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BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION

- - - - -x  
IN THE MATTER OF: : Docket Numbers  
HYDROELECTRIC INFRASTRUCTURE : AD06-13-000  
TECHNICAL CONFERENCE :  
- - - - -x

Room 2C  
Federal Energy Regulatory  
Commission  
888 First Street, NE  
Washington, DC  
Tuesday, December 6, 2006

The above-entitled matter came on for technical,  
conference pursuant to notice, at 1:05 p.m.

FACILITATOR: JOHN KATZ, OGC

1 APPEARANCES :

2 COMMISSIONERS PRESENT :

3 CHAIRMAN JOSEPH T. KELLIHER

4 COMMISSIONER SUEDEEN G. KELLY

5 COMMISSIONER MARC SPITZER

6 COMMISSIONER PHILIP MOELLER

7 COMMISSIONER JON WELLINGHOFF

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## P R O C E E D I N G S

(1:05 p.m.)

CHAIRMAN KELLIHER: Good afternoon. Close the door. Welcome to the Commission's Annual Hydropower Conference.

You can tell it's the Annual Hydropower Conference by my tie, frankly. I have my fish tie, which emerges at least once a year in December. It's the hydropower tie.

The conference this year, is different from recent years, as the regular viewers will know. In the past, we've focused on licensing proceedings which have experienced significant delays.

We've examined the cause of those delays, and have concluded that, in most instances, the delays result from the failure of state agencies to issue Clean Water Act permits in a timely manner.

But this conference is very different and is the first Commission conference to examine the new hydroelectric technologies, namely, technologies that utilize ocean waves, tides, currents, and free-flowing rivers.

I want to congratulate OEP for recommending this subject. I think it's very interesting, and you can tell from the Commission attendance -- three of us are here right now -- and I think that at least one more will arrive later

1 on.

2 I want to commend you for identifying the  
3 subject. I think it's a very interesting topic.

4 Over the past year, we've seen increasing  
5 interest in these technologies, as evidenced by numerous  
6 articles in the news media, as well as a surge in  
7 applications for preliminary permits here at the Commission.

8 Last month, we received the very first license  
9 application for a wave energy project off the coast of  
10 Washington State. The Staff has issued 11 preliminary  
11 permits.

12 Three were proposed tidal energy projects in New  
13 York, Washington, and California, and eight are proposed  
14 ocean current energy projects off the coast of Florida.

15 Approximately 40 preliminary permits applications  
16 for ocean projects are pending before the Commission, all of  
17 which have been filed since March of this year.

18 Given this increased activity in non-  
19 conventional hydropower technologies, we're convening this  
20 conference to learn more about these technologies from  
21 representatives of industry, other state and federal  
22 agencies, nongovernmental organizations, and members of the  
23 public.

24 These technologies have significant potential.  
25 Today we expect to hear how these technologies can fit

1 within the national energy infrastructure, in terms of the  
2 amount of potential energy that can be developed, as well as  
3 its reliability, environmental and safety implications, and  
4 commercial viability.

5 In particular, there are three areas that we  
6 would like to examine today: The environmental effects of  
7 developing this new infrastructure; financial issues having  
8 to do with the costs of research, development, and buildout,  
9 as well as the regulatory processes that may affect the  
10 ability of the new industry to succeed.

11 This conference will help the Commission reach a  
12 better understanding of these technologies and enable us to  
13 formulate prudent next-steps in our regulation of this  
14 nascent industry.

15 I look forward to hearing the views of the  
16 panelists.

17 Before we go any further, I want to recognize a  
18 state colleague who is here, Commissioner Baum, from Oregon,  
19 who is in the back. It's like church and he's in the back  
20 of the church right now.

21 (Laughter.)

22 CHAIRMAN KELLIHER: That says nothing about his  
23 interest in this topic. There's a great deal of interest in  
24 the State of Oregon in these technologies, and I just want  
25 to thank him for being with us at the beginning of the

1 conference.

2 I also want to recognize the leadership of  
3 Senators Gordon Smith and Ron Wyden in this area.

4 With that, I'd like to recognize my colleagues  
5 for any comments they might like to make. Commissioner  
6 Moeller?

7 COMMISSIONER MOELLER: Thank you, Mr. Chairman.  
8 It's great to be here today and see an enthusiastic crowd.  
9 Presumably, we have one on the webcast as well.

10 Coming from the Pacific Northwest, I've had a  
11 long history in hydropower issues. You know, hydropower is  
12 the ultimate renewable resource, the way nature's cycle  
13 governs it.

14 Today, we can build on that by the new  
15 technologies that are out there, and learn more about them.

16 I want to thank you and Commissioner Kelly, for  
17 your interest, as well as the Staff for putting this  
18 together.

19 Compared to some of our other subjects, this one  
20 is pretty high on the top of my list for technical  
21 conferences, so, thank you.

22 CHAIRMAN KELLIHER: Commission Kelly?

23 COMMISSIONER KELLY: It's a pleasure to have you  
24 all here today. Thanks to the panelists for giving of your  
25 time and your effort in making these presentations to us.

1                   It's a new area and we have a lot to learn.

2                   CHAIRMAN KELLIHER: Commissioner Spitzer, I  
3 think, will arrive shortly and we'll give him an opportunity  
4 to make a brief comment, but why don't we go ahead now?

5                   I'll recognize John Katz. He'll provide an  
6 overview of the conference and how we're going to work it  
7 today. John?

8                   MR. KATZ (Presiding): Thank you, Mr. Chairman  
9 and Commissioners. We trust that this will be an  
10 informative and interesting afternoon for everybody.

11                   As you can see from the agenda, we're going to  
12 start out with an overall presentation with regard to the  
13 subject matter at hand.

14                   We will then have three separate panels on  
15 environmental issues, financial issues, and regulatory  
16 issues.

17                   It is not our intent to be real strict about it.  
18 One of the panelists asked me if I was going to viciously  
19 cut people off after five minutes or so. I think he was  
20 probably used to my chairing of other panels at the  
21 Commission.

22                   (Laughter.)

23                   MR. KATZ: The Chairman is the only one with the  
24 gavel prerogative, and we don't intend to be strict and  
25 formalistic here. We hope to have as much of an exchange of

1 views and ideas as we can.

2 The way the panels are going to work, is that I  
3 will pose questions to the panelists. They will have the  
4 opportunity to answer them.

5 The Commissioners, of course, will have the  
6 opportunity to jump in and ask any questions they have at  
7 any point. If we reach the end of the discussion of any  
8 given panel and have some extra time, we'll take questions  
9 from the audience, but if we don't have that during the  
10 panel discussion itself, we reserved a specific time at the  
11 end of panel presentations for the audience to do that.

12 I want to make sure everyone knows that the  
13 conference is being transcribed by our Ace Court Reporter.  
14 He has requested that folks who are posing questions, other  
15 than members of the panel or the Commissioners, please be  
16 sure to identify yourself and your organizational  
17 affiliation when you speak, so that he will be able to note  
18 that for the record.

19 For the folks in the audience here, you will need  
20 to contact one of the Staff members who have mikes, so that  
21 everybody can hear you. For the folks on the phone, please,  
22 again, speak up and give your name and organizational  
23 affiliation.

24 We will do our best to remember to seek questions  
25 from the folks in the regional offices, as we go through the

1 presentations.

2 As I said, we're going to start this afternoon  
3 with an overall presentation on the resource technology and  
4 business issues surrounding these new, innovative  
5 hydrotechnologies. It's going to be presented by George  
6 Hagerman, a Senior Research Associate at Virginia Tech's  
7 Advanced Research Institute in Northern Virginia.

8 Mr. Hagerman researches marine renewable energy  
9 resources, including offshore winds, waves, and tidal  
10 currents for both utility-scale electric power generation  
11 and small-scale energy harvesting from marine and coastal  
12 sensor networks.

13 He has performed ocean wave energy resource and  
14 site characterization for potential demonstration projects  
15 in seven states for the Electric Power Research Institute,  
16 known generally as EPRI.

17 Mr. Hagerman also does research on the benefits  
18 of developing surface coal-mined lands into wind energy  
19 projects.

20 Mr. Hagerman, with that, if you'd go to the  
21 podium and give us your presentation.

22 MR. HAGERMAN: Thank you very much. It's really  
23 an honor to be here. I hope I can provide some information  
24 that's useful to everyone in helping to inform these  
25 proceedings.

1                   What I'm going to do here, is get myself oriented  
2 as the first thing to do. What I'm going to do, is to  
3 really talk about the resource and the technology. At the  
4 end, I'll kind of pull it into how does this drive, how does  
5 our characterization of resources and technologies drive  
6 some business questions, in particular, the business of  
7 developing a project using a specific technology at a  
8 specific site, with a specific resource.

9                   As to the business issues, you will hear from  
10 other panelists who are in this business, and they can  
11 certainly speak to it much better than I can.

12                   (Slide.)

13                   MR. HAGERMAN: We're talking really about two  
14 basic forms of energy: I'll start with currents. They're  
15 the ones probably that most people are familiar with,  
16 anyway. Those of us who live in the tidal part of the  
17 Potomac, we see currents, really by the activating force  
18 here, a sort of distinction from waves, is that the flow is  
19 for at least a few hours, if not always, depending on how  
20 far inland you are and how much you're affected by tides.

21                   It's one direction for a long period of time, so  
22 you have tidal variance, river variance, and ocean variance.  
23 I'll go into all three of those, and then I'll talk about  
24 how the conversion technology that has emerged to the point,  
25 that it seems to be converging on some kind of turbine --

1 vertical axis, horizontal axis, ducted, un-ducted, et  
2 cetera, but some kind of underwater turbine.

3 When you come to wave energy, you've got a very  
4 different challenge on the time scale. The waves reverse  
5 the activating force. The pull energy out, reversing  
6 direction every five to 20 seconds.

7 It's a whole different animal, and, as a result,  
8 you have a wide variety of different kinds of wave energy  
9 devices.

10 I can only give a quick overview of how at least  
11 we tend to classify them nowadays. There are lots of  
12 different ways to classify them, and I'm not going to get  
13 into a debate about that, but it's very diverse.

14 The main thing is that technology, in some ways,  
15 has not yet converged. Maybe it never will.

16 There are lots of different ways to get energy  
17 out of a wave.

18 (Slide.)

19 MR. HAGERMAN: Big picture is, why should you  
20 care? Why should Congress care? Why should the Department  
21 of Energy care? Why should FERC care?

22 If you look at the total conventional  
23 hydrogeneration in 2004 -- this is all from the Energy  
24 Information Administration -- you have 260 terawatt hours  
25 per year, roughly, to the nearest tenth.

1           The wave energy potential alone, if we utilized  
2           15 percent of the resource, would be comparable to all the  
3           hydro that's built out today, in terms of annual energy  
4           production, so it's a significant resource.

5           If you add to that, the currents, which we really  
6           are now just beginning to map -- there was a 20-year old  
7           study on rivers that estimated 110 terawatt hours a year.  
8           Those numbers need to be updated and EPRI is proposing to do  
9           that, and we still have not fully mapped the tidal stream  
10          resource.

11          We know a little bit more about the ocean  
12          currents, and I'll get to that later, but, certainly, at  
13          least 110 terawatt hours a year, if not more.

14          There's a credible potential, I think, that we  
15          really owe EPRI a debt of gratitude for, for having this  
16          multi-collaborative project that fully documents this, that  
17          it can meet nearly ten percent of national demand. That's a  
18          significant resource.

19          (Slide.)

20          MR. HAGERMAN: There are many advantages. I  
21          would say that, given some of our experience in Virginia,  
22          certainly, with siting of onshore wind and the experience in  
23          Massachusetts, siting offshore wind close the shoreline, you  
24          don't have a lot of these visual impact issues.

25          Tidal turbines are submerged; wave energy devices

1 have a very low freeboard, when compared to an offshore wind  
2 turbine. They are submerged and barely visible.

3 There's also a huge opportunity in maritime  
4 communities where fisheries are declining, commercial  
5 shipbuilding is declining, and there's a chance to create  
6 new and sustainable job opportunities there.

7 It's all over the press and in the pundits about  
8 foreign fuel supplies, and certainly it would reduce our  
9 risk and the price volatility. These are capital-intensive  
10 no-fuel costs, so you lock in an interest rate on your  
11 project and then you're set. You know what your cost of  
12 energy is going to be for the duration of the project, which  
13 is decades long.

14 (Slide.)

15 MR. HAGERMAN: Now we're going to talk about the  
16 different resources.

17 Tidal currents: The unique and true of this  
18 resource, unlike any of the other resources we'll talk about  
19 today is that it is totally deterministic. It is totally  
20 determined by the position of the sun, the moon, and the  
21 earth, which we can predict with great astronomical  
22 accuracy, so you can make precise forecasts.

23 I can tell you now, when the lowest and longest  
24 periods of slack water will be at the East River site. I  
25 can tell you what it will be five years from now, ten years

1 from now, 20 years from now.

2 It makes planning and maintenance much easier.  
3 It makes planning of dispatch with other utility sources,  
4 much easier, so that's a unique attribute of that resource.

5 We have not mapped the tidal sites. EPRI looked  
6 at five sites. It was by no means a comprehensive mapping  
7 exercise and there are many more sites to be mapped,  
8 particularly in Maine, Alaska, New York, and other sites in  
9 the San Francisco Bay and Puget Sound estuary areas.

10 These are all underwater turbines, as I've said,  
11 and there seems to be less diversity in technical approaches  
12 than we see with wave devices.

13 (Slide.)

14 MR. HAGERMAN: These are just some of the main  
15 drivers of this precision. It's the moon, it's the moon,  
16 it's the closet orbital body.

17 It provides the strongest gravitational effect  
18 and what happens is -- Roger Bedard always says -- the EPRI  
19 Team Energy Leader -- if he was sitting on the moon and  
20 looking at the Golden Gate, he wouldn't see anything  
21 flowing; he would see the earth rotating through this bulge  
22 that the moon is pulling out.

23 That is, in a nutshell, how the tides work.  
24 There are obviously many, many complications.

25 Then you have the solar effect, as well. Solar

1 is a much bigger body, but much further away, so the solar  
2 tidal bulge is about 50 percent of the lunar tidal bulge,  
3 but it's significant enough that you have neap tides when  
4 you have quarter moons, and you have spring tides in the  
5 Fall.

6 We just had a full moon yesterday. I don't think  
7 it's an accident that they could float the carrier Essex up  
8 out of the Hudson mud when they had the highest tide of the  
9 month. It was all due to planning that you can do because  
10 of the astronomy.

11 (Slide.)

12 MR. HAGERMAN: Tidal power densities are highly  
13 localized. It's unlike wave energy; it's very broadly  
14 distributed. You can go a football field in one direction  
15 or another in a particular tidal channel, and your power  
16 density will drop by a factor of two or more.

