physics and mass and we will teach them in the Geodesy portion was a got in the house. But still that is a complicated issue as well. Because a lot of the training, is almost Geodesy is almost governmental now. The reason why the universities moved away from it, or one that because GPS was there and we thought that solid everything we don't need it anymore. But we all know that is wrong. But you know, getting from, we had a working group, a heart problem working group session with our group.
We had multiple universities attend. We had six hard problems identified and trade crab was one of them. We threw it at the very end. In the overall picture, tradecraft got the most support from across the universities that were there in attendance.
They provided multiple proposals back. Instead of funding any one of those, we decided to push that off until FY-24. We want to get their community practice involved in looking at all of those proposals.
There were some proposals using educating high school teachers on some geodesy project. Summer camp for kids on geodesy. The marketing is a big issue. Instead of funding one of those we need to get the community of practice together and look at that from a larger viewpoint and say okay, how do we lay this out from K-12 group to the University group to the inside our agencies training. How we can develop all three of those aspects. You know having that initial marketing to those whether it is K-8, and then 9-12, there is different ways that you can't market those. It has to be different. We went to a university in Missouri just last year. And presented PowerPoint slides and that is not going to work. I

mean, afterwards I was like, this is not going to work.
We have to market this better we need somebody who has marketing experience. Take the technical aspects of geodesy and throw it into the marketing scheme for those specific agers.
We think that this can happen, I think the university is in line to help with this. We just got to give them clear direction of how we would like that to go, and then allow them to use expertise to build something. We even have the marketing issue for NGA for Geodesy. That isn't internal action for our own agency and why it is so important because everyone takes it for granted. It is one of those things that nobody knows why it is so important to everything we do.
>> Thanks Scott Ben, anything you want to add?
>> Yes, NASA historically an ongoing we have a couple of key touch points, to academia and training. To support our operational programs as well as research interest. Just for a little bit of context of why GRC is important to NASA. Brad mentioned space geodesy in particular. Indeed we have more than two dozen Earth orbiting missions, open space now. And geodesy plays for a pivotal role for all of these missions. Or the determinations and orientation for mariners. The reference frame to tie measurements at the surface.
This is in particular important for gravity are held to maturity and other missions. You may be familiar with some of these the gravity mission. Measuring ice and land elevation as well as shallow imagery. We have a radar mission coming early and 2024. So, we know that geodesy products are fundamental to those missions in those measurements, and advancing and ultimately understanding of their system in particular the processes that require high precision and sea level rise. And so under that we have a couple of that is focused on and developing and deploying the infrastructure the data analysis and data distribution.
And we have a number of academic partners and operations analysis and data provisions. Lake in Texas and Hawaii that partner with universities there. And and then we have the computer research programs. Research and opportunities in space and earth sciences. We have annual calls for proposals that explicitly welcome research and geodesy. And we have probably a dozen additional academic institutions who are active. Addressing some of those hard problems for NASA. So we continue to make those investments, but still see the same kind of challenges in particular, of U.S. citizens. For the core capabilities and operations. And so I think you know for my perspective, the next step for us at NASA is to look how we can better coordinate leverage and complements the initiatives that partner agencies are standing up. And there is nothing to preclude us from looking towards co-funded opportunities. Effective pooling of resources draw an audience and build capabilities. As I think that is where I am looking next how do I take existing resources and programs that we have, and you know leverage the partnerships that were building.
>> Thanks Ben, I think that is the end of our slides. So we have got about 15 minutes?
>> Thank you very much, that is all great work. We needed definitely we needed it. I have a few points, first thing we should not just focus on [Indiscernible]. We have bigger problems nationally the surveyor problem. Those are our aging and nobody is coming to it. So I hope

you expand your work, because the need of surveyor to Geodesy, I would think is the agency could have two good that can do that. The surveyor even more serious of a problem. So we need to think about our recruiting policy.
When we talk about surveying, the kids at University their option for them, they think surveyor is like they going to throw them in the field with a level or something like that. While we need to approach it differently. Surveying is layers of things like that. So we need some kind of right education, we might need to rebrand many of it you know?
I mean, these kids have an opportunity to go into electrical engineering, you know, electronics, mechanical, we can call it positional engineering. No people are stuck with that mentality of a surveyor. For example so we need to liberate ourselves to meet the time, today we are different from different to handed. So that is one of my thoughts, maybe we need to rebrand. Geodesy is a science. But the person was going to pursue it we don't have to call him that anymore column and engineer. That is one way to bring people I think. Injecting money I totally agree for research and development. We can work with universities and encourage them to build divisions. With a brand attractive. So went these kids go for orientation, they don't see just surveying first electrical engineering option. We need this to be smart about approaching these and approach them with that.
Injecting money, I would find it hard for your agency to justify a lot of money without it should perceive that in my opinion. We should have a national assessment on agency levels. You need projected for 15 years. Because that's what you going to talk to Congress or administrator. In ten years I will need 500 people or surveyors. We are going to have to face it. You are not just pushbutton and be cloned right? So when I have 500, ten years, let me program. I will go to this University and give them this much scholarship to give full scholarship to a hundred kids a year for example. If they find full scholarship they will come to it. So really we need what I call national assessment survey, and we can tabulate the need in ten or 15 years, so we can use it in our marketing for example. The community of practice just three agencies? For, but is there any reason you cannot open to academia? Because academia and the slide is big things right to solve it. I mean,, is there any other selection is not just NASA, so that is my suggestion I'm sorry if it took a long time
>> I don't disagree with anything you have said from our perspectives it is surveys, because we do have the survey team or at their meeting and dealing with that absolutely. Our whole thought is trying to get us between the guardrails right now and extend out absolutely. We do have folks that participate with an SPS pick we actually have somebody who's leading the young surveyors for an SPS that is an NGS employee. We are moving out matter.
You are right, were trying to tackle this from so many perspectives, or different ways, but that was Scott and I had talked about is trying to keep it at least focus somewhat to get some momentum. We've had conversations and I am worried we are going to get this off of the side that are going to drag us to the point we can get moving. Which we get the momentum over this. I totally agree ringing in the total academia, the private partners, all of that to work with us, we were worried about it, it might slow us down until we get kind of a focus in the framework build out. So I am totally one 100% on board with what you are

