Floating Offshore Wind Project Webinar

University of Maine Alumni Association

John Diamond

Habib Dagher

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Watch Dr. Habib Dagher, executive director of UMaine’s Advanced Structures and Composites Center, for a May 2021 update on UMaine’s offshore wind program. UMaine is collaborating with New England Aqua Ventus LLC, a joint venture between Diamond Offshore Wind, a subsidiary of the Mitsubishi Corporation, and RWE Renewables, the second-largest company in offshore wind globally, to develop an 11-megawatt floating offshore demonstration project off the coast of Maine.

The New England Aqua Ventus offshore wind project is a critical milestone in the commercial realization of UMaine’s internationally recognized offshore wind technology that was developed at the Advanced Structures and Composites Center. The project has received major funding from the U.S. Department of Energy.

Dr. Dagher was joined in the presentation by Maine State Rep. Genevieve McDonald, a UMaine alumna, lobster boat captain, and consultant on the project.

Transcript is machine generated, unedited, in English.

00:04 everyone
00:05 greetings from orono i’m john diamond
00:07 i’m the president
00:08 and ceo of the university of maine
00:10 alumni association
00:11 thanks so much for joining us today our
00:14 topic is main
and offshore wind technology developed by university of maine researchers and other collaborators. We've got a pretty impressive geographic representation among our virtual attendees today. We have black bear alumni and friends from 16 states and the district of columbia. So pleased to have you here and it's a big day for this topic. In augusta at the state house a hearing is or in augusta there's a hearing going on about the governor's plans for offshore wind for a 12 tower array out off the coast of maine well off the coast of maine and our presenter today I'm sure we'll mention the details of that so art we will be starting our session with a presentation.
by dr habib dagger who is the executive 
director of umaine's 
advanced structures and composite 
centers 
both dr darger and the center are 
recognized as world leaders for their 
cutting edge research 
it would take an hour for me to list all 
of the honors the patents and the grants 
that he and his colleagues at the center 
have received so 
i won't do that but that said you're 
going to see several examples of their 
work 
we also anticipate being joined by 
state representative genevieve mcdonald 
along with her role in the legislature 
representative mcdonald she did get back 
to me on my emails 
whoops hey somebody if you could mute 
your 
mutual microphone i think i picked up
somebody else there so
excuse me so let me tell you about
representative mcdonald i mentioned she
is a humane alumni
uh she's also the mother of twin girls
she's a lobster boat captain
and an advisor to the partnership that's
developing maine aqua ventus which is
the offshore wind power project
that will be the focus of today's talk
the presentation will cover
roughly two-thirds of today's webinar uh
and the remainder will be saved for your
questions and dr dodgers and
representative
mcdonald's answers so if you'd like to
submit a question
there's an easy way to do it if you're
familiar with zoom you've been probably
doing it quite a bit
if you look at the bottom of your screen
you'll see a little comic strip
speech bubble that's the chat button if you want to submit a question just click on that bubble. Type in your question and hit return or enter on your keyboard. We'll get to as many of your questions as possible during the time we have available. And so you know we're recording this session and it will be made available online later probably in a day or so we'll send out a notice about where to everybody who registered to let them know where they could find the recording of this. So with that let's get started I'll turn it over to Dr. Habib Dagger. Thank you. Thank you very much John and looking forward to the presentation. Today I'm going to go ahead and...
and I'm going to talk about offshore wind today and particularly floating offshore wind. Um, I'll talk a little bit about the center. Then I'll talk about floating wind turbines why here what do they look like. I'll talk about humane research on flowing turbines starting about 12 years ago and then talk about next steps particularly New England Aquaventus. This is our research center at the University of Maine. I've been a faculty at the University of Maine for 35 years. I'm looking forward for 35 more. The research center was established 25 years ago and it's the largest university-based...
research center in the state of maine

today

we sponsored over 2,500 students financially from 35 majors and the students come and work in the lab and get paid to do so if you're an undergrad you can work up to 30 hours a week and get paid to do that and of course if you're grad students you live in in the center uh and um we've had we have today um about 260 faculty staff and students that work in the lab it's about 100,000 square feet we've had a number of spin-off companies in the lab from the research developed in the lab over 25,000 visitors have have been to the laboratory these are our partners and clients from across the globe
we have over 500 research partners
or clients that work with us a lot of
them send their money to Maine to do
research and development in Maine for
them
we focus our goal is to develop new
materials
for construction that are more
environmentally friendly
they have a lower environmental
footprint and
to focus on developing what we call
gem or strategic plans called gem
for green energy and green materials for
society
to give you a sense of what it looks
like inside our lab this is an example
of our wind blade test facility and
we're testing right here 165 foot long
wind blades under fatigue loading to
simulate 20 to 25 years of life
in a very short period of time in our
lab and notice there's one actuator at the bottom moving it up and down and it's being fatigued at the resonant frequency of the blade that's how we could move it so easily with one actuator this is our wave wind facility we call it W square wave wind facility and what we do here is we can simulate ocean environments by both simultaneously creating a wave environment as well as a wind environment on top of it it's the only facility of its kind in the united states um and right below you is a wave basin and above you is a wind tunnel uh it's an open jet wind tunnel what you see in the foreground is a floating wind turbine being tested at 150 scale so basically shrinking the size to about
and testing it in this environment to figure out how the bigger units will perform offshore. This is an example of how we test structures that float in the water whether it's a boat or a way to protect cities from extreme storms but you can see here we can create waves of different heights and different frequencies in different directions we can make the waves come from different angles and then on top of that we create a windstorm and the wind will change with height just like it does offshore so we can change the speed of the wind as you rise above the water we can change the wind turbulence intensity.