17 This is sort of a numerical model snapshot of  
18 Western Passage, which is one of the main entrances to  
19 Passamaquoddy Bay, which many of you have heard about. So  
20 it's a very, very localized resource, and a lot of site-  
21 specific analysis and physical data validation has to be  
22 done to develop it.

23 (Slide.)

24 MR. HAGERMAN: There's no significant seasonal  
25 trend. These numbers -- the highest number there, in

1 February, is about plus-five, or 4.5 percent. The lowest  
2 number in November is about minus-six percent.

3 That's not really a seasonal trend. That whole  
4 pattern will shift forward by 48 days each year. This just  
5 happens to be a particular year. There's really no seasonal  
6 trend to tidal power.

7 That's even more true when you look at the  
8 produced output.

9 (Slide.)

10 MR. HAGERMAN: These are the five sites. I can  
11 send PDFs -- there are PDFs available on the website. Don't  
12 belabor these numbers, but these are five sites that EPRI  
13 sort of characterized.

14 They ranged in power density, anywhere from about  
15 a kilowatt per square meter -- when I say a kilowatt per  
16 square meter, if you've got a turbine that's sticking in the  
17 flow, you'll get a circumscribed circle. That's the area on  
18 which the flow is impinging.

19 That's when the kilowatts are being received by  
20 that square meter of load or swept area. It's very  
21 analogous to the wind turbines, but wind turbines are an  
22 order of magnitude less, on the order of 400, 500, or 600  
23 watts a square meter.

24 Here, we're talking about from one to three or  
25 four kilowatts per square meter. It's a much denser energy

1 resource.

2 (Slide.)

3 MR. HAGERMAN: We want the technology -- when  
4 EPRI started its study, we looked at a total of eight  
5 devices. Three were selected by the advisory groups in each  
6 state or province, for further characterization.

7 There will be a web link at the end of this  
8 presentation, where you can download all the reports and  
9 know everything you want to know, that we learned about  
10 these devices, but I'm just going to characterize three of  
11 them, the ones that were selected and that we studied in  
12 more detail.

13 (Slide.)

14 MR. HAGERMAN: There are two that were developed  
15 in the UK and one in the U.S. This is Lunar Energy's. They  
16 have a ducted turbine, a very large, massive structure on a  
17 gravity base.

18 To service it, they have this sort of cassette  
19 that you see on the on the lower left, which is raised and  
20 lowered in terms of servicing the actual unit.

21 It's not a gear electric drive like the other two  
22 turbines we'll see; it's a hydraulic transmission system.

23 The interesting thing here is that they are going  
24 to go directly from the wave tank -- I'm sorry, the towing  
25 tank test that you're seeing in the upper left photos, and

1 they'll go from that to a one-megawatt prototype.

2 That's quite a leap. That's not usual for these  
3 kinds of devices.

4 (Slide.)

5 MR. HAGERMAN: More usual, we'll see in the wave  
6 energy, and I'll talk about that, but here, this is the  
7 Marine Current Turbine, another UK-based company. They have  
8 a 300-kilowatt prototype since 2003, so in almost three and  
9 a half years, now, they have had one in the Bristol Channel.

10 This is a variable-pitch blade device. It  
11 doesn't swivel in the flow. When the ebb and flow changes,  
12 it reverses the blade pitch by 180 degrees.

13 (Slide.)

14 MR. HAGERMAN: Here is the U.S. Developer. This  
15 is Verdant Power. This 200-kilowatt array is being  
16 installed now in the East River. It's a downstream rotor.  
17 Wind turbines are upwind rotors, but here, the flow hits the  
18 nacelle first, it hits the turbine blades, and, I guess if  
19 you go to the Verdant website, you can see more, as you can  
20 on the Marine Current Turbine's website, more about the  
21 progression from laboratory models to tow-tank models, to  
22 small natural models, then to the larger natural models.  
23 That's the usual progression.

24 (Slide.)

25 MR. HAGERMAN: As to the river current energy,

1 let's think about a river that's away. Let's go upstream of  
2 the Key Bridge. Let's go away from tidal influence.

3 It's a totally stochastic resource, meaning it's  
4 based on percent probability. We say there's a 70 or 90  
5 percent chance of rain. Rainfall this spring will be x-  
6 percent. It's not deterministic like tides. It can't be  
7 predicted with precision. It's all probabilities, and, of  
8 course, it's governed by precipitation like the conventional  
9 hydro.

10 There's a 20-year old study out there by New York  
11 University that estimates 110 terawatt hours per year as  
12 production potential. EPRI is now proposing to update these  
13 numbers and hopefully develop another collaborative project  
14 that will really flesh out some of these numbers and  
15 understand what the cost of production is.

16 Again, underwater turbines and many of the tidal  
17 turbines that you've just seen, have been tested in rivers  
18 for short periods of time, but there is no, that I'm aware  
19 of, utility-scale underwater turbine in a non-tidal river.  
20 That does not exist today.

21 I am happy to learn about it, if it does. I  
22 don't know everything, that's for sure.

23 There are some challenges here. Unlike tidal,  
24 there's no predictable slack water. You could be dry  
25 season, the river is going to flow more slowly, but, again,

1 it's not precisely predictable.

2 Typically, there will be higher suspended  
3 sediment loads, greater probability of driftwood and ice,  
4 because these are fresh water, and a lot of them originate  
5 in ice areas.

6 (Slide.)

7 MR. HAGERMAN: I'm going right on to ocean  
8 current energy. This is the Gulf Stream.

9 The U.S. has only one resource in the Florida  
10 Straits, but it's also stochastic. It's governed by ocean  
11 basin-scale climate changes that we don't fully understand,  
12 but there is some variability. It's not a steady resource  
13 that's always the same.

14 At ten to 15-percent utilization, based on DOE  
15 studies and the Coriolis Project in 1980, there's about  
16 three to five terawatt hours per year, if you can extract  
17 ten to 15 percent.

18 But the major challenge here is that one of the  
19 potential climate impacts -- we're paying a whole lot more  
20 attention to the climate than we did 20 years ago,  
21 particularly abrupt climate changes associated with slowdown  
22 in the Gulf Stream.

23 This is going to be a constraint on us; very much  
24 deeper water than tidal or river; much longer transmission  
25 distances than tidal or river.

1 (Slide.)

2 MR. HAGERMAN: These are just a couple slides  
3 from a 1980s report on the Coriolis Project. You see that  
4 power densities are from one to two kilowatts per square  
5 meter, sort of similar to what you see in tidal streams.

6 It's typically located tens of kilometers  
7 offshore in very deep water, but it's very close to a load  
8 center, Miami, the narrowest transect there, and, again,  
9 there will be constraints, probably based on climate change  
10 concerns.

11 (Slide.)

12 MR. HAGERMAN: Now we're going to move on to  
13 ocean wave energy. Again, this is a stochastic resource,  
14 governed this time by winds and offshore storms.

15 These can be modeled. And the Navy and NOAA has  
16 a prediction model, so you can say, well, tomorrow, it's  
17 probably going to be -- we're going to have a wave height  
18 here of that, or we're going to have a dominant wave period  
19 of the other, but it's all probabilistic.

20 We certainly have seen, with hurricane intensity  
21 forecasts, that they can change unexpectedly and quickly,  
22 especially in terms of survival statistic, but we can  
23 predict fairly well, with data that's out there, what the  
24 average resource is. I'll quote some numbers in a second.

25 Production potential based on the EPRI studies:

1       Again we're assuming that we can extract no more than 15  
2       percent of the resource, which is 250 to 260 terawatt hours  
3       a year. That 15 percent is really no better than an  
4       educated guess.

5                 That will be one of my followup points. We  
6       really don't know how much of these resources we can extract  
7       before we start to do the kind of environmental impact that  
8       we want to avoid.

9                 You've got terminators, attenuators, and point  
10       absorbers. We'll talk about what they are.

11                Here, the conversion technology cannot converge.  
12       On the single best technical approach, there may not be such  
13       a thing. This is such a new kind of way of harvesting  
14       energy, that that may not happen, or maybe there may be  
15       three or four best-practice technical solutions.

16                (Slide.)

17                MR. HAGERMAN: Waves are governed by wind over  
18       water. It's not just the speed of the wind, but over what  
19       distance it blows and how long it blows, and then waves that  
20       actually leave the storm area are called swells.

21                You can have tropical storms or hurricanes re-  
22       curving to the northeast between Bermuda and the Eastern  
23       Seaboard, and you get some beautiful surfing waves at  
24       Virginia Beach, but the local winds will be dead. So you've  
25       got this swell component over typically a longer period than

1 the short-period wind-driven waves when the fronts pass  
2 through.

3 (Slide.)

4 MR. HAGERMAN: This is a study that we did for  
5 PG&E in Northern and Central California. In water depths  
6 deeper than 50 meters, it's a very broad distribution.

7 All those circles and triangles are NOAA data  
8 buoys that go anywhere from the Oregon state line, down to  
9 Point Concepcion.

10 They are looking at 25 kilowatts per meter, kind  
11 of a jump in power density, compared to tidal, when it was  
12 on the order of kilowatts per square meter. Now we're  
13 talking about flux a meter's width of a buoy or raft or  
14 something that's out there in the wave field.

15 The wave crests, we have typically 25, 30, 35  
16 kilowatts per meter in the Pacific Northwest. Nearer shore,  
17 though, it's very valuable. It's governed by coastal  
18 features, refraction and shoaling.

19 When we talk about wave energy in the EPRI  
20 project, we're talking 40 or 50 meters deep, and some of the  
21 things we're talking about, really wouldn't apply in shallow  
22 water.

23 (Slide.)

24 MR. HAGERMAN: Unlike tidal, it's not only  
25 stochastic, but there is a substantial seasonal variability.

1 On the West Coast, it can go anywhere from five to ten  
2 kilowatts in the summer; 40-45 kilowatts in the winter.

3 If you have a wave energy device, you've got have  
4 a way to shed that excess power. You're in there, you're in  
5 the wave, and you've got to be able to deal with that.

6 On the East Coast, again, there's a high seasonal  
7 variability, five or less kilowatts per meter, and off the  
8 East Coast of Cape Cod, up to 25, 30, even 40. I'd say,  
9 from my experience of looking at New England wave data, 20,  
10 25, 30, is more typical. I think that is a bit of an  
11 anomaly for this particular year.

12 In Hawaii, you find much more even wave energy,  
13 and that's why OPT is there. It's a much better wave  
14 climate to work in, because you don't have -- it's just  
15 milder; it doesn't drop as much in the summer and doesn't go  
16 up as much in the winter, because it's really far removed  
17 from the storm centers.

18 (Slide.)

19 MR. HAGERMAN: This is our best guess, based on  
20 what we know from when we look at data buoys and look at the  
21 length of EE&V boundaries available on the Minerals  
22 Management Service website.

23 This is where the resource is distributed. Half  
24 the resource is in the Gulf of Alaska, all right? Then  
25 you've got lesser resource areas, but still very

1 significant, in Washington, Oregon, and Central and Northern  
2 California, New England and Mid-Atlantic, the Hawaiian  
3 Archipelago, so, this where the wave energy is.

4 This is a little more backup to the number I  
5 presented earlier. I extracted 15 percent of the flux in  
6 this region, where the annual average is greater than ten  
7 kilowatts per meter.

8 You could do a yield, basically, of the same  
9 amount of energy that all conventional hydro yields today.

10 This doesn't even begin to give you an  
11 appreciation of how many other kinds of devices there are.  
12 Here are four leading examples in terms of engineering  
13 maturity. There's the fixed oscillating water column, where  
14 you've got a receptive wall, and a terminator means -- and  
15 then you've got a floating over-topping terminator, the Wave  
16 Dragon.

17 If you Google on these, you can find out much  
18 more about any one of these. I think I spelled everything  
19 properly, so a Google search will yield you much more than  
20 you have here, but you can see that the feature of the  
21 terminators is that any energy that they don't absorb, is  
22 going to be reflected, large mooring or foundation forces  
23 and a distinct low energy shadow behind the device.

24 So, anyway, that's something to think of in terms  
25 of environmental impact, the spacing of different devices

1 within an array, et cetera, et cetera.

2 Attenuators: The Pelamis is designed to absorb  
3 energy as a wave passes along inside it. Wave energy can  
4 travel laterally along the wave crest.

5 If you fly into Boston or other harbors, you see  
6 that the breakwater and behind it, where there should be a  
7 flat pond, there's actually what's called a diffraction wave  
8 pattern that's propagating into that column of water.

9 That's the lateral transfer of wave energy.  
10 That's like an attenuator, like the Pelamis, or a heating  
11 buoy like Aquabuoy, Aqua Energy's point absorber, and also  
12 the power buoy that OPT has. Those can also absorb more  
13 energy than is incident on their physical section, if  
14 they're properly resonant, just like a radio circuit can be  
15 tuned to electromagnetic waves and absorb more energy than  
16 is incident on the antenna.

17 The same thing happens. It's called antenna  
18 focusing with the attenuator and point absorber devices.  
19 They can absorb more energy than is incident on their  
20 physical cross sections that they present to the wave crest.

21 (Slide.)

22 MR. HAGERMAN: Because of the building of the  
23 full-scale prototype, we had good wave numbers and cost  
24 numbers for many, many different substances. The EPRI team  
25 selected the Pelamis for its design, cost, and performance

1 studies.

2 I would encourage you to go to Ocean Power  
3 Delivery's website, OPD. Go to that website and you can see  
4 the many, many different steps. There's wave tank testing  
5 at different scales, wave tank testing for survival in  
6 mooring load, versus power takeoff.

7 There's a small lake scale model, then there's a  
8 full scale bench test of a power module, all these things.  
9 This is really what it takes to get a device that's going to  
10 survive for ten, 20, 30, 40 years out in the ocean.

11 We thought we had some confidence in the numbers  
12 we developed, and this is basically a floating sea snake.  
13 Pelamis is a genus name for a sea snake. There are joints  
14 and there's a power takeoff by hydraulic cylinders between  
15 the joints as this jointed snake tries to follow the  
16 contours of the waves.

17 (Slide.)

18 MR. HAGERMAN: Where are we, if we look now?  
19 We've finished this quick and kind of high-level overview  
20 and where are we?

21 There are only a few long-term, greater than one  
22 year duration prototypes in natural waters. Typically, the  
23 long-term units are big; they're a hundred kilowatts or  
24 megawatts in size and there are probably a few of those.

25 I don't want to give specific numbers and names.

1 Let's settle for a few, a half dozen at the most, short-term  
2 tests, days to months.

3 In natural waters, maybe a smaller unit of ten  
4 kilowatts to a hundred kilowatts, maybe a few dozen, a half  
5 dozen to a few dozen, and where you've got tow or wave tank  
6 physical models to 1/50th to 1/5th of scale, there are maybe  
7 hundred of those.

8 For a technology to progress, this period is  
9 typically five to ten years, in my experience in looking at  
10 a lot of different wave energies and four or five turbine  
11 developers.