saying.
>> Just a follow-up someone trying to map the ocean how we have better maps of Mars in the ocean I'm nervous when we talk about encouraging people to get into the career and go look at the moon. That worries me a lot. Back to what he said obviously, not originally U.S. citizens. Can't you recruit more people with a powerful way to citizenship, that is a short fuse to be compared to K-12 and I think that should be a focus. Like again related to and I understand what you're saying about getting momentum first, I am not sure that it does not have an issue to. Not the surveying image but it is software whether it be all of the software that we are involved with. It needs someone was really good skills. It was interesting I was talking to Matt Wilson. Who had just having a chat, and he worked some time for KBS which is a software company and he said, I have been to the sea, program and mapping, and then we work for QPS, working with young graduates from the survey program and it is like while those guys know Geodesy. It is just a sub specialization for me from surveying, and it's you go to hydrographic. It is may be that is the wrong perspective and you cannot change the industry. But one of the other things what do we call it? I think that is a real problem. And even related to the ocean mapping, and never talk about Hydro spatial we don't have a profession, and then I went back, this is after 40 years, I am going back doing ocean mapping. And when I rendered data to submit it, I am a Marine technician. That is a problem. It is not even a scientist. So, it is like unless we elevated with the professional society. I think that is we don't know who we are and that relationship and I think Geodesy hangs out as a part of that as kind of a we do is really critical. I think we talk about certification, and ongoing workforce development. My view is, the feds can help manage that by having those programs in order to find the requirements of what people do and assess that. But I think the final thing at survey programs are probably again your biggest kind of recruitment path if you can't improve those. I don't know how many there are in the U.S.? That is just a another foreign perspective on the problem. But I think industry, I know again the challenges embracing it and working to get the momentum. But I think the sooner the better for both industry and academia. It would be my suggestion. Thank you.
>> Great suggestion appreciated thank you.
>> Mary page Abbott, educated in marketing communications. Made money doing that. And then I applied and had to apply to the organization which I volunteer. We were looking at increasing membership it is a membership -based organization the United States power squadron.
Our first order of business, because we were looking, our volunteers do everything for us. Creates educational materials. Instructs, recruit, retain, you got it. One of the things that we did initially when we were looking for instructors, is we took a look at what are the what is the target market as to what are the skill sets that are needed. We went back to all of our members and did a survey, as to who almost had all of that. And sent them a personal invitation to participate in advancing their knowledge base. And we pride them. With things such as we will support you, we will give you these materials and the classes for free, we will give you a career path meaning you will is for nothing in order to teach the classes and

go forth and by the way. You are a subject matter expert because you have years of experience in boating. We have been quite successful. And that to fill the current need, but we have a long-term issue.
It is also with building up membership. A marketing study of the target audience of future members. And did a full demographic the full research and then we were able to describe what our ideal member is going to be. And then create a targeted message to that entity or that person, or people who believe them to be in that group. In order to increase membership. So, it is taking time, spend dollars, you can like I said she'd to, go look at the University of South Florida. Apparently they have got a very fine program in Geodesy. It's growing I don't know what they're doing because I was reading about a country, and, I mean, a school in England or Scotland. Who is going down the twos. So as a comparative who is going up and doing something right, and who is either staying with the old way and we always have done it this way, instead of looking to marketing differently to the students. I heard that no one is coming to its. They are not going to come to you. You have to go after them. You have to create the sexiness, in the future. In the end the product. And the first question each one of those students, or each one of those children in fifth grade is going to be what is in it for me?
If you cannot answer that, you are in the wrong group. That's it.
>> Can I add something. I will give you one example. I mentioned Port Houston earlier the economic impact. Corpus Christi, which is a diversion program. You have other universities in Texas which are dependent they understand supply chain. They don't have that opportunity. If we can't reword it, under as a stem program, and then classify it as a stem program, which will get attached to engineering. College of engineering, that would make a huge difference. Because, many of the laws for national and international students are hinged on stem and engineering schools.
It is worth sitting back getting a large pitcher, so I did ask my class, supply chain folks. And how many of you know what it is and come from a bar?
>> Thank you
>> Hi Nathan Wardwell so when this crisis came up, a few minutes ago. I went on Google and look up the term Geodesy. The use of the term or the word peach in the 60s. And then you look up geospatial, and it is skyrocketing. It peaked a couple years ago, much higher rate. You talk about Brandon, I am on the advisory board for the University of Alaska Anchorage. The Geo Maddox program they go to the same issue too.
It was called survey and mapping at one point, and it went to Geo Maddox, but what does it mean? So they are thinking about Geodesy engineering. And so, clearly understand the branding issue. Talking about the pipeline you know I think if you are talking about a long-term pipeline, it was great to hear that NASA was working with K-12 and encouraging kids to do that too. I know that will not feel the immediate need. But creating the long-term pipeline I think that would be importance and then, just addressing like the industry involvement with the community of practice. I mean,, workforce development comes up everywhere is a challenge for everybody. I would think it would help accelerate things and not slow down progress with community of practice if you include industry. Because