so almost recreate if you wish an offshore environment in our laboratory to test new technologies that we want to deploy offshore so if you're ever back in maine we'd love to show you that facility this is a 150 scale version of a six megawatt floating turbine and being subjected to almost a 50-year storm right here to put things in perspective a 50-year storm has about a 60 foot high way high waves from peak to trough uh now let's talk about offshore wind offshore wind is is a technology that the world is is embracing in europe in the united states and southeast asia to to help develop clean energy for coastal cities and coastal environments the majority of the world
big cities are on the coast and there's a good opportunity here to provide clean energy through offshore winds to give you a general idea here within 50 miles of the US coast there's enough offshore wind capacity to power the country twice two times over in the Gulf of Maine there's 156 gigawatts of offshore wind capacity and it takes less than five gigawatts to power the state of Maine that's how much offshore wind capacity that we have the big issue in Maine is that we have deep waters off of our coast in Europe the first offshore wind farm was erected close to 30 years ago there's over 5,500 turbines in Europe but they're all fixed to the seabed because they build them in
shallow waters
maine has deep waters and anytime you're over 150 feet of water you can't cost effectively fix the turbines to the seabed you have to float them and in back back 25 back in in almost 12 years ago we developed the first floating offshore wind research team in the country at the university of maine i'll tell you more about that later but in the meantime south of us there's been a revolution going on in offshore wind there's as you see right south of us uh the states have developed very very ambitious plans for offshore wind um massachusetts for example has uh 5 600 megawatt plans to put that in perspective if you recall main yankee in maine made
the nuclear power plant was 800 megawatts uh
so so massachusetts essentially wants to be to build the equivalent of seven main yankees worth of offshore wind and they're already on their way they've they put out just uh over the last few days a 1600 megawatt solicitation they've approved two projects each at 800 megawatts already but they're all fixed to the seabound because they have shallower waters new york has a 9 000 megawatt plan rhode island 430 connecticut 2000 new jersey 7500 maryland almost 1500 megawatts virginia over 5000 megawatts uh so so so there's a revolution going on president biden last month announced a plan of 30
gigawatts of offshore wind by 2030.
that's more than 30 nuclear power plants worth
of wind offshore winds
between now and 2030 which will attract
100 billion dollars of investment
in 44,000 jobs so in Maine we have deep
waters who are focusing on floating
winds
we're focusing on leading the the
country in the floating wind space
so this is a map of the US showing where
where waters is deep and what it
requires floating turbines the dark blue
areas require floating turbines because
the water's too deep
the light blue areas near the coast can
be can
can have fixed bottom turbines because
they have shallower waters
if you look at the gulf of maine it's all dark blue so the only option for maine to have offshore wind is to actually do floating turbines now south of us in massachusetts uh they're they have very light blue areas here so the projects of mass and suture scopes i've talked about are all fixed bottom in shallower waters however massachusetts is going to saturate those areas it's going to go beyond that to floating at some point in time if you look at the west coast it's our dark blue california is it has major plans for floating offshore wind right now because that's the only option they have now around the world there's a race to develop floating offshore wind technologies and offshore wind it is anticipated to become more than a
trillion dollar industry
over the next two decades
so let's go back to maine a little bit
we started working on offshore wind
when gasoline prices heating oil
prices in maine went up to four dollars
a gallon back
in the late to the first decade
here of this uh this millennium and um
in maine essentially spends close to
3.6 to 5.8 billion dollars per year on
fossil fuels
that's heating oil that's gasoline
that's natural gas
most of this money leaves the state of
maine because we don't have those
resources in maine
so we're shipping away every year close
to four billion dollars four to five
billion dollars a year
and that leaves the state of maine uh
think about if we can keep some of those
dollars in maine and put them to good use by developing our own uh renewable energy resources what we found is offshore wind is the biggest opportunity that the state of maine has not only the only opportunity but the biggest opportunity and um if what we what we calculated that if we harnessed only three percent of the gulf of maine area just three percent within 50 miles of the gulf of maine we can heat every home and drive every car so the question really is where do we pick that three percent so we can electrify heating and transportation in our states um how do we float wind turbines there are three major categories of floating winter turbines and they're all the designs are all
borrowed from the oil and gas industry so we've taken oil and gas rigs which have been built for decades floating rigs and and figured out how to turn them into floating wind turbines so the first family it designs is called the spar the second is a semi-submersible and the third is attention-like platform the spire design is a very long tube that has a mass at the bottom it's full of air essentially think about a tube that's 300 feet long 25 feet in diameter and has a big mass near the bottom to keep it straight up think of it as if you took a water bottle empty date of water put a bunch of sand at the bottom and put it in your bathtub it will stand vertically up and the more sand you put in the more actually it