12 This is what it takes. There are thousands of  
13 patents and concepts. For them to enter this pyramid and  
14 rise to the top, it's a five to ten years. I just don't see  
15 it being much faster than that.

16 I can certainly see it being a lot slower than  
17 that, no question about it, and it has been.

18 (Slide.)

19 MR. HAGERMAN: Key points and concerns: We  
20 understand the basic oceanography and hydrology. There are  
21 lots of good models and data out there, but the extractable  
22 resource, the percent that we can utilize, is largely  
23 unknown.

24 There still needs to really be research.  
25 Technology is still evolving. Even devices that progress to

1 near the top of the pyramid, are redesigning their  
2 foundation systems, their power takeoff mechanisms, as a  
3 result of what they have learned in these natural waters  
4 tests.

5 So it's still rapidly evolving. It's not like  
6 conventional hydro where you know exactly what a penstock  
7 and this type of turbine is. That's not known about these.

8 It leads me to the concern of, if you grant  
9 exclusive site access for process developers who are using  
10 immature technologies, they can iterate for years before  
11 that site actually yields commercial power for the benefit  
12 of the country, as well as the economic benefit of job  
13 creation of a full commercial-scale project.

14 These are just my suggestions. Could there be  
15 some kind of merit-based competition in the study phase, as  
16 a condition for an exclusive license? This is not your  
17 mother's and fathers' conventional hydro; this is a new  
18 breed.

19 Then I would also say that the environmental  
20 effects, this really feed back to how can we extract. It's  
21 really uncertain and probably due to the lack of longer-term  
22 technology experience in natural waters.

23 Maybe it can be improved by monitoring of  
24 commercial sized units, but maybe in a small pilot array,  
25 which you monitor very rigorously for a few years to see,

1 and then you start to build it out so that you don't all of  
2 a sudden encumber the site with an environmental impact  
3 that's not acceptable.

4 That is the end. This is, by the way, the coast  
5 of Oregon. This is the Umpquah River entrance. Reedport's  
6 around the bend. It just sort of shows -- you've got tidal  
7 currents at the entrance rivers, you've got waves offshore.  
8 It's kind of emblematic of all the kinds of both of these  
9 technologies.

10 I highly recommend you go to that website and  
11 download the many reports, which are very transparent, very  
12 well documented. If you have questions, please e-mail me.  
13 Thank you.

14 (Applause.)

15 MR. KATZ: Thank you. That was very informative.  
16 Mr. Chairman and Commissioners, do you have any questions?

17 CHAIRMAN KELLIHER: Phil?

18 COMMISSIONER MOELLER: Thank you for a great  
19 presentation. As a legislative staffer in Olympia,  
20 Washington in the late '80s, I was intrigued looking through  
21 the statutes to references to siting floating power plants  
22 in the early '80s.

23 There was obviously a time when certain of these  
24 subjects were discussed in seriousness of getting siting  
25 regulations lined up. Give us a little sense from your

1 perspective, of the history.

2 MR. HAGERMAN: DOE had an ocean energy program.  
3 It started out at NSF and it was from about 1975 to 1976,  
4 when we started seeing O-tech conferences. Then it kind of  
5 went to the mid-'80s where about \$250 million was spent over  
6 a roughly ten-year period on ocean thermal energy  
7 conversion, which harnessed the differences between tropical  
8 surface waters and deep waters in the tropical oceans.

9 There was also, in parallel, a much smaller  
10 amount, more like a few million dollars spent on wave energy  
11 devices, outfitting a water column turbine in the Sea of  
12 Japan. There was a tandem wave flap energy converter tested  
13 in Lake Michigan.

14 There were some resource assessments. That may  
15 be where some of that came from. I know there was a guy at  
16 MIT looking at some of the Navy's predictive wave models,  
17 which are much better now, and I know that in Astoria,  
18 Oregon, there was a location that was kind of a case study.

19 But there was no systematic -- the mapping never  
20 really took place of the wave resource. There was nothing  
21 on tidal stream.

22 The Bureau of Standards did a little bit on low  
23 head conventional dam hydro, hydropneumatic technology.  
24 That's not what we're talking about today.

25 It was dam-based, very clever, but not what we're

1 talking about today. So, really, river currents -- there  
2 was a New York University study. I don't even know who  
3 funded it. Maybe some in the audience can tell me. I don't  
4 know how that originated.

5 Really in most of these, the lion's share was on  
6 ocean thermal energy conversion, and a lot was learned  
7 about, particularly, heat transfer, that might become useful  
8 to the country, if we start to milk as much electricity as  
9 we can out of every thermal Btu we generate, but that's a  
10 whole different topic.

11 COMMISSIONER MOELLER: Thank you.

12 COMMISSIONER KELLY: Mr. Hagerman, why is it that  
13 interest in preliminary licenses has blossomed at FERC right  
14 now?

15 MR. HAGERMAN: Well, I'll probably get into  
16 trouble for this.

17 (Laughter.)

18 MR. HAGERMAN: This is how it looked to me, okay?  
19 Roger and I, Roger Bedard and I, after we had this big EPRI  
20 review meeting in May, early May it was, we received our  
21 tidal stream results.

22 It was a two-day affair in Portland. As we  
23 started to travel up the coast, we had a town hall meeting  
24 in Eastport, Maine. We also had to deal with our Provincial  
25 partners in the Atlantic Maritime Provinces.

1                   We started hearing people say, hey, there's a  
2                   permit application for this; did you know about the project;  
3                   have you heard about Passamaquoddy? And I'm going, whoa,  
4                   whoa, I mean, I don't want to give EPRI too much credit, but  
5                   I really do think that people who are kind of, I guess,  
6                   monitoring Roger, will send -- anybody who gives him an e-  
7                   mail, he'll send out reports. It's great. It's a really  
8                   transparent process and I applaud him for that.

9                   I think some people were looking at that and they  
10                  thought, oh, wow, this is something maybe we can get in  
11                  there and lock up some sites. I don't really know.

12                  I just know that I'm going to go back to that I  
13                  really think it would be prudent to just sort of say, you  
14                  know, are we doing what's best for the public good and  
15                  what's best for economic development that would come from  
16                  developing these commercial sites?

17                  But it did seem to me like the wave is a  
18                  different story. I'm talking about the tidal stream, but  
19                  that's where your blossom occurred.

20                  These wave projects have kind of been out there  
21                  and moving along, and all the technology developers have  
22                  been around before EPRI got involved.

23                  Waves is different. You guys were out there and  
24                  in the water and doing stuff, long before the EPRI thing  
25                  hit. So, really, the blossoming issue, as you said, was

1 really in the tidal stream, and even a couple of  
2 conventional tidal, at least one conventional. I don't know  
3 where that came from, but otherwise, they're mostly tidal  
4 current, and many of them cite the EPRI study. That's kind  
5 of my clue as to, well, the EPRI study says -- I am going to  
6 -- just bear with me a second.

7 If I may I know I'm getting close. Yell at me if  
8 I'm really -- if you really want to cut me off, but I think  
9 this is important for people to bear in mind.

10 (Slide.)

11 MR. HAGERMAN: This is really complicated and you  
12 can look at it when you've got time, but this shows --

13 (Slide.)

14 MR. HAGERMAN: This is something Tom selected for  
15 wave energy, but I've kind of elaborated on this. In any  
16 technology, you start to fill in all your cost details.  
17 What's the resource? Oh, man, we've got this data buoy and  
18 that's really different from what we guessed from the  
19 weather charts, et cetera, et cetera, et cetera, and you  
20 start to learn more.

21 You go, oh, man, it's way too expensive. You  
22 redesign. It's a cycle. The clue is when you see a  
23 technology constantly changes from a heating, up and down,  
24 to a terminator, to an attenuator. It's like somebody's  
25 really trying to make this thing come down.

1                   Then, eventually you get to a point where you  
2 think that either with production learning, or you're at the  
3 market value of energy. Let me just now -- this is really  
4 the take-home message.

5                   (Slide.)

6                   MR. HAGERMAN: The EPRI studies were really right  
7 along in this area, we think. We think that our snapshot,  
8 which is fully documented on the ERPI website, shows that  
9 the technologies that we took in that top of the pyramid --  
10 we took the Pelamis and we took the wind turbines and  
11 applied them to specific sites.

12                   We got some well documented cost of energy  
13 numbers at particular sites for particular devices. These  
14 results cannot be generalized to other sites and  
15 technologies, so when you see --

16                   COMMISSIONER KELLY: Mr. Hagerman, for those who  
17 will be reading this and looking at it, can you tell us what  
18 you're pointing to?

19                   MR. HAGERMAN: Yes. So, okay, let me make sure I  
20 address what your concern is. So, when EPRI did a study,  
21 the idea was to do a point design, because you can't be  
22 general; you've got to say what is the cost of a wave energy  
23 device that seems to have some engineering maturity to it,  
24 and we have really good faith that it covers in detail,  
25 their costs and their resource.

1           We, the EPRI team, are going to do an independent  
2 assessment of what the cost of energy would be and how it  
3 would compare to the market value of energy at that  
4 location. So, they were point designs.

5           We estimated. We chose technologies that were in  
6 the top few of that pyramid, that had long-term ocean tests  
7 with large-scale units. We chose those technologies and  
8 came up with a cost of energy at a particular site.

9           One of the things I just really want to caution  
10 the Commissioners about, when you read or anyone on the  
11 Staff reads, the EPRI result cannot be generalized to other  
12 sites and technologies.

13           I have seen claims that, well, EPRI said it's  
14 economical, so we know we have an economical project at this  
15 site, when they're using a completely different technology  
16 and a completely different site.

17           Does that kind of answer your question? Have I  
18 given enough clarity for people who only have reading  
19 access?

20           COMMISSIONER KELLY: I think so, thanks.

21           MR. KATZ: George, thank you very much. We  
22 appreciate your presentation.

23           Folks, if you have questions for George, he will  
24 be available later. Thank you again.

25           Let's turn immediately to our environmental

1 issues panel. Obviously, with any new technology and even  
2 mature technologies, environmental issues are a major  
3 concern. We have assembled a panel of experts who can give  
4 us some enlightenment on this subject.

5 Our first panelist, Jim Gibson, is a Senior  
6 Regulatory Specialist and Manager of Devine, Tarbell &  
7 Associates, Syracuse, New York Office.

8 Jim has served as the Project Manager working  
9 with Verdant Power in the Roosevelt Island Tidal Energy  
10 Project in New York City for over three years.

11 He's also worked on a number of proposed tidal  
12 and wave energy projects and initiatives throughout the  
13 country, as well as the relicensing of traditional hydro  
14 projects.

15 He graduated from Wabash College, where he  
16 majored in Biology, and received a Master's of Science in  
17 Environmental Science and Master's of Public Affairs from  
18 Indiana University.

19 Our second panelist is Dr. Glenn Cada, a  
20 Fisheries Biologist at the U.S. Department of Energy's Oak  
21 Ridge National Laboratory. He has carried out research and  
22 impact assessments on the effect of energy development on  
23 aquatic resources for over 30 years.

24 Glenn has worked for the Department of Energy's  
25 Hydropower Program since the mid-1980s, specializing in fish

1 passage issues. Since 1994, he has been involved in the  
2 development and testing of advanced fish-friendly  
3 hydroelectric turbines.

4 John Novak is Executive Director of Federal and  
5 Industry Activities, Environmental and Generation Sectors at  
6 EPRI. He has over 30 years of experience in the environment  
7 and energy field, including 25 years of experience in  
8 addressing numerous environmental and energy matter for the  
9 electric power industry.

10 Before joining EPRI in 2001, he was Director of  
11 Environmental Activities at the Edison Electric Institute.

12 Mr. Novak holds a Bachelor's Degree in Chemical  
13 Engineering and a Master's Degree in Environmental  
14 Engineering, both from Manhattan College.

15 We did have a fourth panelist, Dr. Mary Boatman  
16 of the Minerals Management Service. She was unable to come  
17 this afternoon.

18 Thank you all very much for being with us today.  
19 Let me start out by asking you, Jim, what are the known and  
20 potential effects of the new technologies we are discussing  
21 today, on the environment and other related resources?

22 MR. GIBSON: Okay, I'd first like to start off by  
23 saying I appreciate the fact that we're having this workshop  
24 today.

25 As John mentioned, I've had the opportunity for

1 the last three years, to work with Verdant Power, and I  
2 have to say that three years ago, it would have been tough  
3 to get this kind of group together.

4 With regard to the question, I guess I'd like to  
5 approach it in two ways: First of all, I'd like to go  
6 through and kind of go through a look at lessons-  
7 learned/challenges that we've observed in the process of  
8 doing the studies, and to identify those environmental  
9 impacts that are associated with these technologies and then  
10 briefly go through the studies that have been performed to  
11 this point, as well as the results of those studies, which,  
12 I think, get at the heart of John's question in terms of  
13 what are the known impacts.

14 In terms of challenges and lessons learned that  
15 we have seen, I'd say there are three of them and I think  
16 they are very specific to these technologies:

17 First of all, in the process of doing studies, be  
18 it Verdant Power, be it other developers, be it the agencies  
19 that are involved in these licensing proceedings, everybody  
20 is very involved and very engaged in doing studies.

21 Everybody is interested in getting a study done  
22 in order to eventually turn in a license and have that ready  
23 for environmental analysis.

24 One of the challenges that we have found with  
25 these technologies, is that to actually do the studies

1 triggers a federal action. If you want to put something in  
2 the water and put a buoy in the water or dig into the  
3 subsurface, you are triggering a Section 404 permit.

4 As a result, you have to go through a NEPA  
5 analysis and all the consultations you would otherwise do to  
6 get that license.

7 So the challenge has essentially been to get all  
8 the permits required to do studies and to eventually prepare  
9 an application to get a license.

10 In the instances of the Roosevelt Island Project,  
11 it took about two and a half years, started the licensing  
12 process, did the consultations, and then got sidetracked for  
13 about two and a half years, as we got the permits necessary  
14 just to get back into studies.

15 What is happening next week, is that two turbines  
16 are going in the water in the East River. Four more  
17 turbines will go in the water in the spring of 2007.

18 The study that we are going to be doing to  
19 identify the impacts, they are underway, but it took two and  
20 a half years to get there, just to get the permits. That  
21 was the first challenge.

22 The second challenge is, really, not only are  
23 these innovative technologies, but what we've learned is  
24 that there are innovative studies to evaluate these  
25 technologies.

1           Listen to what George was saying in terms of your  
2           doing studies in the East River, you're doing studies off  
3           the coast of California, the coast of Oregon, up in Nova  
4           Scotia, and the further you move out, the more challenging  
5           it's going to be to actually perform the studies.

6           You're trying to track individual fish, miles  
7           offshore in very high velocity currents, so the studies  
8           themselves have been innovative, and the studies themselves  
9           were somewhat dangerous in terms of the environment.

10          We have a number of subcontractors who just can't  
11          do that kind of work, so that's been a challenge.