industry is facing the same challenges too. I'm sure they want to help.
>> Good points, thank you very much did you have something Mr. Johnson.
>> You need to tell everybody Mr. Johnson. In my formal life I serve on the licensing board of North Carolina. And over half of the states, hydrographic survey and the [Indiscernible]. And the current exam to get a professional license is boundary heavy, so I think 2016th 2017, we came to the NCAA's console which is the national Council of legionnaires and surveys. They develop the example all the licensing boards. And said you need to have another exam that is a pathway for the surveyors that are non- boundary and so there has been ongoing and the conference in Boston this past August, there was a lot of states is saying we need this exam there is a task force now to put together exam that will give a pathway for Genesis hydrographic surveyors if they want to get professional licenses, so we need to tell and see double as, that we need to take the exam. And we've had this discussion with Admiral to see if we get support on this. That would give people that want to get professional license a pathway. And they will be taking exams and areas of expert that they practice in. Anything we can do to let and see double as snow this is another way of attracting people to the profession would be very helpful
>> Thanks Gary we always thought on the survey part land survey boundaries you know you have to take in the curvature the earth. So that is that extra step in serving, but it is probably not well understood.
>> Right, and like I said over half of the states license laws, you have to have a professional surveyors license. So the pathway at now there is an obstacle because you had to take that boundary. And so if we can create an exam that is more math and science that gives them a pathway if they want to get a license.
>> I like to make a comment on that, because you and I definitely looking forward to chatting, I think from a North perspective we have to look at the details but we open the ideas of providing supporting letter to that and I would also like to invite the panel to provide a supporting letter for that effort, I think it is a different perspective. And I was a panel of experts, different perspective than me or catching Rachel and Nicole to sign off on that. Not that we won't, but I would invite the panel could to consider to do so as well.
>> Thanks, couple people have said things Mary page included on the border on this. It seems to me one of the things that your group needs to do is sort of set out a list of competencies, that constitute what you are looking for.
Because you know, otherwise, you are going to have people saying I will be a survey or and they go through survey school, and then they are not. I would encourage you to set out a list of competency for Geodesy may be at a couple of different work role levels, so maybe there are people that work and support in geodesy that have one level of competency and then people at the heil theoretical level. It seems to me that would be a good first start to developing your plan to get people to that position. Thank you.
>> Thanks Sandy, I will share it with you and been a couple of years ago created a strategic human resource plan to look at their future surveyors and lay that all of all the companies require a pic of the future, workforce not the current workforce, which includes a I and all of those pieces right? In the new updated programming skills and all of that that comes

along with that. So thank you. And we will talk about that. I agree with you, that is something that we need to sit down and talk about.
>> Thanks Julie, so, I also would like to thank the panel and everybody who contributed to this afternoon's discussions. Very robust, and the timing showed we could've talked about either one of those topics all afternoon probably longer. Hopefully there will be time during some of the social time and also the panels tomorrow that are complementary to these two to continue these discussions. We are at the point for public comment. This is an a for sure request for public comment. You've the audience are encouraged to put comments in the box. Target them to the HRSP members in NOAA and focusing on what NOAA can to do the navigation positioning product data and services. This is not an opportunity to ask specific questions. We have some comments that were previously submitted I will turn it over to Virginia to read and summarize those. We will show the comments on the screen there will be collected into a document and shared with the HRSP members and NOAA, and they will be posted to the website as public record. Virginia please.
>> First comment from [Indiscernible]. Advance comment is offshore when enemy development plays an important role, and first U.S. achieved nation stated clean energy blue economy goes. Is the world's leading geo- data specialists in collecting and analyzing compounds of information about the earth and their structure is built upon it. We maintain offices in 12 U.S. states and we serve both public and private sector clients on land and at sea. Over the last decade, for go has been at the forefront of offshore and wind energy developments. In the U.S., providing survey and other technical and consulting services to help advance offshore wind energy development while protecting biodiversity and enabling shared stakeholder use in the ocean. We recognize and support NOAA active engagement in the process. With partnerships at regional and national levels to enable science driven resource management decisions.
Good example is NOAA and PO EM strategy on fishery surveys as well as studies on special on spatial planning and sitting offshore wind energy in the Gulf of Mexico and Central Atlantic. Just to name a few. Another area that could benefit from even more inclusive partnerships is ocean data management and sharing. Our experience indicates a high level of interest from research and ocean user communities. To access and openness from developer communities to share. Sitting data collected as part of that characterization requirements. While PO EM is the lead agency under the process not a science agency. Numerous projects are entering the construction operation plan. Which gives approximately two year lead time for this dated to become enable for sharing. Known pain points around data in this phase is axis, packaging, storage, sharing, management, fidelity, and standards particularly around metadata. We believe NOAA through the integrated ocean and coastal mapping working group is a unique position to help make the most of limited resources. Help her share ocean and coastal data, and related products so people who need data can't find it and use it easily. This would align with agencies map once used many times in mantra. In partnership with private sector the troke one, can improve the process by which sitting data includes data which was acquired as part of the study. Sitting offshore wind energy infrastructure can enter public domain and be used many times.