will
ballast it down but that's exactly
exactly essentially where the spar
is except a lot bigger now notice
that the spar
has three mooring lines on it because
you have to keep it on station
uh and that's what the three mooring
lines do and they're mooring lights just
like you would have on a boat
they're typically made out of steel
chain even though we're looking at
synthetic mooring lines as well right
now
the second family of designs is called
semi submersibles
the the advantage there is they're a lot
shallower they have a much shallower
draft
so you can actually make them dark side
and tomorrow to see these designs
will have about 25 to 30 foot draft and
and that's the design we've actually focusing on in the state of maine and would like to make it out of concrete because maine has the ability to produce concrete locally and concrete will stand up better in the environment than steel offshore and we can actually get over 100 year life on a hull versus 20 to 30 years on a steel hole so that would reduce the environmental footprint of a construct of construction the semi-submersible works like a boat essentially if you if you've sailed the catamaran the catamaran has two hulls and the way the camera catamaran stays stable is by by having the hulls apart and by having bigger holes so in our case this design is the
trimaran it's got one
two and three holes and these three hulls keep it stable
and basically they're made out of concrete in our case and are filled with air
they're like three big concrete air tubes air cans
and the towers sitting in the center the last design is called attention-like platform
what it is it's got a big buoyancy module like a big air buoy here and that buoy wants to pop out of the water and you keep it from popping out of the water by putting tension legs to the seabed
the disadvantage of that is you need very expensive mornings and the unit is not stable on its own you have to you have to actually hold it
up as you take it from port to its final location whereas both the semi and the spar are float can be towed out to sea on their own i'll show you that in a minute there's there's a gold rush right now to build floating turbines to design and build floating turbines across the world there's over 40 designs out there and they're all competing for a position in this growing industry there are countries can competing with other countries to get floating turbines out there first right now and in the united states the university of maine and the state of maine are likely to build the very first commercial scale floating turbine
and lead the country in that direction
we started our program wow we started
about um a decade ago but
back in may 2013 you main made history
and you main main history
because we built and deployed the first
grid connected offshore wind turbine in
the united states
people don't remember don't know that
but we did we built the first one
so in may 2013 we we put this unit in
the water
it was made at umaine in our lab taken
on three trucks to broader maine
assembled in brewer maine by trimboro
put in the penobscot river and towed out
to sea
and this is how we towed it down the
penobscot river you can see here we have
three flotation columns one two and
three in each corner
that's how it works like a trimaran and this is a one to eight scale version of the bigger unit so that's how we thought it out to see and then we got it to the casting and moored it to the c band when we got to castine we had already pre-installed three mooring anchors three morning lines and tied it to each corner of the hull and we had a pre-installed under c cable that brought the power back to shore we hooked that up and we ran that for a year and a half and because it's a one to eight scale it saw very extreme environments in a very short time relative to its size and um and we had over 50 sensors on board to and the purpose of that was to figure out if we can design a hull
that would last 500 years in the gulf of maine and the good news is is uh is is we've proven that we can and um this is an example of one of the first terms we encountered in december 2013 it was called winter storm electra so what you see blowing across here is actually snow these are this is a snowstorm blowing across and you can see the size of the waves and the white caps relative to the size of the hull remember this is a 1 to 8 scale version of the bigger unit relative to the size of the hull these were 60 foot waves relative to the size notice the white gaps and notice that the hull isn't even moving you can't even see it move in a 50-year storm and that was the aha moment that our designs work
our computer models work and because of that the US Department of Energy decided to invest in US $50 million dollars to build the bigger one so we won a national competition to build the bigger one just to give you a sense of what happened during that year and a half deployment of Castine that unit saw 50 to 500 year storms about 40 storms like that and the maximum cell acceleration was less than two-tenth of a g and then the maximum heal angle was seven degrees so the tower moved off vertical only seven degrees in five hundred year storms and what you see in blue and red are our computer models versus the
actual measurements of the motions of the hull we're right essentially we know how to predict the motions of these hulls in these 500-year nor'easters so so the next step now the project is to build a bigger one so we're going to build one unit just one hull but it's not just one hole it's an 11 megawatt unit it'll be the biggest floating turbine in the world and um and the units will have each blade in that unit will be the size of a football field so it's a big unit and that unit would be capable of providing enough electricity for close to five to six thousand main homes main households umaine has over 60 patents to date on this technology and it was designed so we can fabricate
it here in maine our goal is to start construction next year and to have it off mount vegan island to be tested starting in 2023 under 23 beginning at 24.