12          The third challenge, then, is because this is a  
13          FERC licensing process, and we've gone through that class of  
14          '93; we've done the big IFIM studies; we've done the big  
15          fish passage impingement studies.

16          One of the great challenges we have seen, is  
17          working with agencies and stakeholders, the minute we get  
18          into a FERC licensing process. The idea is big studies.  
19          I'm sure there are going to be some other panelists today  
20          speaking on this, but with the result at Roosevelt Island,  
21          for example, right off the bat, we're talking upwards of \$2  
22          million of fish studies, just to evaluate six turbines.

23          There is some question that once you go from six  
24          turbines to ten turbines or ten to 20, how applicable are  
25          those studies? And that's sometimes, a challenge, so the

1 reason I go through that, is that when we were preparing for  
2 this panel, the question was, what studies have been done  
3 and what do we know with regard to impacts?

4 Well, there haven't been a lot of studies  
5 performed to this point. Those are the reasons why: There  
6 have been challenges to get out and do the studies.

7 The studies that have been done, and there are a  
8 few, and in as to Verdant Power, they did deploy a scaled  
9 down version of their turbine in the East River, back in  
10 early 2003.

11 They did use fish finders; they did use visual  
12 observations, and, based on that data, there does not appear  
13 to be any impact on fish in that instance.

14 It's the same thing in the Merrimac River in  
15 Massachusetts. They did the buoy, the turbines, for roughly  
16 60 days, and, as a result of that study, using hydroacoustic  
17 systems to monitor fish, once again, no impacts to the fish.

18 There have been some other deployments. OPT,  
19 for example, off the coast of Hawaii, they had a NEPA  
20 process done by the Department of Defense. Through that  
21 NEPA process, there was a finding of no significant impact  
22 issue, and that has, therefore, allowed them to deploy a  
23 wave energy conversion device off the coast of Hawaii.

24 The last one worth knowing, is Aqua Energy. Aqua  
25 Energy did put out a wave buoy a couple of years ago, in

1 order to measure wave heights and wave periods.

2 When you come right down to it, when you talk  
3 about what are the potential impacts, right now, that's  
4 still in the evaluation stage. Most of the work that's been  
5 done, has been either baseline or desktop surveys.

6 It has been such a challenge to do anything in  
7 the water to do further studies and to further evaluate it.  
8 Some of the other panelists are going to talk about in more  
9 detail, fish strikes versus other types of fish impacts.

10 We get into navigation; we get into security  
11 issues; we get into recreation. It's your typical types of  
12 potential impacts to resources that you'd see with other  
13 hydros, but that's where the studies are today.

14 With that, I'd be happy to answer any questions  
15 or pass on to the next speaker.

16 MR. KATZ: Thank you, Glenn. I'd be interested  
17 in your views on the same subject, and, more specifically,  
18 what sort of studies do you think will need to be done?

19 MR. CADA: Thanks, John, and thank you for  
20 inviting me to speak to you today.

21 As you mentioned in the introduction, I'm  
22 speaking from the standpoint of someone who has been  
23 involved in the DOE Hydropower Program for many years, as  
24 well as FERC licensing activities.

25 I think that in terms of a conventional

1       hydropower dam sort of system for fresh water, and the  
2       impacts associated with that, which are very well known and  
3       there are mitigative measures that are very well known, and  
4       to reinforce what Jim said and George said earlier, we don't  
5       have a lot of experience -- we don't have any experience  
6       with these devices, actually in free-flowing streams.

7                 We can speculate and we can come up with a  
8       laundry list of what the environmental impacts are likely to  
9       be, so we know which ones to monitor when they do get  
10      installed. I was gratified to hear George talk about free-  
11      flowing rivers.

12                There are many designs out there, but they tend  
13      to be converging on submerged turbines in some form or  
14      another, which makes it easier for me, from a conventional  
15      hydro standpoint. It's something I can grasp onto.

16                If you think in terms of a submerged wind turbine  
17      operating in a free-flowing river in the water, the expected  
18      environmental impacts would be some subset of what we think  
19      about for conventional turbines.

20                Compared to a conventional hydropower project,  
21      you don't have a dam, so you don't have to deal with the  
22      issues of blockage or obstruction of fish passage, nearly to  
23      the extent you would with conventional.

24                With conventional hydropower projects, which have  
25      a large storage dam, these can cause substantial changes in

1 water quality, water temperature, the silt content, and  
2 sediment loads of rivers. Again, you take away the  
3 reservoir, you put these new devices into a free-flowing  
4 stream and you get away from all those other impacts.

5 Two of the big issues are either minimized or  
6 probably go away entirely -- water quality problems and fish  
7 obstruction process. Water alteration is less, compared to  
8 conventional storage reservoirs that can stop the flows of  
9 rivers and stop them again.

10 Sediment degree transport can be a problem for  
11 hydropower projects, but is a necessary part of the way  
12 streams and rivers operate. Those are not altered as much  
13 by these new designs.

14 The issues that still must be considered when we  
15 think about a turbine operating under water in a free-  
16 flowing stream, strike is still a possibility. I say that  
17 the absolute obstruction by the dam is gone, but if we have  
18 one or two or even dozens or hundreds of these devices in a  
19 river channel, there is still the possibility of fish strike  
20 or another organism striking these devices or their  
21 movements, migrations up and down, being obstructed by these  
22 power farms.

23 That would be the biggest issue, and the  
24 interference with fish passage is probably going to be the  
25 biggest outstanding issue.

1           Other issues that could occur, would be chemical  
2           contamination, if the devices leaks oil or the paint is  
3           toxic or coatings turn out to be toxic. Those are issues  
4           that would have to be evaluated and mitigated, possibly.

5           Noise: These devices make noise and they produce  
6           electromagnetic fields around them, which I don't think have  
7           been quantified very well. We don't know what their  
8           biological effects are, so there's some possibility there.

9           Jim mentioned the recreational aspects. We need  
10          to make sure that the devices do not interfere with boating,  
11          fishing, swimming, and aesthetics. It looks like a lot of  
12          these things would be submerged, so aesthetics may not be  
13          much of a problem.

14          Those are sort of the issues that must still be  
15          considered. Part Two was what needs to be -- what studies  
16          need to be done?

17          MR. KATZ: Yes.

18          MR. CADA: I would focus on those, and George  
19          said it earlier and it's my belief as well, we really don't  
20          have -- I don't know of any systems in fresh water where  
21          these devices have been deployed a full scale.

22          So, we really don't have -- we can only speculate  
23          on what the environmental impacts could be at this point.  
24          However, because of the design of these devices, if they  
25          turn out to be mainly turbines of various kinds, there's a

1 lot of information from existing studies that would help us  
2 get at what those are.

3 The British researchers, back in the late '80s  
4 and early '90s, began studying component stress associated  
5 with passage through a turbine. That work was picked up by  
6 the Corps of Engineers in the Northwest and the U.S.  
7 Department of Energy's Hydropower Program in the last ten  
8 years.

9 They've done a lot of studies to quantify what  
10 those possible stresses might be, and then to apply those  
11 stresses in a controlled laboratory setting, to fish, to  
12 determine what the effects on fish are, as well.

13 So I guess that's a long way of saying that  
14 there's a lot of basis in the literature, published reports,  
15 et cetera, that would give us a real step up on assessing  
16 what these would be.

17 I think that in your package, there's a one-  
18 pager, which I recommend to the members of the audience  
19 here. Some of the reports that bear directly on assessing  
20 the environmental impacts of these devices, are all on the  
21 DOE website, and, as long as that last, anyway, they're  
22 available.

23 One last thing I would mention -- and Jim alluded  
24 to it a little bit -- and that is evaluating the effects of  
25 large numbers of these devices in water. One turbine or two

1       may not be a significant problem and may be easily avoided  
2       by fish, but if you have 20 turbines in the water or 100  
3       turbines in the water or something, or more, as some of  
4       these full buildouts predict, there's the unknown issue of  
5       the cumulative impacts of these turbines put together.

6                I think that's a very fruitful area of research,  
7       modeling, and perhaps substantial monitoring, as these  
8       devices are installed.

9                MR. KATZ: I do want to turn to John Novak, but,  
10       Jim, let me ask you, following up on what Glenn just said, I  
11       know that the East River Project, at least in some of the  
12       conceptual stages, has the possibility of a few turbines and  
13       to test dozens of them, ultimately. How has your client  
14       reacted or thought about the question of transferability of  
15       small amounts of environmental data or environmental data  
16       regarding small numbers of turbines to a larger set?

17               MR. GIBSON: That's something we're still working  
18       on with the agencies and other folks. We're doing a rather  
19       exhaustive study on the six units, 18 months, 24/7  
20       monitoring of these six units.

21                At the same time, we are doing hydroacoustic  
22       monitoring of baseline data of the entire footprint of the  
23       project. So the idea is, as data starts coming in -- and  
24       data should start coming in here within the next ten days or  
25       20 days, at this point, as units go in the water -- the idea

1 is to take that data and start extrapolating it up.

2 But we do have a challenge to prove or to  
3 demonstrate that, like Glenn is referring to, that a fish  
4 coming through the East River, as it approaches six units,  
5 will have the same effect as approach, say, 60 units or 100  
6 units.

7 MR. KATZ: John, a couple of questions for you:  
8 Give us your thoughts. We heard George say at the  
9 beginning, that one should not assume that the results of  
10 any given study -- and I don't think he was focusing on  
11 environmental issues so much, as perhaps the economics and  
12 geographical characteristics -- should be considered to be  
13 transferable to another site.

14 I'm interested in your thoughts on to what extent  
15 environmental studies will, in fact, prove to be  
16 transferable, or whether the different fish species'  
17 characteristics and different geographical characteristics,  
18 will make that difficult?

19 As a second part of the question -- I know we're  
20 going to have the regulatory panel later, but one thing we  
21 hear a lot about, is whether there can be new and more  
22 efficient review processes for these types of projects.

23 A question for you is: To what extent do you  
24 think study periods will be able to be shorter? I realize  
25 they may not be as much as terrestrial work, but, if,

1 traditionally, you need a couple of years in the water for a  
2 dam-oriented hydro project, is there reason to believe that  
3 there will be less time needed for one of these wave or  
4 tidal action-type projects?

5 MR. NOVAK: Thank you. First of all, I want to  
6 say I appreciate the opportunity to be here today before the  
7 Commission.

8 You've heard about EPRI. EPRI is the Electric  
9 Power Research Institute. We are a nonprofit, collaborative  
10 R&D organization headquartered in Palo Alto. Most of our  
11 funding comes from the electric power industry, but we also  
12 have partnerships with federal and state governments,  
13 vendors, and other organizations.

14 The EPRI Team Leader on Ocean Energy, Roger  
15 Bedard, could not be here today. He's been the one, the  
16 person behind our program.

17 Let me say a few things about ocean energy and  
18 how it fits in. We believe that we're going to need all  
19 options all our electricity options open to meet future  
20 energy, economic, and environmental needs.

21 That includes coal, nuclear, gas, renewables, and  
22 end-use energy efficiency. We think R&D can make a  
23 difference, including demonstration, in lowering the cost  
24 and improving the performance of these technologies, and  
25 especially their environmental performance out in the future

1 in dealing with issues, for example, like global climate  
2 change.

3 This is renewable energy. It's not emitting, so,  
4 obviously, it has greenhouse gas benefits. I don't know how  
5 much that has been talked about, replacing future potential  
6 coal or natural gas and reducing emissions.

7 For renewable R&D, ocean energy is one of the  
8 priorities at EPRI. We really are looking into this. We  
9 believe that there are significant resources in the U.S.

10 These technologies are becoming available, so we  
11 put together a partnership to begin to evaluate the  
12 feasibility of ocean wave, tidal, and river and stream.  
13 That's a very broad program, with a number of EPRI teams,  
14 ten city agencies, 21 utilities, four federal organizations,  
15 three institutes, 30 technology companies.

16 It's a broad effort, and all the information  
17 we've generated to date, is available to the public. You  
18 saw the website, [www.epri.com/oceanenergy](http://www.epri.com/oceanenergy), and I think we  
19 have 16 reports on tidal and 17 on wave or vice versa.

20 We talked about extrapolation of studies, and,  
21 from a technical perspective, whenever we do calculations,  
22 the cost of a particular technology, we're always worried  
23 that it will get taken out of context.

24 Clearly, anytime you're evaluating the cost of  
25 putting in power generation, site-specific conditions have

1 to be factored in. It can have a significant impact on the  
2 cost and performance, so that's something that we always  
3 caveat when we give out numbers.

4 From an environmental perspective, I think it's  
5 probably similar. There are going to be different  
6 conditions, different types of fish, for example, so I think  
7 what we're going to have to do, is to try to collect  
8 information and try to find out more about these  
9 technologies.

10 We believe that we need to do demonstrations of  
11 these technologies at different locations to collect  
12 performance data, first of all, to see how well they perform  
13 under different conditions, to see whether they are even  
14 attractive or even capable of generating electricity to meet  
15 our future electricity needs, and, second of all, to collect  
16 information on the potential environmental impacts.

17 Only then can we determine whether or not we can  
18 do this in an environmentally benign way. But, again, don't  
19 forget that this is a renewable technology. It has inherent  
20 benefits, because it doesn't emit any emissions from, for  
21 example, burning fossil fuels, and it will reduce greenhouse  
22 gases.

23 As far as study periods necessary in these  
24 technologies, versus a large-scale hydro, I really have no  
25 experience to comment on that. It seems to me that a lot of

1       these are smaller-scale; they don't involve a permanent  
2       fixture, necessarily, so they may have some benefits and  
3       allow us to shorten the time that we need to study to  
4       collect this information.

5                   I would stop there. Thank you.

6                   MR. KATZ: We at the Commission don't have a lot  
7       of experience in determining the studies necessary for this  
8       type of project. Until we recently received an application  
9       for the Nakah Bay Project in Washington, we had not dealt  
10      with this type of project before.

11                   I'm interested in whether any of you -- and,  
12      again, Jim, you may have heard more about this than others,  
13      but have any members of the panel heard about what reaction  
14      you're getting from our fellow federal and state regulators  
15      as to what sort of studies are necessary and how quickly  
16      those can be done?

17                   MR. GIBSON: I'll be happy to jump in first here.  
18      To this point, I think the technologies are seen as an  
19      unknown by the other agencies, both on the federal and state  
20      levels.

21                   So, as to Roosevelt Island, some of the things  
22      we're doing in Massachusetts or what's going on on the West  
23      Coast, to this point, the studies seem to be very exhaustive  
24      and very far-reaching.

25                   Glenn was mentioning recreation, navigation,

1 security, and cultural resources, kind of all of those  
2 things that you have to traditionally look at under NEPA,  
3 and we'll be requested to study that.

4 In addition to that, when you start getting into  
5 marine wildlife, you have marine mammals, threatened and  
6 endangered species, and you start talking about gray whale  
7 migration on the West Coast, you start talking about Striper  
8 migration through the East Channel, at this point, they are  
9 very exhaustive studies.