There are successful examples of such seabed 2030, and official action of the United States states decade of ocean science and sustainable development. And NOAA own national centers for environmental information that can be used as models. For part, we have been leading private sector participant in seabed 2030 project. Contributing over 2.3 million KM to of data acquired. Vessels and facility numerous contributions our clients to this goal of ocean mapping initiative. We have specific ideas and resources for this cause and stand ready to help expand public and private corporations. Collaboration in this regard. We strongly believe that such partnerships and collaborations directly contribute to amplify the benefits of our nation's clean energy and blue economy goals and developments. That was the first one. Thank you for your comment. The second one is an online, earlier this morning. His statement is ML is particularly useful in application of a hybrid approach to coastal management and blue economy. Did NOAA have some working plan in this sector?
>> Thank you Virginia, with regard to the first comment, I will just say that we appreciate the interest and the strong support for the program. And we welcome, as I mentioned this morning, one of our chief constraints, Chi challenge, is getting data into hands of people who need it in the right format. In a timely fashion. And so certainly very receptive to that to the note about challenges of doing that. We would welcome the opportunity to discuss ideas further. In regards to the second comment I think ML is machine learning. And I will the comment came in during Nicole's comments. So I don't want to speak for them. But I will know, NOAA does have the NOAA Center for artificial intelligence. So it is intended to be a center of expertise. A small center of expertise. To bring the power of AI and machine learning to bear against the troke one mission. So whether there is something specific that the doctor was referring to I don't want to speak for him on that. But certainly machine learning is present i NOAA, we now open it to comments for members of the public and members of the audience for open comments.
>> Okay awesome good afternoon I am the deputy high driver for of the Navy. I would like to make the panel in the public aware of the excellent interagency coordination and cooperation, that takes place within the U.S. federal hydrographic program. U.S. Hydro is unique in three different organizations. NOAA, oceanography and NGA maritime. They share responsibilities to the international community. Policy position reports and proposals and participation relevant to I HO 15 regional commissions are discussed and coordinated formally at the monthly U.S. hydrographic planning committee meetings. And on a daily basis among the joint team.
These relationships and body of work and short unified confident message and strengthen the ability to maximize the benefit from I HO.
Great example of the effort is the successful participation at I HO in Monaco this past May. The delegation comprised of 30 individuals from other organizations and State Department and academia and contractors. We introduce a much needed and will oversee proposer to transform I HO capacity building is resource. We held towards and a reception on board the oceanographic survey vessel. Which was attended by [Indiscernible]. U.S. ambassador to France and help strengthen our valuable international relationships. We won the award for best national exhibit enhanced by displaying examples of national data sets on science.

Culminating in an election of troke one Dr. John labrum as National Director. This example represents numerous other ways of work together every day to strengthen our program. And I believe the multi agency represents the government best practice, and provides tremendous benefit to science and industry and nation. And support that you are aware of this thanks.
>> Thank you Matt we have those comments while it has responsibility for U.S. waters, we could not represent and really be the frankly force the U.S. is on the world stage and I HO, without the capacity provided by the native -- the Navy and other partners. We share that with the Department of Commerce and the Department of Defense sure that responsibility. I could not agree more with Matt's comments on the success of the assembly. With thankful to the Navy for supporting that. Are there any additional comments from the floor? Okay that I think we will close public comment period. There will be an additional opportunity for public comment on Thursday and Friday. Again send them in advance if you can. Staff will collate them and we will display and read them at that time thank you.
>> Thank you, what I was going to say thank you for all of those public comments. And it is nice to have feedback. Okay, we are going to wrap up today's session. By going around and getting comments from the panel. And the NOAA leadership here. I really appreciate all of the sessions that we listen to. We will start with you Nathan. We are going backwards. We will give Mary Paige a break. It is all yours.
>> Yeah, I mean, I don't have a whole lot of comments today. Workforce development issue came up quite a bit. Like the discussion the including K-12 pipeline was in the pipeline was something that I was thinking about quite a bit as the discussion goes on. And then, I really appreciated Derek's picture of radar, and using wave data from radar, it took ten years for a tide gauge. It was some noise in the data is now somebody's data. So like acceptance of this encourage NOAA to continue to accept new technologies. And faster. That is it for me.
>> Great thank you Nathan, as we go around just a reminder. We will send a letter to Dr. Spinrad at the end of the meeting. If you have any notes or recommendation that you want to include will have another chance tomorrow and the last thing on Friday we can jot them down as you think about them.
>> Glad to hear all of the progress and effort being made on Geodesy crisis it is a crisis. It is not just Geodesy it is the survey and the profession, we have one program in North Carolina and those graduates have 45 job offers. There is a market out there we just gotta figure out how to get the word out to get students to come to us. And then, I encourage we can do support for this math and science again. It is good I would be glad to provide the score information for that. It is my last time, so someone asked what have I enjoyed my eight years. And I think I served on a couple of other committees and on those the complaint I hear is they never get anything done. Well here we get things done. We also track things, so that is what I have enjoyed most. We get things done.
>> Thanks to you also. Okay, two things, one is I will look forward to seeing a draft letter from you, that we can help both and circulates it amongst HRSP for signatures. You will be here tomorrow and the next day or stay your last day? You will be here the whole time, you