the good news is is the national renewable energy lab did a study which they published last year and that showed that this technology the humane technology when scaled up to full scale farms when we're cranking these things up we can get down below six cents a kilowatt hour so it's a very competitive energy resource because of all of that uh the we we were joined by two major corporations that are invested in the technology each has invested 50 million dollars committed to invest 50 million dollars
one company is called rwe
and the other one is the mitsubishi
corporation through its
subsidiary in the us called the diamond
generating corporation and diamond
offshore wind
these two companies are are some of the
best in the world in their field
rwe is the second largest offshore wind
developer in the world
they're a german company and both of
them are investing in maine to help us
build this hull
and um notice the hull has three morning
lines i'll describe a bit
how it works we have three mooring lines
one
two and three it floats in the water
just like a boat would float
instead of having one hole or two holes
it has three holes one on each corner
one
two and three under the water the three holes are tied together by rectangular beams the whole hull's made out of concrete you might ask well how can concrete float well it's not concrete that floats this this is essentially a big concrete air can so each one of these floatation columns on each corner are about 120 feet long about 40 feet wide and they're full of air it's basically a big concrete air can and then the center column is also another concrete air can and under the water that tied together with concrete rectangular air cans as well now the hull is very unique and i'll describe it in just a short while its design is unique but the
project
is off monhegan island about two miles
south of monhegan
and that's what the site looks like it's
got 300 feet of water
that's monhegan island you can see in
red mountain island up here where it is
in the state of maine and and the the
area where
the test area we're going to go ahead
and test it out is about two square
miles
the state of maine provided that test
area to the university of maine
as a research site to do this kind of
work back in 2010
through an act by the legislature
the this is what's unique about our
technology is is that we can make it
locally
and it can be built like a bridge like a
cement bridge
if you've seen a segmental concrete bridge being built
uh essentially this is how we're going to build this so rather than try to develop a technology and figure out how to industrialize it later we started with an industrialized concrete construction method for bridges and applied it to a hull so we have an industrialized technology right off the bat so to give more examples here is let us this is on the left hand side is like a three roadways coming together over the water you get one and two and three roadways and they're supported by peers and four piers now in this case the piers are made out of concrete cans that are hollow they're cast near
23:23
the bridge site
23:24
and stacked on top one another with an
23:26
epoxy in between and squeezed together
23:29
each one of these cans could be 30 to 40
23:31
feet in diameter
23:32
and 15 feet high and then you squeeze
23:35
them together vertically with
23:36
with like long bolts they're called
23:38
post-tensioning tendons to make one big
23:40
unit
23:41
and then uh the the superstructure
23:43
of the bridge
23:44
the roadway itself is made with
23:46
rectangular boxes
23:47
that are filled with air as well and
23:50
they're made near the side
23:52
set that's put up there and squeezed
23:54
together
23:56
now if you take that bridge and flip it
23:58
upside down
23:59
you've got our hull so the idea here is
24:02
to turn bridge builders into hull
24:03
builders
24:04
and be able to make it right here in
24:05
maine
24:07
so the only difference is a lot easier
24:09
to build this than to build a bridge
24:10
because you're starting
24:11
on the ground and build it from the
24:13
ground up then put the whole hole in the
24:14
water
24:15
and throw it out to sea this is an
24:17
example of
24:18
of the sarah long bridge that was built
24:21
by chimbro between maine and new
24:22
hampshire
24:24
and this is when it was being built a
24:26
few years ago
24:27
and notice here the concrete boxes these
24:31
cement boxes
24:32
were made right at the site many of them
24:35
half of them were made near the site
24:36
and half of them were brought in and
24:38
they were
brought in on a barge and lifted with a crane and stacked on top of one another like big huge legos and and between each layer between each can there's essentially an epoxy and and then there's steel post-tensioning tendons like big big bolts if you wish they are squeezed vertically to tie the whole thing together that's how strong these are when you make bridges out of them but think about using the same technology to build hulls that's that's that's the invention that umaine has developed now the goal here is to try to make some of these in brewers these these boxes and cans in brewer or make them in searsport and we're also looking
potentially at eastport as one of the
to assemble in searsport the
goal is to assemble the hull and throw
it out to sea
now how do we moor it to the seabed we
can moor it with steel chains or with
synthetic mooring lines
but at the very end there's an anchor
into the seabed
we're likely to be using what we call a
drag anchor this is what it looks like
looks like a big plow essentially
and you tow it along in along the mud
with the tugboat and as you towed along
the mud
it embeds itself into the mud and sets
itself in it could be embedded 40 feet
or so
until you have enough tension on the
tugboat to
to hold up the turbine so you test it
out to the tension that you need
and then you hook it up to the turbine
each turbine will have three mooring lines like that on it
over the last decade the university of maine has been busy uh collecting data on the environment in the test site off monegan island we had bird biologists and fish biologists uh and marine mammal biologists um study who lives under the water above the water we've taken tags and put them on on marine mammals so to see where they move around how they move around uh we've had um the new jersey audubon worked with us and put a radar on on monegan island and scanned the skies for over a year to look for birds and
bats
and identify how they fly and where they
fly we also had
bird biologists go out there and and
count the birds and the types of birds
that would fly over over the test site
so this was the most
studied test sites from the
environmental perspective in the gulf of
maine that we know of
after all this data has been collected
now we're going to take a single hull
put it off monegan island and
see how that impacts its environment
we're going to see how the birds
behavior changes we're going to learn
over five years afterwards how the fish
behavior may change
what the impact might be on the lobster
industry so these are the kinds of
studies we're going to be doing under
that one turbine so we can develop the