10 I mentioned earlier that just for putting six  
11 units out in the East River, we're doing 18 months of study,  
12 24/7, monitoring, with a very elaborate hydroacoustic  
13 system.

14 I think that right now, the studies seem to be on  
15 the conservative side. They're trying to collect as much  
16 data as possible, in order to evaluate these technologies.

17 MR. KATZ: Glenn?

18 MR. CADA: Let me add a word or two. I don't  
19 have much or any experience in the regulatory arena  
20 associated with these things, but a year ago, DOE held a  
21 workshop on these devices, and there were regulatory people  
22 there, resource agency people.

23 Their concern, as I mentioned earlier, is the  
24 effects of large numbers of these projects within a power  
25 park. They may feel the impact of one or two turbines, but

1 when they're talking about larger numbers, they get  
2 concerned about a whole variety of issues.

3 The other thing that I remember them saying, is  
4 that they don't want to have to reinvent the wheel every  
5 time they take a new look at a new project. As to the  
6 extent of research and actual monitoring, once these devices  
7 start getting deployed, can be done in a standardized way  
8 and the results made available to the industry and  
9 regulators, as a whole, it will make their jobs easier.

10 I think it might be a nice idea if someone could  
11 come up with guidance on operational and environmental  
12 monitoring of these devices that begin to be deployed, and  
13 then to modify them to whatever is needed for a particular  
14 site-specific situation.

15 But I'm sure your Staff is not looking forward to  
16 trying, for each and every project, to come up with an  
17 entirely new monitoring design in issuing a license.

18 Some guidance along those lines, early on, might  
19 be very helpful.

20 MR. KATZ: Thank you very much. That's been very  
21 helpful. Are there any questions from the Commission?

22 COMMISSIONER KELLY: Yes. Mr. Gibson, is your  
23 client burdened with doing the studies themselves? Are they  
24 paying for them?

25 MR. GIBSON: No. They have hired consultants, a

1 series of consultants, particularly some specialty firms out  
2 of Seattle, specializing in monitoring the fish, including  
3 ourselves, Devine, Tarbell & Associates, as well as several  
4 other consultants.

5 They are paying for that, initially through  
6 grants and work with NICERDA in New York, and now through  
7 financing. They are a developer without revenue. This is  
8 all being done through financing in grants.

9 COMMISSIONER KELLY: That was really where my  
10 question was going. How does a developer of a new  
11 technology, afford to get the studies done? Have you found  
12 public money or private grant money that's been able to  
13 cover most of it, or do you have to fund it yourselves? Is  
14 that appropriate?

15 MR. GIBSON: I think that in the first year, they  
16 all mortgaged their homes.

17 (Laughter.)

18 MR. GIBSON: It goes back kind of to your  
19 question earlier about why the spike in applications. I  
20 think Verdant Power is one of the companies that, over that  
21 two and a half-year period, proved that these could be  
22 permitted.

23 They received that Army Corps permit, and that  
24 seemed to be when there was a real spike, that this could be  
25 done.

1                   I think when that Army Corps permit was issued,  
2                   that's also when financiers came out and said, okay, there  
3                   is some viability here. There's going to be others speaking  
4                   here today that can answer that better than I can, but  
5                   that's where the money is coming from.

6                   COMMISSIONER KELLY: Thank you.

7                   COMMISSIONER MOELLER: It seems like one of the  
8                   challenges you have in moving forward on studies, is that  
9                   you have different fish in different places. In Puget  
10                  Sound, we have five species of salmon and Steelhead that are  
11                  running, and certain seasonal runs, as well.

12                 Sockeye generally hang out at different depths  
13                 than maybe the Silvers would. I'm happy to say that I have  
14                 eaten many of those fish, however, I have not gone fishing  
15                 in the East River, and I really don't intend to.

16                 (Laughter.)

17                 COMMISSIONER MOELLER: You did mention a  
18                 migration of Gray Stripers, but what kind of fish are you  
19                 looking for there? You obviously have some migratory issues  
20                 there, as well. This is a question to the whole panel, but  
21                 particularly to Jim.

22                 MR. GIBSON: It is a far array of fish that we're  
23                 looking at. Believe it or not, there are a number of  
24                 different species that either are residential to the area or  
25                 migrate through the area.

1           Stripers have gotten the most attention, because  
2           there is a commercial fishery, more recreational, but they  
3           take fishermen out, so Stripers have gotten the most  
4           interest. It's a little bit of everything, bottom to mid-  
5           level.

6           I guess, going back to one of the earlier  
7           questions, the hope is -- and we do have a number of  
8           fisheries biologists engaged in the project, upwards of five  
9           or six, and this is their specialty -- and we are taking  
10          that data, and the hope is to take that data and be able to  
11          extrapolate that, either to the West Coast or up and down  
12          the East Coast, onto different channels.

13          Kind of going back to the question of how do you  
14          take that data and say, okay, this is for six turbines, and  
15          how do you extrapolate up to 60, once again, we've got a  
16          number of people engaged in trying to do that.

17          What's nice about at least this project, is that  
18          we're really essentially hugging the coast of either  
19          Roosevelt Island or the Queens area. When you look at the  
20          entire East River as a channel, you're using up about two  
21          percent of the passable area.

22                 COMMISSIONER KELLY: Does Oak Ridge or does EPRI  
23                 have any intent to do generic studies related to the  
24                 environmental impact of any of these technologies?

25                 MR. NOVAK: We have two studies that are on our

1 website, one on wave and one on tidal, and I'm holding in my  
2 hand, some summary tables that my colleague, Roger Bedard,  
3 prepared on what are the issues, what are the impacts, and  
4 what are the things you can do to mitigate those, and I'll  
5 be happy to make that available. But there are two reports  
6 available.

7 MR. CADA: The quick answer is, Oak Ridge  
8 National Lab and the other National Laboratories that  
9 support the DOE Hydropower Program, don't have any immediate  
10 plans to work on this issue, the reason being that our  
11 budget was zeroed out for this fiscal year.

12 Unless the cavalry arrives and saves us, then we  
13 won't be doing any more of that kind of work. However,  
14 under the Energy Policy Act, the EPAct of last year, there  
15 is language in there that asks the Department of Energy  
16 Hydropower Program to study kinetic hydro and ocean energy  
17 turbines.

18 If money was restored to that program, it would  
19 be a big part of what we would be doing next year and the  
20 years after that. It would be likely that we would be doing  
21 resource assessment and environmental sorts of studies, and  
22 general environmental studies. That would be useful.

23 MR. ROBINSON: I guess the thing that I'm hearing  
24 from you that worries me the most, in terms of what we have  
25 to do, is sort of a chicken-and-egg thing that's going on.

1           We don't have projects in place, so we can't do  
2           the studies and the projects to know what the impacts would  
3           be, but yet we're going to be faced with applications coming  
4           in, asking the Commission to do projects in place.

5           What do you see out there or what information do  
6           you think that we could use to sort of cut that knot and  
7           make some assessment?

8           I'll take a specific example: The Pacific  
9           Northwest migratory patterns of salmon coming in through  
10          these areas, how are we supposed to assess what the effect  
11          of your project might account for on those stocks of fish,  
12          so that this Commission can then judge whether or not they  
13          think it's in the public interest to allow it to be  
14          constructed? How do we do that? What information do you  
15          think we might be able to use to make that assessment?

16          MR. CADA: I'll start. You have to start with  
17          the literature in terms of assessing if you've got an issue  
18          with salmonas at a site off the coast of the Pacific  
19          Northwest, you've got to start with the literature on what  
20          the possible impacts be and the knowledge of what the device  
21          might be, as best you can assemble it.

22          That's the general part of it, then site-specific  
23          knowledge. That's where it behooves the developer to  
24          provide as much site-specific knowledge in terms of  
25          distribution of fish, over time and over space, so you can

1 put the two together.

2 That gives you a basis for predicting impacts,  
3 and then you just have to jump in with monitoring when the  
4 device is actually installed.

5 MR. ROBINSON: You've been doing this a long  
6 time. Do you think our critics, the people who are going to  
7 be assessing our analysis, are going to accept that type of  
8 literature-based review as an experienced assessment of what  
9 may happen, as a foundation for saying put those in?

10 MR. CADA: I think that if it's done on a step-  
11 by-step basis, the phased deployment, much as Verdant is  
12 intending to do when they start out with a small number of  
13 turbines that can be pulled very quickly, in case something  
14 looks bad, and if everything works out and the monitoring  
15 gives everybody a certain amount of comfort, then they can  
16 start building out larger and larger numbers. It will have  
17 to be phased.

18 MR. ROBINSON: Jim, that takes me to you. Do you  
19 think we're going to have developers who will be willing to  
20 invest the capital to put facilities in, with the idea that  
21 they could be pulled out, if the monitoring indicates that  
22 we were wrong in our assessment?

23 MR. GIBSON: I think that's a challenge there. I  
24 think it depends on what is approved to be built. If you  
25 first approve, say, six turbines, like Glenn said, six

1 turbines can be stopped.

2 If that's known, I think the investors are there,  
3 the developers are there. You phase that out then into 20  
4 units, 50 units, 200 units.

5 There are investors out there that just want that  
6 200 units to be approved, and that's where the money is  
7 going to come in. That's obviously a challenge, but there's  
8 got to be some middle-of-the-road there, as compared to  
9 approving 500 units from the first step, that there is an  
10 approval for 50 units, 100 units along the way.

11 I don't know if that's a phased licensing  
12 approach; I don't know if that's an adaptive management  
13 approach, but I think we could end up one of two ways: We  
14 could end up getting nothing in the water, because other  
15 agencies just won't let it go forward, or if we do go  
16 forward with 200, that could be tough, as well.

17 MR. KATZ: In terms of the expansion to larger  
18 numbers of facilities, in terms of what you know of, has  
19 there been any computer modeling or studies to determine  
20 what makes more sense in terms of the arrays? I'm thinking  
21 of the traditional hydro use, attraction flows to get them  
22 to go the one way you want them to.

23 If you put 20 buoys laterally across the East  
24 River, that's going to have a different impact than maybe a  
25 diamond-shaped pattern that may cause the fish to go in such

1 a way that they are less affected than by some other method.

2 Do you know if there has been any of that kind of  
3 study done, or is there anyone looking at doing that?

4 MR. GIBSON: I can jump in once again here. We  
5 had, through consultation with agencies, an original pattern  
6 for the initial six turbines, and we modified that, based on  
7 consultation that was performed, both with the Coast Guard,  
8 because of navigation, as well as different agencies.

9 The idea is that data will be collected on these  
10 six units, that will help further define that. It could be  
11 either modeling or through consultation, that's where that's  
12 going to come from.

13 MS. MILES: I wanted to go back to the chicken-  
14 and-egg situation. That is really a problem, I think, for  
15 everyone.

16 The Commission passed the Verdant Rule to allow  
17 for short-term testing, for exactly that reason, to be able  
18 to gather some information over a short period of time and  
19 then have that information available for preparation of a  
20 license application.

21 We haven't seen a lot of people coming in to do  
22 that, to use that option. Do you all have any sense of  
23 what's going on?

24 MR. GIBSON: I think the Verdant ruling that came  
25 out last year, once again, I think that led to a number of

1 preliminary permit applications. That did open the door.  
2 That was a big step forward, but I go back to what I was  
3 saying earlier, and that is that you still have to go  
4 through the Army Corps because of federal action there.

5 Even though the FERC has made it a viable process  
6 to go out and do these studies, you could still be looking  
7 at two to three years of NEPA and Army Corps permitting to  
8 get something in the water.

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1                   COMMISSIONER KELLY: One follow-up question.

2                   If you're putting your money into these studies -  
3                   - private money -- how much of these studies can be used by  
4                   subsequent applicants and how much is just specific to your  
5                   site? If there's a substantial amount of money spent for,  
6                   if you will, a generic study, is there any way for you to  
7                   get reimbursed for that or to somehow be compensated for  
8                   that?

9                   MR. GIBSON: I may not be the best person to  
10                  speak on the compensation. I do think the data that's being  
11                  collected will hopefully apply to that technology wherever  
12                  that technology may be moved to. And if, for example, in  
13                  the East River, if there is to be another developer doing  
14                  work in the East River, some of that data could be used for  
15                  them.

16                  But once again, with the compensation, I can't  
17                  speak to that.

18                  COMMISSIONER KELLY: John.

19                  MR. NOVAK: One way to sort of share the risk, as  
20                  our approach, has been to create public-private partnerships  
21                  involving a lot of different entities. So if there's a  
22                  problem or you have to bring the technology out one entity  
23                  won't be shouldering all the costs. That's our approach.  
24                  And that information, if it's public -- there's public  
25                  funding involved, will be publicly available.

1 COMMISSIONER KELLY: Thanks.

2 Do you have funding for more studies in this  
3 area?

4 MR. NOVAK: We're working on it. But, yes, we  
5 are planning to move forward. And we do hope to continue  
6 these feasibility studies.

7 COMMISSIONER KELLY: Thank you.

8 COMMISSIONER KELLIHER: I have a couple of quick  
9 questions so I can keep this on track.

10 What was my first question? Mr. Hagerman had his  
11 little triangle -- I don't mean to belittle the triangle --  
12 but the technology development status triangle to mark out  
13 how it's a five- to ten-year period to go from concept only  
14 to full scale, large scale prototype. Which of these  
15 technologies is further along on that transition? I assume  
16 they're not on equal stages. But which ones are furthest  
17 along?

18 MR. GIBSON: I'll throw out some of the ones I  
19 know that either are currently in deployment or very close  
20 to there. Verdant Power with their East River Project; OPT  
21 between their deployment in Hawaii and plans along the West  
22 Coast; AquaEnergy with the application that's been  
23 submitted; OPD -- Ocean Power Delivery System -- theirs --  
24 we really haven't discussed it today, but over off the coast  
25 of Orkney is what's called the European Marine Energy

1 Center.

2 COMMISSIONER KELLIHER: Off of which coast?

3 MR. GIBSON: Off the coast of Orkney over in  
4 Scotland. It's called EMEC, the European Marine Energy  
5 Center.

6 What they've set up over there is essentially a  
7 park where you can bring your technology and test your  
8 technology and work with your technology. And there are  
9 some others here today that know that -- have worked with  
10 that much more than I did. The point being between OPD,  
11 Energetic, and some of the others who have been doing work  
12 overseas -- AquaEnergy being another one of those as well --  
13 I think those are the ones that are kind of in that upper  
14 level of the triangle.

15 COMMISSIONER KELLIHER: There's another triangle  
16 on top of that, isn't there, though, large-scale prototype  
17 to actual commercialization? Is there a benchmark that you  
18 would use for that transition? Or do you go immediately  
19 from a large-scale prototype to commercialization?

20 MR. GIBSON: I guess what I would throw out there  
21 is -- I'll use the Roosevelt Island project as an example  
22 again. The idea is to do the studies on these six units.  
23 Then once the FERC license is issued for a larger  
24 development we would then build out, say, 20, 30, 40, up to  
25 ten megawatts of electricity.