worry me for a minute there.
All right, moving right along to Ed.
>> Thanks Julie, another good day tremendous amount of information on databases and digital twin it was a fire hose of information. Which is fine I think it's great. I think it also leads to the point that it's got to be, it's got to be a creative way to make all of this accessible to the general public. That is where it will shine. And as I have said before, I maintain, we need to get it to the point where scientists and engineers, and professionals, aren't the ones that are using it, we need to get it to the people who are outside of the room or types of expertise that we have. City planners all of that type of thing and that's where it will shine in terms of its usefulness. It is a big aspiration but that is the real target for us for what we are talking about. So thanks and I look forward to tomorrow.
>> Thank you Ed, did you survive your first day?
>> All I could think about is Schoolhouse Rock, and the reason I say that is we start talking about workforce issues. We have a real problem is not just Geodesy, we talk about merit is. NOAA core offices, we got to be creative other ways to do it. I would not know what a Bill is today if I did not watch Schoolhouse Rock. Maybe that's an opportunity, I will tell you one thing that NOAA does possess, which is an exceptional resources is your sanctuaries. You need to use the sanctuaries to use as educational tools. Whether it be recruitment through Geodesy being a piece of it or whatever you want to call a professional survey. But use though centuries we use them on the Great Lakes for both Wisconsin shipwreck Coast and also for the Thunder Bay National sanctuary.
We are busing kids from Detroit. We are taking the from inner cities to get them out there and educated and experienced. This is an opportunity to use a sanctuaries is a great place for them thank you.
>> Good ideas. All right, is to Tuba Online no. Okay.
>> I want to say what a great thing it was to see Rachel's position created. That means a lot of elevated issues, that come from you know my part of the world. The industry, to see that higher level brought and I think it is awesome. Eric kind of stole my thunder on the workforce issue. But the mariner workforce is to, I see on G captains lots of ads for NOAA officer corps and it is an interesting dichotomy. Because there is so much need for it, and I served on the foundation at Cal Maritime. Where the only West Coast Maritime Academy is in jeopardy of losing funding because they cannot be enrollment goals. So, it is definitely opportunity there.
>> Is not a good thing thanks for highlighting that. Deeann? She's gone sorry. Lindsay.
>> Yes, and before I start I guess, what Eric said it tweaked me. I worked with many of the sanctuaries over a few years particularly Thunder Bay, from an outreach perspective they are some of the best federal agencies I have ever seen in reaching out to people. They seriously have a great connection. Just people who know how to do it properly, and working both West Coast, Hawaii, up and Thunder Bay there will connected.
I would like to go back and really just, there was a comment made about being in D.C. is not Hawaii or Puerto Rico. I think we all appreciate having the leadership here. That is significant. It is important that we get that face time with them. I think it is important also

again appreciate the directors updates. Always to see something Ed and I always talk about that. It is always something new. It is interesting to see that. Workforce development I think it is really it is oversee talking about. I don't know how we are going to reduce that for what are our recommendations to be the platform supporting the geodesy crisis. It is something the nation has to deal with.
It is more than just the GRC crisis I think. I think it is very much so. In relating to that and digital twin, we could have discussed that for a long time I think. Sometimes it gets into the height level concept, it was great to have that with real examples. One thing I briefly mentioned, but I think if I look at research, and this is for the Admiral. We seem great things happen that you and H.
I am not sure that there is research being done or the development of that, that supports digital twin and data up there. And maybe that is an area that can be further discussed. Is there a way to do it is it the right people, how connected? I think that is kind of something that tweaked me today. It is like yeah, there are other people that do that. That research up there. So that is my common things.
>> Interesting Lindsay because that was kind of the genesis of my comment about joint venture between Lockheed and NOAA. Liquid is ago where is the next step how can that really.
>> That goes into center of excellence.
>> Okay there you go. But see I don't believe Nicole is online, no Sean.
>> Thank you Julie kind of interesting today the discussion and I've had to leave on the Mississippi River. We are dealing with extreme low water emergency situations. Even coming back to digital twin. Some of the things that we see on the river, in my opinion have to be driven sea level rise relative sea level rise. Impacts, we are seeing saltwater encroachment with the level of river in years past we would see so water encroachment. I think for me, I remember I will say their name and give them a plus as they are not here, but some of that we all know that usually comments on HS RP events, said Sean you are kind of like a translator. I'm not a scientist, I'm not a mariner.
But I kind of know what we need and looking at this information, and I will always get lost in trying to figure out how to digitize the Mississippi River. I mean, I know that is not where we would start, but the importance is Geodesy advancements is I've been on the bridge of the ship enough times to know you're looking at DB use that of full of geode data metrics, and things that we all need and I think I made some comments I will say for the paper. But I think the importance of those metrics to navigation is being left out. I have a couple of words to add to that. But I apologize for being off, we had emergency saltwater and pipeline removal issue and lower river in Venice with the river is deepening. Hydrographic surveys may have been off as by as much as 20 feet. It remains one of those places where as we deepen channels across of the country, we really don't know with any integrity out deep a lot of pipelines are. Which is scary and another place that translating and pulling in real details real hydrographic advancements is very important what we are here Ray. I look at all of you to solve my problem. I will keep bringing my problems here Kirk thank you. Thanks Sean.