scientific and engineering basis for going the next step and to show you the kind of numerical tools we use to design these hulls and how we design these halls. Um we used computer models developed at the university of maine or advanced at the university in maine to figure out how the hull actually moves with the winds and the waves and these numerical tools are visualized right here on the top. On the top you see a 50-year storm 50-year waves 60 feet high coming at the hull and you can see how the hull moves under these waves now this is exaggerated so you can see it doesn't move that much. What you see below that are the stresses as the waves go through it the stresses are color-coded to show us
where the maximum stresses in the hull are to figure out how strong we get we have to make the hull to give you a sense of what it takes to engineer a hull we run over 80,000 simulations like this to represent different wind wave current environments icing environments snow environments and so on and so forth to make sure the hull is designed properly to survive 500 years out in the gulf of maine how do the electric cables come to shore now typically if you have a big farm and hopefully in the 2030s in maine will have those a big farm might have 50 turbines in it about a mile apart what you do is you put them in rows of say 10 turbines and
or so and each row would have each
turbine would have a cable coming out of
it but
each each row would have would have one
collection point
and then each row of 10 turbines then or
each collection point from each row
comes together to a
collection point offshore and you have
one cable coming back to shore now you
try to bury the cable into the c-bound
to the extent that you can now with from
each turbine
the cable comes down through what we
call a j-tube
and it goes and it makes a lazy wave and
back into the seabed
uh it's tied to the seabed with the
tether in an anchor and then we try to
bury it
bury the export cable for the money line
we have about a 24 mile
export cable from the monahan projects
which we plan to bury to the extent that
we can
um
notice what the cables look like there's
a lot of questions that we got asked
why would these cables kill the fish and
would they have emfs on them and so on
and so forth
well the good news is we've been using
these kinds of cables in the gulf of
maine for decades now
give you an example how do we power the
islands off the coast of maine
actually we run cables from the mainland
to the islands many islands to power
them and these are similar to the cables
we'll be using
for example in ielts borough
the iceborough has had a subsea cable
connecting
it to northport since 19 since since
for over 60 years and the cable was replaced in 2015 it's a four inch diameter cable and it's buried about six feet in the mud now our cable will be a bit bigger it'll be six to eight inches in diameter you can see it here on the right hand side and our goal is to also bury it in the mud to the extent that we can as you know in the gulf of maine the seabed has rock outcrops that might prevent us from burying it in certain locations now how do we know how to run the cable and way to run it and how to bury it you do offshore surveys so on the right hand side is our proposed cable route from the monhegan island test site to boothbay harbor we plan to take the
cable to boot bank
and the question is is how can we find mud pockets
to do it now we've done some studies to figure out where we think about the pocket pockets are then we send ships out there uh sites that have that send seismic waves to the seabed and help us figure out where the mud pockets are and on the left hand side is the cable from isboro to northport that's been around for decades our cable on the right-hand side and the cable on the left-hand side are essentially the same they're both going to be buried the same neither neither the left cable nor the rack cable is going to have
have any bigger impact on the fish or the wildlife people fish over that cable right now off Islesboro and have been for decades now how do we know again where if we can bury the cable as i said we did a fishing survey we did a survey uh we ran boats that vessels specialized vessels that send seismic waves and other types of waves to the seabed to figure out what the seabed looks like and we did that last month in april and we're analyzing this data as we speak so real time this is just a snapshot of the data that we've collected to give you a sense of the resolution of the data that what you see in in brown and in yellow and green are outcrops where you have rocks what you see in purple
are essentially deposits of sand and mud and initially we plant we plan to have the survey along the line that's uh dotted and after we've started running we've run the survey we're going to try to move the line to the green location if you wish where there are mud pockets so we can bury the cable six feet and allow most fishing to take place normally there what does that mooring line look like and how big is it and is it going to impact the whales well here's what it looks like actually to scale next to a six-foot person uh there are two types of mooring lines that we're looking at one of them is a steel chain
mooring line and that's one chain in the
link one link in the chain if you wish
and on the left hand side here in the
middle you have an eight inch diameter
synthetic mooring line it's a polyester
type cable or some other synthetic
mooring lines
um notice that these are big big units
so so so these are very big
and they're tensioned to hold up the
hull and therefore they're not going to
move around
you're not going to have a whale or a
marine mammal getting tangled up in that
it's not like a very small
fishing line and so forth so there's a
lot of tension in it it's very big
and experienced has shown us over
decades in the oil and gas industry
who's used these kinds of
mooring systems that the marine mammals
and the whales go around them they don't
run into them we have videos of whales going around these for in the oil and gas industry now this with a long history in the state of maine this has not just happened overnight i've been at it for 12 years and i'm i'm an offshore wind in me but back in 2008 the governor governor baldacci at the time put together an ocean energy task force with some which i served on with angus king and many others it was a bipartisan task force they put a report together that recommended five gigawatts of offshore wind in the gulf of maine to electrify heating and transportation it was not uh it was not easy to explain to people
10 years ago they will have electric cars but we have them today it's easy to explain today that we could have electric cars and they do work.

In 2009, the state of Maine passed a billion unanimously in the legislature imagine demand unanimously with one extension to provide to assign the test site for the university Maine to do research following that in 2010 Maine voters actually voted to provide the university 11 million dollars to get going and design some technologies and do the demonstration projects so we are under a mandate unanimous mandate by the legislature and a vote by the people of Maine to do this so we're doing what the people in Maine have asked us to do for the last 10 years.
and today governor this last couple
years governor
mills have put some ambitious targets to
achieve state carbon neutrality by 2045.