1                   COMMISSIONER KELLIHER: The central question that  
2 you all addressed, though -- what are the known and  
3 potential effects of these new technologies on the  
4 environment and other resources -- is the short answer to  
5 that question that I've heard from you all that the known  
6 effects actually are unknown at this stage, that we're  
7 really dealing with potential effects but we actually don't  
8 know the effects at this point?

9                   MR. GIBSON: Once again let me use Roosevelt  
10 Island as an example. It's the one I'm most familiar with.

11                   We know that if you're going to put turbines in  
12 the water chances are there's areas that are not going to be  
13 able to be used for recreation, some navigation. In New  
14 York City we deal with security. So there's a number of  
15 resources there where there would be impacts. We have  
16 determined at this point -- and it still needs further  
17 investigation -- that with regard to water quality we  
18 haven't found any water quality issues either due to a lack  
19 of sediment in the river or the fact that these turbines  
20 actually take energy out of the river versus speeding up the  
21 turbines and therefore generating more turbulence and  
22 turbidity.

23                   Really the focus has been on aquatic wildlife.  
24 You're talking about fish. You're talking about striped  
25 bass, marine mammals. We're very fortunate in the East

1 River to this point that we have no known threatened or  
2 endangered species. Turtles, we've gotten consultation with  
3 different agencies that turtles could appear there but it's  
4 very unlikely. So really the whole focus seems to get down  
5 to fish, are you impacting fish.

6 COMMISSIONER KELLIHER: Not navigation, though?

7 MR. GIBSON: Navigation's a given. I apologize.  
8 With regard to navigation, recreation, security, those are  
9 things we acknowledge there will be impacts to.

10 COMMISSIONER KELLIHER: Even though your  
11 technology's on the river bottom, right?

12 MR. GIBSON: Yes.

13 COMMISSIONER KELLIHER: There's still an impact  
14 in terms of recreation, on fish, or something?

15 MR. GIBSON: The thought is that even though  
16 these are probably going to sit five to ten feet under water  
17 we will probably have areas that are closed off for  
18 recreational fishing to go over the top.

19 COMMISSIONER KELLIHER: I didn't realize it would  
20 be that shallow, five to ten feet below the surface.

21 MR. GIBSON: Yes.

22 For example, the six units that are going in the  
23 water, we're in about 32 feet of water in that area with 15  
24 foot diameter. So there's not a lot of water there. You'd  
25 have to deal with navigation, security, recreation, cultural

1 resources. But really the focus has been on fish, both that  
2 near-term impact as a result of the spinning blade -- are  
3 you striking a fish -- as well as migration -- are you  
4 adversely impacting the migration routes through these  
5 channels.

6 COMMISSIONER KELLIHER: There's different but  
7 still fish effects of the submarine technologies as well as  
8 the ones that are at surface or near surface; it's just  
9 different fish might be affected?

10 MR. GIBSON: Yes. And I would say with the wave-  
11 type devices the potential impacts to fish are much less.

12 The idea is you have a wave, buoyant, it's kind  
13 of bobbing up and down, or like the Pelamis just on the  
14 surface. Once again you get into recreation, you get into  
15 navigation.

16 COMMISSIONER KELLIHER: Wave systems, do you have  
17 one buoy or a field of buoys?

18 MR. GIBSON: You'd eventually have a field.

19 COMMISSIONER KELLIHER: How big a field are we  
20 possibly looking at?

21 MR. GIBSON: Permit applications have been  
22 submitted showing fields of maybe a square mile or two  
23 square miles.

24 COMMISSIONER KELLIHER: There's an interesting  
25 tidal density map -- and I think this is Phil's neck of the

1 woods. But is there a relationship between navigation  
2 channels and power densities for tidal projects? Do you  
3 have the greatest power densities right in the middle of the  
4 navigation channel? Or is there no relationship between the  
5 two?

6 MR. GIBSON: I think it's site-specific. There  
7 are some places that's definitely a navigation channel but  
8 there's other places with the navigation channel a little  
9 bit further down.

10 COMMISSIONER KELLIHER: If a wave project could  
11 have a square mile -- it's a big ocean, I suppose. Is that  
12 the answer? A square mile here and there doesn't add up to  
13 too much. But there would be recreational impacts in those  
14 areas, certainly.

15 MR. GIBSON: Yes.

16 The idea is that you're putting these offshore by  
17 two kilometers, three kilometers. You're not just right  
18 offshore.

19 But I know in the preliminary permit applications  
20 that have been submitted there will be areas that will be  
21 blocked out for these technologies.

22 COMMISSIONER KELLY: I see the opportunity for an  
23 LNG-ocean technology partnership.

24 (Laughter.)

25 DR. CADA: If I could add to what Jim was saying.

1                   We've been talking mainly about potential  
2 negative impacts of these projects. But if you cordon off a  
3 square mile or two square miles of ocean and protect that  
4 area from commercial fishing and put a bunch of structures  
5 in there that are not damaging the fish but in fact may be  
6 attractive and create a bit of habitat for them, some have  
7 suggested that there may be some beneficial effects to these  
8 power parks.

9                   MR. ROBINSON: That's called a fisherman  
10 attractant, too.

11                   (Laughter.)

12                   DR. CADA: There you have it.

13                   MR. NOVAK: The one environmental impact there,  
14 there's a wave project in Hawaii, a power buoy that was  
15 installed in 2005, and the environmental impact statement  
16 had a finding of no significant impact. The only  
17 environmental impact noticed to date is fish habitat  
18 creation.

19                   So, so far again, there's a number of issues.  
20 With wave it's changes to sediment transport patterns that  
21 could result. That's something you might have to deal with.  
22 But in wave dispersion farms or for groins you have  
23 interactions with marine life, sea birds, ecosystems,  
24 pinnipeds can find this little place to rest. You may have  
25 to put a cone device or something that will not allow them

1 to get on top.

2 On the West Coast, San Francisco, you know what  
3 happens when they decide to use your boat as a resting  
4 place.

5 You know, there are other things, conflicts with  
6 other uses for sea space and interfering with migration  
7 mammals. A lot of these have been identified. And some of  
8 the mitigation options also. But again, the experience is  
9 limited to just a few cases. Tidal as well. We do have  
10 some overseas tidal experience that some units have been  
11 deployed for about three years in the UK and there's a  
12 number of other that have plans to be constructed. So we  
13 could learn from those projects as well.

14 MR. KATZ: Mr. Chairman, I'll just note that at  
15 the staff level we've heard some discussion on the research  
16 side of the State of Oregon or academic institutions therein  
17 being interested in developing a research site off the coast  
18 of Oregon. If indeed they're doing pure research and we're  
19 not interested in commercializing the power, that might fit  
20 within the picture that's been set forth in Verdant. It  
21 would be something they could do on their own without need  
22 for a Commission license.

23 COMMISSIONER KELLIHER: Thanks.

24 I think it's been an interesting panel. It  
25 presents us with different issues than the conventional

1 projects because they, frankly, in many cases pre-dated our  
2 licensing jurisdiction for the projects. We were really  
3 dealing with more of a universe of known effects. It wasn't  
4 as theoretical. So it does present us with different  
5 challenges because we have to make findings on the effects  
6 of these projects.

7 And to me it's unremarkable that there are  
8 potential environmental effects. There's potential  
9 environmental effects from really any energy infrastructure.  
10 So there's nothing exceptional with respect to these  
11 technologies. There may be benefits as well.

12 But I think it's been an interesting panel.

13 Colleagues, any other comments?

14 (No response.)

15 COMMISSIONER KELLIHER: Thank you very much for  
16 your help today.

17 MR. KATZ: Thank you very much.

18 (Applause.)

19 MR. KATZ: We can now switch out with the  
20 financial issues panel.

21 (Pause.)

22 MR. KATZ: Mr. Chairman, Commissioners, our next  
23 panel is going to be on financial issues associated with  
24 these new technologies. We have four distinguished  
25 panelists.

1                   Wayne F. Krouse is the Chairman, CEO and founder  
2 of Hydro Green Energy, LLC, started in 2003. Prior to that  
3 time he held positions with several major companies, many of  
4 them in the energy area. Mr. Krouse graduated from Tulane  
5 University with a bachelor's degree in chemical engineering.

6                   Our second panelist, Alla Weinstein, is a co-  
7 founder of AquaEnergy Group, Ltd., which is the entity that  
8 has filed the Makah Bay application with the Commission and  
9 has been its chief executive officer since 2001. In 2006  
10 she became a director of Finavara Renewables following its  
11 acquisition of AquaEnergy. She became the first president  
12 of the European Energy Association in 2005. Prior to co-  
13 founding AquaEnergy Group she held several positions in the  
14 business world. She holds a bachelor of engineering in  
15 electrical energy from Stevens Institute of Technology and  
16 an MBA from the Garvin School of International Management.

17                   Our next panelist, Dr. George Taylor, is a co-  
18 founder and chief executive officer of Ocean Power  
19 Technologies, which you've heard referenced earlier, where  
20 he's held a variety of management positions over the last 20  
21 years. Dr. Taylor's career began as a member of the  
22 technical staff of RCA Laboratories. He has a bachelor of  
23 engineering degree, a doctor of engineering degree from the  
24 University of Western Australia, and a Ph.D. in electrical  
25 engineering from the University of London. Dr. Taylor has

1        authored three technical books and has written more than 60  
2        technical articles and has 18 issued patents, for those of  
3        us who want to have an inferiority complex here.

4                                (Laughter.)

5                                MR. KATZ: Andrew Dzykewicz has served since the  
6        beginning of this year as chief advisory on energy to the  
7        governor of Rhode Island. He had a lengthy career prior to  
8        that. But just prior to the appointment he worked at Rhode  
9        Island Economic Development Corporation where, among other  
10       things I know will be of interest to you, he facilitated an  
11       agreement on underground high voltage transmission lines, a  
12       subject for another day, and represented the Corporation in  
13       a rulemaking on state renewable energy portfolios. He's  
14       spent almost 40 years in the energy business in both  
15       government and private industry.

16                               Thank you all very much for appearing with us  
17       today. I'm going to have some basic questions I think that  
18       I'll just throw open to all the panelists and you can answer  
19       them in turn if you like.

20                               First, what are the costs for developing these  
21       types of new technologies and how do those costs compare  
22       with fossil fuel generation and with other alternative  
23       energy sources? Whichever of you wants to jump in first.

24                               MR. KROUSE: Chairman Kelliher, Commissioner  
25       Kelly, Commissioner Moeller, thank you for giving me the

1 opportunity to talk and bring my opinions before the panel.

2 I think there's a broad range of costs associated  
3 with the various technologies, some of which require sources  
4 to be operational and some do not. Most of them are  
5 available in the literature for those specific industries  
6 pretty readily, or via Internet searches or the Energy  
7 Information Administration as well.

8 But I'd say in order to try to box in a range of  
9 prices for the cost of developing hydrokinetic technologies,  
10 at this point it could be difficult primarily because  
11 there's a variety of technologies or technological  
12 approaches that are out there, which include a variety of  
13 different costs associated with developing those  
14 technologies. As yet the regulatory costs are still  
15 somewhat unknown. Those also have significant impact on  
16 smaller projects that are just coming into commercialization  
17 as well.

18 MS. WEINSTEIN: Well, thank you very much for  
19 having us here and having this workshop to begin with. It  
20 is obviously very timely. It is timely for a number of  
21 points.

22 First of all, with the first application  
23 submitted, we are hoping that the Federal Energy Regulatory  
24 Commission would be able to act on it in a timely manner  
25 because that has a direct impact on how much does it cost to

1       develop technologies.  If you remember George's chart that  
2       looked like a pyramid, it takes a long time and a lot of  
3       money to climb the pyramid.  We're talking about millions of  
4       dollars that it takes to develop technologies -- it's not a  
5       couple of hundred thousand -- and years and years and years.

6                So if we are spending our mortgage money you're  
7       not getting paid for years to be able to move something  
8       forward.  And when the financing world looks and says on top  
9       of everything unknown you also have the regulatory unknown,  
10      it becomes a very challenging task to be able to get from  
11      here to there.

12               However we are all sitting here because we  
13      managed to get something done and we are all committed to  
14      getting it done.  It would be very good if the Commission  
15      could work with us to make things move forward quickly.

16               I would like to take this little opportunity to  
17      address some of the questions you asked the previous panel.  
18      One of them was known effects.  In the case of AquaEnergy  
19      there are navigational buoys.  They're very similar.  So  
20      there's a lot of known effects that can be used, that can be  
21      put into the studies.

22               And Devine Tarbell, when they did the assessment  
23      that was presented with their application, did exactly that.  
24      They looked at what was already known and that already  
25      exists.  That's something we all need to think about and say

1 let's not recreate; let's try to use what's there. It helps  
2 all of us.

3 The other question that was asked, who pays for  
4 the studies and who pays for everything. It's us. It's our  
5 families. There is very little private funding available in  
6 the United States. There is no government funding available  
7 in the United States. So it is unfortunately -- on the one  
8 hand it's a strange fact that an American becomes president  
9 of the European Ocean Energy Society; on the other hand  
10 there's a lot more of developmental money available to do  
11 that in Europe than in the U.S. So it's not really helping  
12 us. But we should be looking at -- there's a lot of  
13 benefits from these technologies that will impact our  
14 reduction on climate change versus maybe the impact that  
15 we'll be providing. And I kind of like the joke that we're  
16 probably going to make the most impact on the humans because  
17 it's the builders that will be prohibited to do that.

18 Thank you.

19 DR. TAYLOR: I'd also like to thank the Chairman  
20 and his fellow Commissioners for giving us the opportunity  
21 to present what we believe is a very exciting new technology  
22 which has great implications in terms of assisting in  
23 production of the ever-growing need for energy in the United  
24 States and at the same time has the distinct advantage of  
25 producing clean energy. And we believe that ocean power

1       technology, as I think my fellow panelists believe, that we  
2       have the ability to get the price of the electricity down to  
3       becoming competitive with fossil fuel within a reasonable  
4       period of time.

5                 Inside my own company we are expecting by the  
6       year 2010 to be able to be competitive with fossil fuel  
7       without subsidies. Obviously when subsidies are there it's  
8       tremendously helpful during this interim period of growing  
9       the new industry.

10                I think the question was what has been the cost  
11       and what is the cost to develop a new technology such as  
12       wave energy. And we began operations in 1994. During that  
13       period up until now we have expended about \$17 million, some  
14       of it from the founders and their families and their  
15       friends; also some high net-worth individuals, a few  
16       companies who became shareholders in our company -- one of  
17       them being a company called AMP, now part of Geico; another  
18       company being Woodside Petroleum, which is Australia's  
19       biggest gas and oil company.