>> Thanks Sean Alex are you online.
>> Thank you thanks so just summarizing for today great leadership is nice to have that support. From HRSP to get the support from Alicia. Think outside the box, the blue economy. As we are part of the Department of Commerce that support for business for optimization, I feel that is key. The other one is greenhouse gas net 02050. We have to start to reach their to keep up otherwise. It is something to think about. There is economic data supporting this. So the session which needs to be made for the additional print is concerned we have got to start somewhere. Sometimes perfection is paralysis. If we see value, we have got to remove it at a pace and then take it to the next level. But if you want to have a perch -- make a perfect picture it may not happen. Representative Cummings you to say if you cannot see it you cannot dream of it. And at this time, geospatial engineering is not seen by students by high school by college, you are not going to get them that information has to be visible to them. And made sexy if I may use that term because that's what students like if you can get it that that we have got something. Otherwise we have got a problem and we keep repeating it. It is the same story, and we know where that is going from 0.4 down to 0.2 where the world is his 0.2% when I say that. And we call ourselves the largest economy in the world. Thanks.
>> I hope you went the other way in the order because it will be after me. The vision of Nicole definitely. Just emphasize what he said. Let zero goal for 2050 is great support. And joint Center and Hydro surveying blue economy, climate, [Indiscernible]. I don't know what that is. To be ready for climate. TAS data as a service that is a new thing. [Indiscernible]. Working with grades partner should definitely on that. NOAA in the cloud is a great concept and direction. So humble to call for guidance and to tell him, what we are missing it we are. It was a lot of room to help along that line. Rachel is a great appointment and great created position I want to follow up with this idea of connecting land and sea. All I did is effort there but I want to want them to go faster. Two connects the freedom [Indiscernible]. Great things to do. There is fertile ground the environment is right we just need to push a little bit small department division to start focus on implementing. Because we have all of these pieces. It has a lot of it and we just need to make it happen. Built that digital [Indiscernible] so we keep talking about it. Geodesy, I hope you prop follows up I hope. My suggestion and to open the community of practice to make it whiter as soon as I can. I understand if you start. You not going to go anywhere. Nice start but it can go big or thank you very much.'S
>> I agree I one 100% opening up back to Damien because Dane it sits at Scripps Institute of oceanography, we have a lot Geodesy department comparatively. A few students a few graduate students. I definitely see the interaction with the into academic community at that point. Mary page?
>> Thank you very much. Not sure whether I like this order. Regardless, I appreciate everybody being here and interacting with you all again this time. Being the second meeting that I have attended. I want to say countable that means I'm not doing my job. But the getting a better grasp as particularly as a taxpayer as to where my dollars are going. Where it actually can work. I do have, this morning session was great. Informative, I feel better informed. I do have a question that I will ask Director Snowden on the C web COS

whatever that means I am a marketer. Cameras on Northwest aloe and to me which is longitude latitude something tide stations. So I will make up my own answers to the acronyms. But how in the world do you photograph rip currents? I live in Florida we have a horrible reputation for rip currents. So I am kind of curious how that works. At some point in time someone can give me the answer. So that was something that piqued my interest. I also want to let you know. I didn't read the strategic plan for the 2023-2028 I think it is. I found it fascinating and I sent it to my friends. In Puerto Rico and I asked them to read it, I have not gotten a reply back, but I wanted them to see the photographs that included in the report. Because as almost all of Puerto Rico. I knew they would appreciate the fact that they were included. I represent, I am here on behalf of recreational boating and voters. One of the things that came out this year end it does every year end may is the recreational boating statistic has six). There are 11 million registered boats in the United States of America at this point in time. It is almost a 2% decrease from the previous year. As people learn I suspect from covid-19 that boating is not the cup of tee and they are exiting. Out of that 4040 accidents that were reported in 2022, resulting in 635 deaths, which is lower than the previous there was still 636 people died. There were 2222 injuries. Operation of a vessel were the top three reasons and numbers for accidents. There were 2000 out of that 4000 accidents 2300, half of the deaths were attributed to operation vessel and adequacy. 1500 injuries, and of that the two that I took to artwork the operator in attention, and operator and experience. The top two reasons for accidents, deaths, and injuries. Our concern for me is and we are going forward and I know we need to educate and continue to advocate recreational boater to pay attention and unfortunately, I look at and I fear, that electronic navigational charts is maybe, may preface that big capital letters made, contribute to someone who is running a 26-foot vessel or 44 and smaller vessel. From not paying attention. Rather than having a paper chart. My organization needs to do a better job of educating and advocating. And I think all of us, if you are a boater, or a hunter, or fish meant that goes out on the water you are a boater. Whether you are in a canoe, a kayak, rowboat, stand up paddle board Your Honor vessel. And you have to pay attention to where you are and what you are doing. So we have a responsibility to make sure the products that we put out on not put out to the public Gentlemen, but we offer that training. Or the education. I just want to point that out. These are numbers that are near and dear to me thank you very much.

>> Thank you, it would be interesting to follow up on if you can nail it down, because my first thought when he was saying it is accidents because people are texting or reading text. It could be they are pulling out their iPhone, I am thinking you know, San Pedro over to Catalina Island is a lot of boats. This other people having a beer and looking at the iPhone and sorry, they do you know. So I would be interested to follow up on the statistics, I don't know if you have the capability to nail it down further? Or break it down find it out further? Is it looking at attacks that came through or whatever?

>> They don't not use the equipment. There is a whole slew of things. This type of information is reported voluntarily. Unless there is something major. It is very hard for people to say that happen because I was reading the text or something. I will look, and I will