to do that we need offshore wind we also
need other forms of renewable energy to
work together but offshore wind is key
to get there
so what's the state of maine plan the
state of maine is developing an offshore
wind plan right now by working with
constituents across
across the state and all users of the of
the sea
and um and the plan calls for crawl
before you walk walk before you run do
it right
back in 2013 i told you we did a one to
eight scale that was crawling
in 2023 we we hope to put a full scale
11 megawatt unit
that's walking slowly in 2025
the state of maine is proposing a turbine called a research array of up to 12 turbines about a mile apart each to to further scale up the technology you need that you can't go from a single turbine to an industry you gotta have a step in the middle or we can potentially make some major mistakes so the 2025 project the research array actually there's a bill in there today that's being heard by the legislature as we speak today so so if you're interested in this email theeut committee to vote on this on this bill i'm not telling you how to vote i'm just subliminally telling you you might you can't do that and um and then the idea is is is um these turbines this this uh research
array would be over uh between 20 and 30 miles offshore and would be in an area that would minimize impact on the environment and minimize impacts on fishing and so on and so forth and one goal of the research array is to work with fishermen to figure out how to fish inside that farm as well so this is what the research array may look like notice the turbines they're about a mile apart in groups of four and in between them we're going to leave large areas so vessels can easily go through them that's one potential opportunity it'll be 16 square miles you'll have 12 turbines and notice that one of our goals is to be able to see how to fish inside the farm as well
the circles that you see in white are the areas where it would be difficult to fish because of the morning lines and anchors but you can still fish right inside the farm where my cursor is and that's what we're going to be studying is how to do that working with that's part of the research that the research area will be doing the other opportunity i'd like to talk about is the opportunity beyond offshore wind the as we build an industry like that and potentially bring billions of dollars to the state of maine we're also going to impact other industries one industry we're going to impact is our boat building industry there's an opportunity to build fleets of vessels to build these offshore wind farms and
to maintain them
this is a 3d printed boat that we printed in our lab the first of its kind in the world which we won a guinness world record for it was a 25 foot 5 000 pound vessel that we printed in three days but this particular vessel is a potential for us to actually in the future to be potentially printing some of these boats we are actually studying right now the opportunity to print to to to build a 60 to 70 foot uh vessel uh it's it's called the crew transfer vessel to go out to the monhegan project and um and and maintain it and that vessel will be built built in main and we're hoping to 3d print the mold
that we use to fabricate the composite vessel
so to summarize here um for us we've been on a journey over the last 12 years
the next part of that journey is to build a single turbine off monegan island
our goal is to help decarbonize the state of maine and create thousands of clean energy jobs in the state keep our energy dollars in maine and keep our youth in maine at the university of maine advanced structures and composite center we have now close to 20 engineers working only floating offshore wind many of them came back to maine there were mainers that left maine and heard about our
project wanted to come back to maine to be part of this future and helped create this future many of them are in the lab today some of them testified to legislature today about why they came back to maine so we hope to bring a lot more people back to me and young people to build this next generation industry electrify heating and transportation in the states thank you very much for listening i'm happy to take some questions very good thank you dr dogger and we also have as i mentioned earlier we have representative genevieve mcdonald here to answer questions as well if you have uh if you are interested in posing a question please go to the chat function on the bottom of your screen and just click on that type in your
question and hit
enter and we have a few questions now
and
let me get to those uh
question is is there any practical
application
for integrating a submerged turbine suspended below the floating platform for example a two power to have two power generating devices on the same platform
very good question actually thanks for asking that we've looked at that actually we've looked at to see if we can locate wave energy devices and tidal energy devices or current energy devices on this you can but it's not quite clear that it's cost effective i think the more energy generation devices you
have
the more complex the system is the more
you have to
you have to um you have to do but it's
certainly worthwhile studying further
it's on our radar screen thanks for
asking the question
very good um
question uh and you've addressed
this a little bit but could you
elaborate a little bit
more on the uh
the uh concerns of some in the fishing
industry
about uh this project specifically the
one
the researcher ray could you talk about
not only
what those concerns are but also explain
more about
what the university is working on to
help the fishing industry navigate in
and around the research array
sure i'll take a first crack at it
and i'll hand it over to genevieve
because genevieve lives and breathes the fishing industry
so representative genevieve mcdonald and had a great pleasure to work with her
and she's brought a lot of the concerns from the fishing industry to us
so at a high level just to give you a sense remember i said if we if we harness just three percent of the area of the gulf of maine we can heat every home in maine and drive every car three percent and that's three percent within 50 miles of the coast so the question is in a worst case scenario we need three percent i'm not suggesting that we do we have three percent but the worst case scenario we need three percent and the question really is
is which three percent of the area within 50 miles minimizes impacts on the fisheries that's what we're trying to figure out in the long run that's the goal so as you might imagine 97 percent of the gulf remain within 50 miles would be completely open with to the fisheries even if we go ahead and did three percent and so that as you know uh would have a minimal impact on the industry the other thing we're trying to do is figure out how to fish inside one of these farms as well was trying to study that by having the right people in the room by working with the fishing industry and figure out within that three percent if you wish how to go fish inside of it
so the purpose of the research array is to answer those questions actually build an array and work with it with the fishing industry actually work with a to go out there and and figure out how to fish inside the farm figure out what the challenges may or may not be and we're confident that we could find solutions to fishing even within that three percent that this industry can potentially take i'm going to head it back to genevieve thank you doctor oh sorry thank you dr daugher and thank you for having me here today it's a pleasure to see everyone so i'm happy to discuss the concerns of the fishing industry and there are really two primary concerns one is environmental concerns what impact will the research array will wind development in the gulf of maine have on
the marine ecosystem and the other
is displacement fishermen are concerned
about losing fishing bottom this is a
heritage industry and fishermen are
generally resistant to change
so to the environmental impacts um there
is a nepa process there is an
environmental review and assessment that
is part of the permitting process and so
i think a lot of those questions will
get answered
as this process moves along both for
montegan and for the research array
and then to speak to displacement um the
fishing industry is really concerned
about
the development that we've seen in
southern new england and in the
mid-atlantic these are really big
commercial scale leases
and they have displaced fishermen in
those areas and so i would say that the
scale that maine is working at to start with a single turbine and you know test the feasibility how close can fishermen feasibly operate and then expanding that to a 12 turbine research array still taking in those um considerations into conversations into dialogue into stakeholder engagement and really seeing how we can co-exist is the right path forward thank you representative mcdonald thank you for your leadership and legislature on this issue as well thank you i'm going to go back and listen to the rest of that hearing when we uh finish here yeah i need to get back and give my testimony oh right uh i'll run through these other questions than to uh question about the the choice of the
Monhegan site, what led you to choose that site and what role will the Monhegan site play in the development of the research array? Thank you.