20                Then we've had the financial support of SBIR  
21       Contracts from the Office of Naval Research. Obviously the  
22       Navy has particular interest in being able to produce power  
23       in the open ocean, and also the Navy is one of the biggest  
24       users of electricity in the United States at its various  
25       naval bases in the U.S. and also overseas. And there, of

1 course, the driving force is the strategic issue of being  
2 able to get energy from a natural source rather than being  
3 completely dependent on the shipment of fossil fuel.

4 Getting back to how does one pay for the  
5 development, it's a case of working very hard to persuade  
6 investors who are willing to gamble on the future  
7 opportunity of what will be a huge industry to put up their  
8 money at an early stage. As Alla said, the Europeans and  
9 the British people have been very strong in their desire to  
10 have a significant percentage of their energy renewable.  
11 Therefore we found that when we wanted to do a public  
12 offering three years ago the best place to do it was in  
13 London. We were fortunate in being able to raise a  
14 significant amount of money in an IPO over there.

15 I think in the United States now the private  
16 investors are starting to realize that renewable energy is a  
17 very major issue and I think what happened three years ago  
18 in the U.S. will start to show. We'll see the same type of  
19 situation develop in the United States.

20 MR. DZYKEWICZ: Clearly I'm not from a company  
21 that's trying to develop any of these products. But rather,  
22 being from a state is a different perspective.

23 I, too, would like to thank the Chairman and the  
24 Commissioners for inviting all of us here today and being  
25 able to participate in this. The next time I see you in

1 Boston, Mr. Chairman, I'll keep my mouth shut.

2 (Laughter.)

3 MR. DZYKEWICZ: I am from Rhode Island. Our  
4 nickname is the Ocean State. We have a tremendous interest  
5 in this technology for a lot of reasons. Being part of New  
6 England, we're faced with some of the highest electrical  
7 costs in New England, and we've seen them continue to go up  
8 constantly.

9 We see the opportunity to develop some of these  
10 renewable technologies as a way, if not to reduce the costs,  
11 certainly to put the brakes on. And we're looking at types  
12 of technologies with no fuel costs. That has a lot of  
13 appeal. It certainly helps the volatility; and the long-  
14 term prospect for reasonable energy prices is a good one.

15 As to why we're so interested in this, you know,  
16 when I was appointed to this position last January the  
17 governor gave me five tasks, one of which was to find 15  
18 percent of Rhode Island's electrical energy from wind. Then  
19 I started talking to him about some of the opportunities we  
20 have with waves and tidal power. In his typical fashion he  
21 said, 'Well, that's great. Let's make it 20 percent from  
22 all sources.'

23 (Laughter.)

24 MR. DZYKEWICZ: 'And let's do it five years  
25 faster, if you would, please.'

1           So I'm looking forward to working actually with  
2 any of the folks here at this conference. We have a state  
3 with a lot of resources where you can do your testing. When  
4 you grow your technologies, we have some industrial parks  
5 that are located on the water with 33 feet of water at the  
6 pier and 3,000 acres between buildings. So I'll make that  
7 little pitch for Rhode Island to everyone here.

8           Clearly it's difficult to raise the capital to  
9 develop these new technologies. We've been able to help a  
10 little bit in New England. We've sponsored partially the  
11 EnergeTech project off Point Judith together with  
12 Massachusetts and Connecticut. Frankly, Rhode Island is  
13 looking at not just a pilot project there but at five to ten  
14 megawatts along our shoreline.

15           We feel that wave energy is one thing that we  
16 have a tremendous potential for and we'd like to exploit it.  
17 The project also goes in a place where the transmission is  
18 constrained. It makes for a great distributed generation  
19 project as well.

20           We don't have a lot of resources to contribute.  
21 I wish we had more at the state level. The resources we get  
22 are from the system benefit charges. The question becomes  
23 how much more do you tack on to the ratepayer for  
24 development.

25           We think there's an opportunity. I've studied

1 the ocean renewable energy coalition's principles and they  
2 seem to make a lot of sense to me. Perhaps what we ought to  
3 do is make a national -- put a national deposit down on some  
4 of this environmental work. And then when developers are  
5 successful with projects they can pay that back. That's a  
6 principle we've adopted with all of our renewable energy in  
7 Rhode Island.

8 We don't give grants any more. We loan money.  
9 We work for projects that have a return so that we can have  
10 more money coming in to invest in more projects. And  
11 perhaps that's something that the federal government ought  
12 to think about doing, particularly for those environmental  
13 determining issues where there is some transferability.

14 I don't know if I've contributed a lot to your  
15 question. But that's kind of where we're coming from.

16 MR. KATZ: You have. Thank you very much.

17 My colleague, Mr. Robinson, who is such a globe  
18 trotter that we consider it a single honor that he's  
19 actually in Washington for this conference, recently got  
20 back from a conference of a bunch of deep-thinking energy  
21 folks out west.

22 And jump in if I'm misquoting you.

23 But one of the take-aways he took from that was  
24 that those folks were saying all these new technologies are  
25 wonderful, but count on burning a lot of gas for a long time

1 in the future.

2 Are those folks wrong? If so, how do we convince  
3 them to look more at other types of technologies?

4 MR. KROUSE: It's my experience in trying to  
5 raise equity capital out in the marketplace and also having  
6 talked to a significant number of debt-investors that  
7 there's a significant amount of interest in the potential to  
8 generate an acceptable rate of return by making investments  
9 in these projects or in these companies that are getting  
10 started. However, most investors quantify rates of return  
11 versus risk. I think the uncertainty in some of the  
12 processes that are in place now translates into them having  
13 to evaluate that risk versus their risk tolerance profile.

14 I guess in translation it means if they don't  
15 really understand or know that there's a certainty in place  
16 in terms of the process that they are going to have some  
17 hesitancy in putting their money into these young companies  
18 or these young technologies until at least that process has  
19 been proven out and there is some understanding within the  
20 marketplace about what that time line or time frame and that  
21 time line's cost might actually look like.

22 Ultimately, to answer your question or to make a  
23 comment on that remark, I do think that it will take time to  
24 ramp up the current based and wave-based technologies. I  
25 don't believe personally there will ever been 100 percent

1 off of any type of power-generating source. But I do  
2 believe that the ability to ramp these technologies up could  
3 be much faster than some people may have thought was  
4 possible a few years ago just because of the number of  
5 technologies that are out there.

6           Ultimately there will be multiple solutions to  
7 the problem of generating power from current based systems  
8 and wave-based systems. I'm sure as you're familiar, in the  
9 thermal power generation business there's a number of  
10 technologies based on a number of fuels that generate power  
11 at a variety of cost points. It really just depends on  
12 where you are and how much you can utilize the existing  
13 resource and at what point you can have operational  
14 excellence, if you will.

15           COMMISSIONER KELLIHER: Let me respond to that.

16           There is very significant potential for these  
17 technologies. We do want to show regulatory flexibility,  
18 and we did in the Verdant contract. We actually took a  
19 pretty clear approach toward Verdant. But there are some  
20 limits. There are some immutable regulatory risks we cannot  
21 address because even though it is a FERC licensing process,  
22 we are not the sole master of our licensing process. There  
23 are multiple decision-makers, both at the federal and state  
24 level. And they have an ability to impose conditions as we  
25 move to issue licenses that we cannot reject.

1           So if you had viewed our prior meetings, at this  
2 time we talk about prolonged licensing proceedings. And  
3 typically a licensing proceeding takes a long time here at  
4 the Commission because one of those other actors, whether it  
5 be a federal or a state actor, actually is not acting. So  
6 we're efficient at our end but we are not the complete  
7 master of the licensing process. Our ability to be flexible  
8 in our approach I think is pretty clear based on Verdant.  
9 But there's limits to what we by ourselves can do.

10           I recognize from your point of view you'd like  
11 the process to go as smoothly as possible, to be fairly  
12 predictable. And you don't want a very prolonged maybe -- I  
13 assume you do not want a maybe that stretches over years;  
14 you'd like a crisp answer one way or the other. We'll try  
15 to do that within the limits of the law.

16           MS. WEINSTEIN: If I might take from where kind  
17 of you left off and try to answer your question, the only  
18 way you're going to change people's opinions is if you have  
19 demonstrations and if you have actual operation and you have  
20 some quantity of megawatts produced. Otherwise people will  
21 not believe it. They will always look at the industry, you  
22 know, it's not R&D in a wave tank or a sandbox. Looking at  
23 how to finance a project -- and we have been looking at  
24 financing projects not just technology development -- it can  
25 be done. And we are doing it. And I think that's the

1 reason why you've seen the surge of permit applications  
2 because the funding can be obtained if certain conditions  
3 are met.

4 In the case of AquaEnergy, having gone through  
5 the PDA process or being a part of the ALP we can somewhat  
6 predict what it's going to cost and how long it's going to  
7 take. It's a known quantity. We have to do certain  
8 studies; we know how much that costs. We have to do some  
9 analysis; we know how much that costs, how much time it  
10 took. And now we know that within 12 months there should be  
11 a ruling from FERC. That can be quantified. That can be  
12 costed out. That can be put in the financial projections.  
13 And from that we can derive what size of plant we need to do  
14 to be able to make money and to be able to show financing  
15 organizations what it takes.

16 On the other hand there is this unknown of will  
17 we get the permit and can you demonstrate performance and  
18 will you get the same amount of energy as we predicted.  
19 That forces you into something that addresses actually a  
20 previous question, too, into phased development.

21 We're willing to go through phases. We're  
22 willing to start small. We're willing to demonstrate  
23 things. And financiers actually understand that, too, as we  
24 move on to the greater expansion. During the phased  
25 approach we can address both things: Not only financial

1 commitments and demonstrations, we can produce the energy  
2 that we said we're going to produce.

3 Also environmental. We did the studies based on  
4 known data, known performance characteristics and so on. We  
5 can monitor those performance characteristics through the  
6 same phased approach. And the approach we took in Makah Bay  
7 in the PDAA and in the work with the sanctuary since we  
8 ended up in the marine sanctuary was if we don't know the  
9 answer let's do a study as part of the permit application so  
10 that we will have the answer at the end, so we will have the  
11 data to go to the next stage.

12 DR. TAYLOR: We ocean power technologies have  
13 been in the process of commercializing our technology over  
14 the last couple of years. We've been working with the U.S.  
15 Navy to build a one megawatt wave power station at the  
16 Marine base in Hawaii for which there is a permitting  
17 process financed by the Navy -- I think it was about a half  
18 million dollars it cost to do that study. And as was  
19 mentioned earlier, there was a finding of no significant  
20 impact.

21 The details of that study are available to  
22 anybody who wishes to see it.

23 We also are under a contract with Evadraula in  
24 Spain to build a 1.25 megawatt wave power station off the  
25 north coast of Spain. We have completed the planning phase

1 and are now in the building phase. We'll be putting ten  
2 buoys in the water off Spain. We also have similar  
3 contracts to build a demonstration wave power station for  
4 Total, the French oil company on the west coast of France.  
5 In both cases the intention of Total and also Evadraula, the  
6 big Spanish utility, is to expand these initial small-size  
7 wave power stations out to hundreds of megawatts.

8           Being a U.S. company, we were delighted when the  
9 State of Oregon made it clear they wanted to be a leader in  
10 wave energy in the United States. As you'll hear later from  
11 Mike Grainey in the next session, Oregon is very well  
12 committed and fully committed to this. Given the wave  
13 energy resources of Oregon, the fact that the grid  
14 connection is very close to where the power cable would come  
15 ashore, we applied, as everybody knows, to FERC for a permit  
16 for up to a 50 megawatt wave power station. Initially we  
17 will build two megawatts. We expect to put a first buoy in  
18 the water in 2007, next year, and then subject to being  
19 granted permission, we would expand that to two megawatts.  
20 That two megawatts would be a great demonstration to the  
21 utility industry in the United States. And we would expect  
22 to then, with the partnership with utilities or with  
23 independent power producers, to expand it out to the 50  
24 megawatts.

25           So as Alla said, the demonstration of systems in

1 the water working smoothly with no problems producing the  
2 energy that we're able to project, they're able to produce,  
3 and with the economic model that we have developed being  
4 demonstrated and approved, then I think we're on our way to  
5 building a big industry. But obviously we need to work  
6 closely with the U.S. government and the Oregon government  
7 in terms of getting the necessary permits in place.

8 MR. DZYKEWICZ: I guess the answer to your  
9 initial question do we think we'll be burning gas for a long  
10 time, I think, yes, we are. I think a lot of these  
11 technologies are promising. But I think we're quite a few  
12 years away from utility-scale projects large enough to  
13 displace the generation that we're getting from gas right  
14 now.

15 Just like in New England: New England's 30  
16 percent gas-fired. Peak load is 28,000 megawatts. That's a  
17 lot of this technology to get in the water if you want to  
18 make a substantial dent in it.

19 Our target, we've set a target by 2014 of five  
20 percent of our 1000 megawatt annual average load in Rhode  
21 Island, which is only 50 megawatts by 2014, you know, I  
22 think we can achieve that. I won't be there to see it and  
23 neither will my governor. But those are the goals we've  
24 set. And hopefully when we're gone somebody will carry  
25 those on.

1                   But I do think we're still going to be burning  
2 gas for a long time.

3                   COMMISSIONER KELLY: Is that from renewables or  
4 from wave and current?

5                   MR. DZYKEWICZ: Our five percent is from all  
6 renewables except wind. And for us that turns out to be  
7 tidal and wave. We don't have a lot of biomass to use and  
8 we don't have a lot of other renewable resources.

9                   Wind is what we've got an awful lot of. We  
10 should be able to get about 15 percent of our power from  
11 that by 2014. And we're looking for five percent by that  
12 time from this new technology.

13                   COMMISSIONER KELLY: That was actually -- I  
14 didn't mean to cut into your questions. I wanted to ask the  
15 broader question along those lines.

16                   We know that 24 states and the District of  
17 Columbia have renewable portfolio standards. We know that  
18 all of them have wind. Most of them have solar as eligible  
19 energy sources.

20                   Do you know how many have current and wave? And,  
21 if so, will that lead to more dollars for development or  
22 more of a likelihood of the deployment of your technologies?

23                   MS. WEINSTEIN: I believe for today the state  
24 that shines -- even though the sun doesn't shine very often  
25 -- but the state that shines is Oregon because Oregon did

1 put a program in place that embraced wave energy in  
2 particular. Whatever the reasons were, it is a program that  
3 certainly is very attractive. Other states that do have at  
4 least included ocean energy in their definition of renewable  
5 resources is California, Massachusetts, Rhode Island, New  
6 England, Washington State did it this year, finally. Hawaii  
7 certainly has it, and they in fact passed the legislation  
8 back in 2002 where they embraced wave energy also.

9 So, you know, the states are there. The question  
10 then becomes what does it come with. Is there a financial -  
11 - a monetary support that comes with it. There again Oregon  
12 would be at the top of the list.

13 Although Massachusetts and the New England states  
14 have a program, it is a very minimal program. And I think  
15 once they select a project, a technology, then they're  
16 somewhat unavailable very much, if at all. Also the  
17 resource is very different. If you look at the chart George  
18 presented, you're dealing with about half of the wind  
19 resources on the east as you have in the west. The  
20 economics are going to be very different too.