as people.
>> Do you have any comments on that admiral?
>> Can I out on that I was going to say, so we are having exactly the same issue in Houston Galveston Bay that area. This was identified about eight years ago. So we started an outreach program. With the voters. And that has brought success. So there is there are programs available there an outreach is there. When you say about E and C and char and GPS. Most of the GPS have an alert that if you're going off track it gives you a buzz. They also found most of them actually disabled the alert. So how do you have somebody who does not want to be helped? I don't think the problem is E and C, I believe the problem is practice and training and getting the message out to them. Having some sort of surveillance program Coast Guard boards the boat all the time. Maybe that is a question they asked have you disable that alum? Do you know you have an alarm? And you can use it. Sorry to hear about the numbers they're always bad. Deaths are deaths whether it is one or more. That is something that we try and we seen some success in that space.
>> Yes it is a concern. Derek? Your first HRSP meeting.
>> All right I think the thing that's got my wheels spinning is digital twin conversation. A lot of observations has been made at the end of the discussion. Lindsay brought up what was in my mind what is our role there? How can we facilitate if were not going to be creators of the complex digital twin as we talked about over lunch. We are providers of data, so one of the things that we have talked about for years how we get data to the public.
We receive very little feedback on EPI that we do publish. We've done ten different types of them over the years. Everybody has their favorite. We don't have good information on Morse the best. And whether or not that is the way that we should pursue it going forward, because we could have the exact same conversation and called it the new blue economy. And entitled that new blue economy and talking about meeting customers in the cloud. New companies that are going to be developing services on top of data. Maybe they don't want it they just want to put it on the cloud. Anyway, any sort of objective feedback on that topic is helpful for long-term planning.
>> Okay thank you. Rachel were glad you are here. As you can tell from the comments, I think there is overlap with the lot of participants if not all participants on the panel. To have you join us as been an honor.
>> Thank you that's kind. I will just I will make one lighthearted remark regarding the Geodesy crisis. As Mary mentioned, reaching out and grabbing them are getting back to being a senior in college and getting a letter in the mail from a nuclear reactor saying hey we want you to be in nuclear power. And I am like no. Absolutely not. I know exactly what you guys do. And then recollecting back to why I even joined the Navy? So I think Tom Cruise may have something to do with it. But you know maybe we need to find the Geodesy or Mariner version to get us a new top gun. With that being said, this has been a fantastic day, I really appreciate everybody and there and say.
I'm sorry I missed the digital twin discussion. I'm fascinated by it I have questions. I am also interested in the discussion on the person on the recreational boating. As I just read an article the Navy just sent to unmanned vested in Japan without incident. So maybe the

person and the loop that needs to be taken out. Really, the topics that we discussed today I am really happy to hear the suggestions and recommendations for the summary letter to go to Dr. Spinrad. these are the conversations we need to have picked the level of support at the foundational data gets and all of the directors and all the foundation here today. It is taken for granted. And it is important to continue. Were continuing to fight the good fight. I am doing what I can on my level to kind of get down and get the nitty-gritty of the information and the data and where is the data going, how is it being used?
So I can take that information not only within our own four walls but up to NOAA and out the door for everyone else. Just to kind of really hammer it home. This is what you are getting for your investment. So, I am looking forward to sharing that with you in FY-24. It'll take time to get there but I am getting on it. I will be here all day tomorrow looking forward to the discussion. And looking forward to the panel and just as Nicole said earlier today, please continue to ask those hard questions thanks.
>> Thank you very much Rachel. Julianna?
>> First thanks Rachel for giving us food for thought for that image of what they. What they would look like to attract other people that will be a challenge. We have a I, we have all kinds of like things that can create the perfect super hero whatever we call it will work on that.
[Away from microphone]
we are going to work on that. That would be great the other thing I want to reflect back on the digital twin session. We have been hearing about this for a long time. Been in other sessions I've learned a little bit still a long way to go. It was great that we had an opportunity to dive into it and a lot more detail. I am left in the same position as Derek and other office directors. I feel even more so within the mission areas to support the development of digital twin spy all of our other users and partners in people with that as part of their sexy mission areas of their doing. Others that are within the NOAA leadership. What is it that specifically we aren't doing that we should do the digital twin effort? That is probably the best I can say at this point. I woke every that with a caution everything which is you know what can't we do that goes in the purview of the mission areas. And you all hear about them every time I come to these meetings. In the meetings in between.
And I will just say we cannot do more with less. We can't do more with what we have, because we tighten our belts considerably over the last several years. We can only do more with more. So how is that going to happen? Open ended question. And just say I feel like especially you know everything happening between the fiscal year's. That we are not going to talk about you know, the future is uncertain to do all of the things that we would love to do. And love to respond to. And like your help in pinpointing what that is we cannot do it all. That is fine too, that's be realistic about it, the future is of how will be able to manage on a positive note I would like to thank all of the panel members are all of your engagement I think you have been doing a terrific job. I like to see the new panels members here and be in person with you. I love hearing people use the term we I'm talking about the special government employees while you're here at this meeting what we should be doing. And I heard that several times a day, and that really made me feel like here we

are out we are on the same team trying to do things better. You all have your personal experience and thoughts about how we do that. Also putting yourselves in our shoes and saying we and I love that. I think leadership support that was here today, is also just another great reason to be here, and to continue to work together. Thanks for putting up with my long-winded.
>> We love it. And you know I just want to make one comment Julie and I'll get back to. I had the same thoughts and what is the role of NOAA with digital twin? I think that after Lindsay's panel discussion tomorrow, we will take time to may be drill down, and get different perspectives from the panel. Like what they feel if they have anything to contribute on that. It is a big question. Okay. Did you have a comment?
>> I totally agree with Julianna, nobody made it clear what needs to be done. My opinion from what I saw from the joint venture the huge company you know. That would be a good start to learn from its. I don't agree a lot with were not going to touch it we invested that just to find out. So seems like no vision to build and continue that's with the momentum for us should push us to learn from. Because they use the best digital twin environment and on the verse. So Lockheed Martin taken the money I'm sure and invested it. Learn a lot what NOAA can do with it. Instead of benchmarking it and leaving it.
>> Okay where into it I can tell. Okay great.
>> Kind of a comment to Derek and Juliana, it is something that I've heard of. But clarification I guess. An industry if you are selling something, there is a pile of metrics if you are using the Internet for sales. And I see it is delivering products and services over the web. I understood you are not actually allowed to track who is using it and that is a barrier to knowing. Your question of who are the users, and how the API is use, industry and has you over the barrel, because they know exactly what their clients are and that is a whole science of how you do that. Is there any way to partner with industry to be able to get access to that? I see that as a barrier, like people see that question and you send out surveys and you do that. They never answer a survey how does that happen where other tools that are there, it is just part of the way industry and marketing. I know, I can't do it but I know to come for me and asked the question that is the point right? That is something that the government delivers of service of data into this how do they deal with it I guess is the common?
>> I would just say we need to be careful we are not competing with industry. There has to be that line that's all of them say right now.
>> Great question when you say that you point out that data. Let's go back X number of years, when NOAA started to publish weather data. They had a weather model they had a storm on, they started it. And then they gave it the industry to work it forward and they step back. So it is that first advantage that is what we need, we don't want NOAA or the government to lead digital twin forever. Because we are looking for is one trial model. Do it to the study, make it public, and that paves the way for industry to move forward. That is how I see going forward. Otherwise we will always be waiting for each other. But remember private does not have the resources. In today's competitive environment. That is the challenge today.