Excellent question. The Monhegan site was selected in the state to a process that was put together by the state of Maine. They've looked at over 10 different sites in state waters where we can do research testing. They've talked to fishermen, they've talked to local fishing communities and environmental interests and had dozens of meetings along the coast to figure out where we can do a demonstration project and the state then identified Monhegan.
as an area that they assigned to the university of maine to do this work but it took a long process to figure out where we can do a test that's month the next part of the question is what do we learn from monhegan and then to take to the research array the mohegan is a single project single turbine project and its impact is based on a single turbine we're going to learn a lot about how this unit can be built single turbine can be built we're going to learn its impact on the environment around it we're going to learn how to fish around the single unit but that's not going to tell us how to build an industry how to build the farm and so the research what we learned in monhegan is going to be taking the
research array
and in the research area we'll learn how
to build more than one how to scale up
manufacturing how to industrialize
manufacturing
which sports facilities can we use in
maine what upgrades do we need to have
to our port facilities how do we store
them how do we deploy them
how do we maintain these turbines and
then more
more important than not what is the
impact on the environment and the
fisheries
uh so what we learned in monique and
we're gonna go out and apply on an array
and say okay
we figured out how to fish around one
turbine how do we figure out how to fish
around 12 turbines
okay and and how do we space them
apart and um what kind of mooring lines
do we use
we're looking at both synthetic mooring lines as well as chain mooring mines the synthetics are actually have a smaller footprint on the seabed but could we use those and reduce the impact on the fisheries um so those are some of the things we would be learning and and you know building an industry like this is like running a big marathon and you don't just go out there in the morning and decide to run 26 miles okay and what we're trying to do here is uh crawl before we walk walk before we we run the marathon and and we've been crawling we've been walking slowly uh and the research array is part of walking walking diligently
uh before we go out and build anything
bigger in the gulf of maine so it's the
right approach that the state's taking
we we certainly i applaud the state and
uh for moving in that direction
and being so open and holding all these
meetings to
to locate the research array so does
that answer the question
i believe so another question was asking
about it says why would you
not get the data from this project
before moving on to the research array
of 12
turbines that's essentially going to
happen
if you look at how long it will take to
get to the 12 turbine array
these processes can take five to six
seven or eight years before it finally
comes to future fruition
so essentially we're just at the very
beginning of a long process to get to the research array so if all goes well we should start construction of this first unit next year and we'll learn a lot about what it takes to build it starting next year and the year after we're already learning a lot what it takes to where we can build them and that information is going to be fed into the research array process similarly if this unit gets into the if this unit is in the water at the end of 23 beginning 24 we're going to learn a lot what it takes to take it out there how to fish around it and so on and so forth which will help plan if you wish what we do with the research array so so the timing is actually perfect to get the monhegan project done
and then start planning a you know five to seven or eight year process for the research array today so we're at the very beginning of a long road with the research array very good we have a question that asks uh about uh the any resistance expressed so far by the public for the effect on beach views by placing these uh wind turbines offshore in maine very very good question and um the beauty of of floating offshore wind is that you can you can place them farther out because they float you don't have to have them fixed to the seabot that gives us an opportunity to pick sites that provide a minimized impact on on view shots uh we've done a lot of studies at the university of maine to look at view
sheds from different beach areas as well as from the tops and mountains uh in maine and based on that um we uh the state of maine is going to help to identify where to put these farms to give you a sense if you're about 25 miles offshore uh and you're standing if the farm is 25 miles off shore you're standing on the beach you're not going to see pretty much anything from the beach um the hub of the turbine would be below the horizon and uh and you'll be too far for your eye to even see the blade maybe come come across the horizon on the top uh if you're at 30 miles offshore uh you're basically not going to see even the tips of the blades based of
50:32 course on
50:33 what the size of the of the rotor is so
50:36 the beauty of floating is
50:38 is is that you can put them farther
50:40 further out to sea if you had the queen
50:41 elizabeth
50:42 parked in portland moored in portland
50:44 you're going to see a big queen
50:45 elizabeth as the queen isn't the sales
50:47 sails to the ocean it's eventually going
50:49 to fall off the horizon you're not going
50:50 to see it anymore
50:52 and floating turbines are the same way
50:53 by getting them far far enough apart
50:55 away from us
50:56 we're not going to see them anymore and
50:58 that's an advantage
50:59 compared to what they're doing in new
51:01 jersey and in massachusetts and
51:03 and and so forth thank you that answered
51:06 the question
51:08 i i believe so it did for me uh
another question deals with the commercialization of the patents how will the university and or the state capitalize on the commercialization of the patents in particular and will the patents be licensed to private companies and another part of that question is are your patents completely owned by the university or by some of your partner companies uh yeah the answer is oh we have over 50 uh actually over 60 patents as of today and they're all owned by the university and they will be licensed uh to to developers um and then you may would derive a revenue back from from these developments so and that process has been going on for a long time
jake ward the vice president for economic development and innovation at the university of maine has led this effort and done a tremendous job at putting put laying down if you wish contractual vehicles to allow us to to allow the state of maine and university in maine to benefit from these patents thank you what is the expected life of the rotating parts of the wind turbine considering the long expected life or the expected long life of the float itself how will this design impact the repair and replace or upgrade of the wind turbine itself excellent question typical offshore wind farms in europe that were built 30 years ago they were designed initially for 20 years of life and after which they would basically repower them
um now the our whole we've designed our hull for close to 100 years of life because it's made out of concrete and we've designed it in such a way to do that so the opportunity here every every 20 to 30 years to go back and throw the hull back to shore and put a new turbine onto and back out so so the opportunity here by doing so we reduce the costs for the next generation uh uh deployments and reduce the environmental impact of this technology on the world around it so we're very excited about the opportunity to do it that way and we're the first to actually propose offshore wind hulls of floating hulls that would last a hundred years so that we can repower them every every every 25
years so our great children and grandchildren would be repowering these just like just like the hoover dam the hoover dam was built by humane alumni actually but francis crowe was humane alumni was in charge of the hoover dam and the hoover dam has been around because a big chunk of concrete in the water essentially and the only thing we replace are the moving parts and think of this as a hoover dam as well where we would replace the moving part every 20 to 30 years answer the question yes thank you uh how are the possible assembly sites that you mentioned such as searsport eastport brewer how are they being assessed and what is the timeline for those decisions um we're looking at a lot of different
things one is how to build the first one
then the next question is how do you
build 12 of them and then how do you
build 50 of them
in the future and all those are
different questions the state of maine
has actually hired a private company
moffett and nichols who's whose
expertise is important port facilities
to actually look at that that question
and those this company
has to work with us and others on how to
identify uh port facilities um
the partners we have at the rwe and
and the mitsubishi diamond
corporation are also looking at that for
the single unit for 12 units and in four
more so it's a teamwork effort
uh to figure out what these facilities
do and and the
prime suspects of course are sea
sports um right now and eastport is an
opportunity because of the deep
deep draft at eastport uh and um and
there's
fabrication sites across the state of
maine that could be used to actually
assemble these halls
so um so there's a the process over the
next many years will help identify
and answer fully these questions thank
you
uh question about uh the concrete
sections
and uh could you explain a little bit
more
how you uh can create them in a way that
retains the air
do you add air i mean are they
pressurized could you
explain a little bit more for those of
us who are not uh
engineers okay let's take let's take a
wine barrel
okay or a beer keg uh uh you know and
empty it out
and toss it in the water it's gonna
float right if it's sealed
and think of these floatation columns
that we have are essentially a beer keg
made out of concrete instead
instead of being you know three feet so
and so forth
it's it's 120 feet long and so forth so
basically it's a
it's a skin of concrete that contains
the air in it we don't fill it with air
when you cast the concrete the air just
comes into it and and we see on the top
so in the thickness of the the walls of
the
the concrete sections yeah they're they
vary from
from a minimum of a foot to and they
could beat a foot and a half in some
places
so very good and in some places they reach actually two feet near the bottom and this will probably be our final question because both you and uh representative mcdonald have to get back to the hearing but the question is who is it expected to buy power from the first uh from the monhegan turbine once it's uh once it's ready well the it's going to actually be fed into the cmp grid right now and uh and the goal is to uh to uh have it fed through in the booth bay area so so so basically um people who get their power from cmp would would get the power from that project very good well dr daugher and representative mcdonald thank you both so much for
your presentation today this was wonderful and as i mentioned folks we will be posting this on the university of maine alumni association website but we'll also be sending everybody who registered for today's webinar a link to that website so that you can watch it again so you can share it with others and we do encourage you to pay attention to what’s going on now both in augusta with the hearings on this legislation and on other topics related to the remarkable work being done at the university through dr dugger's center and and among his colleagues so again on behalf of the alumni association we thank you dr daugher and representative mcdonald
and uh for all of you who are able to join us thank you so much for your time take care and enjoy the rest of your week bye bye take care go black bears

The University of Maine in Orono is the flagship campus of the University of Maine System, where efforts toward racial equity are ongoing, as is the commitment to facing a complicated and not always just institutional history. The University recognizes that it is located on Marsh Island in the homeland of the Penobscot nation, where issues of water and its territorial rights, and encroachment upon sacred sites, are ongoing. Penobscot homeland is connected to the other Wabanaki Tribal Nations — the Passamaquoddy, Maliseet, and Micmac — through kinship, alliances, and diplomacy. The university also recognizes that the Penobscot Nation and the other Wabanaki Tribal Nations are distinct, sovereign, legal and political entities with their own powers of self-governance and self-determination.