>> We like to hear the comments were commenting on the days presentation.
>> Thanks a lot sorry for missing out early appreciate coming back to me. My mind has been going just 1000 miles a minute today all of the things, so I am going to take the focus in on the issue that is offshore win. My area of interest at the moment. But it touches on an issue that I think is actually relevant to safety to navigation and relevant to any other project. Relevant to any where we work in the near shore. It does not fully capture the concept. I like to call it seabed mobility. It is changed there's changes on the seabed over time. It has a lot of well, I mean, one example is the port in San Francisco. Where all of a sudden this sediment there. We saw pictures in the presentation I think from maybe it was from cap where windfarm was no longer underwater the foundations were exposed. I would like to tie this back to NOAA. They collected data and has the data and has the capability of all the things we talked about today to build the database machine learning and and use that as a predictive tool and we start to talk about seabed mobility and prediction and prediction of seabed, similarly that we do to meteorological predictions with forecast. I think it is it will become more and more relevant as we have more and more weather events that are causing this sort of activity with the seafloor. So, I think we would propose that as an issue paper or something. As we move forward.
>> Thank you, we have time allotted to talk about issue papers. Let's revisit that at that time. Okay great. Andy?
>> Thanks I think I am going to continue to harp on digital twin. I enjoyed that session. Julianna was reading my notes. So I sort of jotted down relative to the digital twin, who is going to make the digital twin in the ocean? Whose job it is that? Is it ours? Or is it our job to make a piece of it? What is sort of the system that we aim this digital twin? Is that a port, a coast, an ocean, where is the target level we are going to join, and the other thing I like it showed up in a couple of slides, we need to recognize the challenges and limitations and the practicality of our capacity when we take on these digital twins. So I think we certainly have a role, and I think if we have more discussion it would help to find exactly what the role is. And what we are aiming at thanks.
>> Okay Admiral?
>> Thank you, thank you all for your time today, at the risk of running down, I will keep my comments brief. I will note, starting with the geodesy crisis, which as I had mentioned the last time why met. I regarded as a subset of spatial crisis, that is incredibly limiting for us right now, I mentioned in the comments earlier that the field unit activity contractors and our in-house units were limited this year by lack of talent, lack of workforce, I should note that I personally appreciate the comments about the need to grow the NOAA Corps I agree with her. We also need to know know work shifts are staffed by civilian mariners. Two thirds of the seagoing workforce are desperately short and that. Two. The notable CAL-maritime and other academies is concerning. And I will also come back to the digital twin, and I think I was not the only one Derek and Giuliana and Andy, recently read the script that I wrote for myself here. Again same questions what is the appropriate place for NOAA, what is the appropriate place for I navigation services offices and enabling this concept and it was really great to see I think sometimes we struggle with what is a digital twin? Is it like a

ship simulator? Is it this is it that? Seeing some real world examples of what digital twins are and how they can provide benefits was beneficial. And then the same question of okay, what is our role? I'd come back to my comments around our national source. Which I think is one of the geospatial underpinnings of the ocean. We are building that out with exactly this application in mind.

And I think that one thing that we know we need to do better is make the turnaround of new data entry into the system more timely. We would love to hear more specific actionable recommendations from the panel on how we survey and we at NOAA can make our data more available to better serve this. I think there is a strong connection between this concept of digital twin. I see this as a perfect example that Dr. Spinrad, talks about the blue economy. The ocean based sector this is right on that spot. Personally as I sit here today, I am questioning whether it is NOAA role to billet or our role to enable that and encourage that. In private industry to be used it in as bespoke fashion to the particular need of clients. To drive value in economic benefit I look forward to more conversation around that. Thank you all for your time today, it is been a productive day I will stop there and turned back to.

>> I actually made a slide last night for the discussion on that panel, it shows kind of the chain of command and what happens at the Port of Long Beach with different desperate data sets coming in. How they go to Rotterdam, and then back to the pilots. I will show that tomorrow. We talk about Long Beach success story for NOAA. It definitely is. But the digital twin part to me is being run over in Rotterdam, so it is pertinent to the discussion. And it is like where along that chain does NOAA want to, if you want to expand what would your role be if you were going to change and be more involved with digital twin.

So that's a preview of what I will talk about for 5 minutes tomorrow. I think I am not going to say anything everybody has been inclusive of all of the comments that I have made today and I appreciate the panel I appreciate and glad that Eric and Rachel are here. And all of the others. And Virginia do you want to talk about logistics for this evening? Thank you to the public audience here also for coming. In the meeting my gavel. Okay meeting adjourned. But I do want to make sure you in the audience we are thankful that you attended also.

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