21 I think Alaska is considering this but I don't  
22 think it's in it yet.

23 I hope that answers your question.

24 COMMISSIONER KELLIHER: I had a question on the  
25 generating characteristics of the new hydro technologies.

1           If you look at other renewable technologies like  
2 wind or solar, the generation is intermittent and it can't  
3 be predicted that far in advance. How do the new  
4 technologies, the new hydro technologies compare? Are they  
5 less intermittent than wind and solar? Are they some fairly  
6 -- I would think something like tidal might be intermittent,  
7 but that is just a guess. I'm just curious. What are the  
8 generating characteristics?

9           DR. TAYLOR: Concerning waves, wave energy is  
10 first of all more predictable than wind. The waves roll  
11 across the ocean and you have an integrating effect. So by  
12 the time the waves get to the coast you have a very constant  
13 predictable source of energy. In fact, you can look at  
14 satellite photography and see three days ahead what the wave  
15 energy is going to be at the shore where your wave power  
16 station is. This is very advantageous from a utility  
17 viewpoint.

18           The other point is because the wave energy is  
19 just more concentrated than the wind energy you get a higher  
20 capacity factor. In other words, you get a higher  
21 percentage of the number of hours in the year that you're  
22 going to be producing energy than you can do with wind. All  
23 that allows you to do a costing model and show while the  
24 capital costs of wave energy may be rather similar to that  
25 of wind, the amount of energy you get per ton of steel, if

1       you like, is going to be larger in the wave energy case than  
2       in the wind energy.

3               Now wind has been around, of course, for 20  
4       years. They're well down on their learning curve. We're  
5       the new boys on the block. But I think we will get there  
6       faster because there are many other advantages that wind has  
7       helped. Utilities are used to integrating wind into their  
8       grid system. Some of the power electronics that have been  
9       developed for wind are applicable to wave.

10              So we in our company expect that in four or five  
11       years we will be way down there where wind is today with  
12       those advantages on top of that, including the pollution  
13       issue, the visual pollution issue which was referred to  
14       earlier. Waves have the advantage. We're offshore mostly  
15       below the surface.

16              COMMISSIONER KELLIHER: One question.

17              I'd like to hear from Andrew. How do you mark  
18       off an ocean wave project? Do you have to mark it off? A  
19       set field of buoys was shown to me earlier.

20              DR. TAYLOR: We've had experience in doing this  
21       both in Australia and off the coast of New Jersey and  
22       Hawaii. The Coast Guard, you tell the Coast Guard or you  
23       ask the Coast Guard where you would like to site your wave  
24       power station. Obviously you shouldn't be in a shipping  
25       channel. Then you talk to the fishermen to make sure where

1       you're going to put it is not going to interfere with their  
2       fishing.

3                       Once that's agreed on -- and we've been  
4       successful in doing that -- then it gets marked on the Merit  
5       Dye maps. The Coast Guard requires that you put the right  
6       flashing lights, radar reflectors, and navigation aids on  
7       it.

8                       COMMISSIONER KELLIHER: It sounds like a very low  
9       profile.

10                      DR. TAYLOR: A very low profile.

11                      COMMISSIONER KELLIHER: Andrew?

12                      MR. DZYKEWICZ: The one issue you raised, Mr.  
13       Chairman, is something that's probably the only issue that  
14       troubles me about any of these resources. What I worry  
15       about is as we achieve higher and higher percentages of our  
16       generation from the intermittent resources I wonder what  
17       this does to our need for load following services,  
18       essentially load following services because you know the  
19       power is going to be there all the time and what the costs  
20       are of that as well. If we're displacing some of the gas-  
21       fired generation some of that can respond in ten-minute  
22       reserve and thirty-minute reserve. It isn't constant so we  
23       do need backup power for those contingencies.

24                      DR. TAYLOR: There's no question you need backup  
25       power. But what we save on is the amount of fuel.

1                   In other words, you've already got the gas  
2 turbines there so you don't have to turn them on as often.

3                   MR. DZYKEWICZ: I understand the process, yes.

4                   DR. TAYLOR: Also with wave energy and also with  
5 wind energy at nighttime of course the energy is still  
6 there; the load on the grid is reduced. Therefore you have  
7 to get clever. What do you do with that energy you're  
8 generating at nighttime? Pump storage of course is an  
9 obvious way to use the energy.

10                  Another way, which hopefully is not that far off,  
11 is to use the electricity at night to dissociate the water  
12 into hydrogen and oxygen. So basically you've now produced  
13 the hydrogen for the hydrogen economy of the future. You  
14 have to store the hydrogen but this is all going to be  
15 required anyhow.

16                  MR. KATZ: Commissioner Moeller, I think maybe  
17 you had a question. Let's give you the last shot at this  
18 panel.

19                  COMMISSIONER MOELLER: Another comment occurs.  
20 Yes, we will be dependent on fossil fuels for a long, long  
21 time. But if we do see what happened with the wind  
22 industry, particularly once the industry had the certainty  
23 of the production tax credit, it's increased in almost  
24 exponential fashion. So momentum can take off in a hurry  
25 once things start rolling.

1           I think for policymakers to think about one of  
2           the aspects, what we really did find is with the production  
3           tax credit when you were given the incentive to produce  
4           energy it was particularly effective compared to some of the  
5           other incentives. So it's not our decision, but  
6           nevertheless it's one that worked, and one that if applied  
7           here I'm sure would help as well.

8           And again, fossil fuels for a long time, but this  
9           is going to be part of the solution.

10          MR. KATZ: Mark Robinson.

11          MR. ROBINSON: A real quick question. Maybe,  
12          Wayne, you can help us out here. I'm not asking you to give  
13          proprietary information, or anyone else, but just in terms  
14          of a range, what is it you're trying to come in at in  
15          dollars per kilowatt installed capacity? What would be a  
16          rationale range you're trying to hit in developing these  
17          technologies to bring them online?

18          MR. KROUSE: I'd say in terms of nameplate  
19          capacity versus actual equipment costs we're looking in our  
20          first couple of projects at getting in the \$2000 kilowatt  
21          range. Those are non-tax credit, if you will. We're  
22          looking at revenue generation based on capacity factor.

23          Just as a side comment, I'm a current developer.  
24          Our projects are based primarily -- the projects we're  
25          working on are going to be based on rivers where essentially

1 the capacity factor is close to 100 percent. When you  
2 factor in the overall total cost and look at the end of the  
3 year what it's going to turn out to, that has the ability to  
4 drive those costs down further.

5 Initially on these first projects that's where we  
6 are. It's pretty competitive with some of the other  
7 renewables. We're more competitive than PB, pretty  
8 competitive with wind even just a few years ago, and some of  
9 the other technologies out there such as biomass, if you  
10 will.

11 MR. ROBINSON: When you try to sell this into  
12 some system are you getting any capacity credits for this?  
13 If so, what percent of your installed capacity are you  
14 getting the credit for?

15 MR. KROUSE: If we were to go into a project that  
16 we're working on or proposing to do -- and we haven't  
17 initiated it yet, if you will -- but it would allow for tax  
18 credits if the particular body or the group that we're  
19 putting it in at actually paid taxes. But since it's a  
20 municipal location they don't pay taxes so they don't  
21 qualify for the tax credits.

22 But based on what we think they would qualify  
23 based on the interpretations of the regs.

24 MR. KATZ: With that, we'll conclude the panel.  
25 Thank you very much. We appreciate your time and your

1 coming in.

2 (Applause.)

3 (Pause.)

4 MR. KATZ: Our third panel of the day is going to  
5 deal with regulatory issues.

6 Gil Sperling, our first panelist, is the general  
7 counsel of Verdant Power, Inc., a leading developer of  
8 hydrokinetic systems and projects. When in private practice  
9 Gil focused on the development and financing of power  
10 plants, energy pipelines, and other energy projects. Prior  
11 to that as senior counsel to the Energy Conservation and  
12 Power Subcommittee of the House Energy and Commerce  
13 Committee, Gil worked on legislation that ultimately became  
14 the much known and loved Electric Consumer Protection Act of  
15 1986. He is a graduate of New York University School of Law  
16 and Dickinson College in Carlisle, Pennsylvania.

17 Richard Roos-Collins is Director of Legal  
18 Services at the Natural Heritage Institute, a public  
19 interest law firm based in San Francisco, California. Since  
20 1981 he has represented public agencies and non-profit  
21 agencies in water and energy matters. He is the founder and  
22 director of the Hydropower Reform Coalition, also chairman  
23 of the Low Impact Hydropower Institute. Before joining NHI  
24 he was attorney advisor at the U.S. Environmental Protection  
25 Agency and Deputy Attorney General, California Department of

1 Justice.

2           Thomas Bigford is the Chief of Habitat Protection  
3 Division, Office of Habitat Conservation of the National  
4 Marine Fisheries Service of the National Oceanic and  
5 Atmospheric Administration. In that capacity he directs  
6 national habitat protection programs related to marine  
7 habitats, wetlands and waterways, anadromous species and  
8 watersheds. Mr. Bigford has more than 30 years of  
9 experience in marine research and management. He received a  
10 bachelor of science degree in fishery biology from Michigan  
11 State University, a master of science and zoology and marine  
12 biology from the University of Rhode Island, and a masters  
13 in marine affairs also from the University of Rhode Island.

14           Michael Grainey is Director of the Oregon  
15 Department of Energy, which, among other things, administers  
16 Oregon's programs to increase use of energy conservation and  
17 renewable resources and site large energy facilities. Prior  
18 to joining the department in 1980 Mike worked for the U.S.  
19 Nuclear Regulatory Commission for seven years, where he was  
20 Deputy Assistant Chief Hearing Counsel. He graduated from  
21 New York University Law School and from Gonzaga University.

22           Our last panelist, Des McGinnes, is the Business  
23 Development Manager at Ocean Power Delivery, where he is  
24 responsible for market development in the USA and some other  
25 markets. He has 16-plus years of energy experience in areas

1 including oil and gas exploration and extraction, energy  
2 services, power sales, and biomass applications, and has  
3 most recently turned to wave energy. He has a degree in  
4 engineering and a masters degree in business administration.  
5 He has served as an officer in the Royal Engineers.

6 Thank you all very much for coming.

7 The basic question we'd like the panel to focus  
8 on is whether or not the current regulatory regime works in  
9 these new and inventive technologies. And while our program  
10 is focused on whether the FERC regulatory regime works, I'd  
11 rather have you not just kick us but be equal opportunity  
12 kickers --

13 (Laughter.)

14 MR. KATZ: -- and address whether or not just the  
15 regulatory program here at FERC and the other statutes and  
16 regulatory programs on the state and federal level also work  
17 and ways in which they could better serve this growing  
18 industry.

19 Gil, why don't you start it off.

20 MR. SPERLING: Mr. Chairman, Commissioner  
21 Moeller, than you for your endurance and for having us here  
22 today. We've heard a lot about the exciting potential for  
23 our technology. I would add a reminder:

24 What we are doing is first. We cannot pull this  
25 technology off the shelf. We cannot build systems off the

1 shelf. This is all new. Our goal is to become off the  
2 shelf. We want to be modular. We want to be scalable. In  
3 other words, we want to be very boring just like all the  
4 other people in the power business.

5 (Laughter.)

6 MR. SPERLING: Another point is that we do share  
7 the view that our nation needs all the economic,  
8 environmentally sound and renewable energy we can get. For  
9 us at Verdant it's about developing the resources to benefit  
10 us all.

11 I have to say that Verdant Power is a risk-taker  
12 and an innovator. Obviously you've heard a lot about the  
13 burden today. This coming Monday, weather permitting, we  
14 will deploy the first river-bottom-mounted customer-meter-  
15 connected electricity generator turbines in the East River  
16 in New York. If you can make it there you know you can make  
17 it anywhere.

18 Working alongside our government and our non-  
19 government partners, like the New York State Energy Research  
20 and Development Authority, we've made great progress toward  
21 overcoming the technological and cost barriers to generating  
22 electricity in freely moving tidal areas, rivers -- and what  
23 we haven't mentioned today, man-made waterways. We are also  
24 pleased that we're making progress in educating the workers  
25 within the regulatory environment. This is my first

1 occasion to publicly thank the Commission. Without your  
2 decision allowing us to supply electricity directly to end-  
3 users on Roosevelt Island without the need to obtain a  
4 license our demonstration wouldn't exist. We believe this  
5 Commission can be instrumental in helping the nation realize  
6 the prowess of this technology.

7 With that in mind, there are three regulatory-  
8 related issues I would like to bring to your attention  
9 today. You've heard it a little bit already.

10 First, whether this technology should be  
11 permitted to move forward in the absence of conclusive  
12 evidence that its impact is benign. While we believe -- and  
13 what we've studied thus far -- the impacts would be minimal  
14 and acceptable, we share this concern in part. It's for  
15 this reason we've decided to proceed slowly by demonstrating  
16 our technology in the East River.

17 Over the 18 month demonstration period, as you've  
18 heard today, we will spend more than two million dollars in  
19 fish monitoring. Our issue is fish migration. The  
20 monitoring plan was carefully developed with our friends in  
21 the resource agencies and the fish and wildlife community,  
22 and the results will be shared with them.

23 I will state in answer to Commissioner Kelly's  
24 question, do we want to spend two million dollars and give  
25 all of our information to the next developer who comes

1 along? No. But I can be more emphatic if you would like.

2 (Laughter.)

3 MR. SPERLING: Despite the commitment to and  
4 expense of our demonstration project in the East River as we  
5 enter the active licensing process we're beginning to hear  
6 that our six turbines are not enough. You've heard that  
7 today. It has been suggested that we need to deploy and  
8 study a much larger field of turbines over a more extensive  
9 three or five year period before any consideration should be  
10 given to licensing or for field deployment. We respectfully  
11 disagree.

12 While we believe it appropriate to employ  
13 adaptive management solutions that are proportional to the  
14 identified impacts on fish migration, we do not believe that  
15 it is fair or right to expect us to spend millions of  
16 dollars to deploy a large number of turbines without a firm  
17 license under which we can recover our investment for the  
18 sale of electricity. That raises the second issue: the  
19 time it takes to get things done.

20 We believe the issues related to licensing our  
21 project are fairly simple and narrow. They may have  
22 complicated answers but we know what the issues are. In  
23 this environment delay works in favor of those who want to  
24 do nothing. We, on the other hand, do not have the five to  
25 five and a half years we've been told it takes to get the

1 license. We need to move along the path to commercial  
2 revenue quickly or our investors will pull the plug.

3 At the same time we believe the issues considered  
4 in the licensing process are important and deserve thorough  
5 consideration. We recommend that the Commission work with  
6 the stakeholders in the licensing process to establish firm  
7 deadlines for action. As much as possible, we believe that  
8 publicly available data should be relied on. We support the  
9 idea of an interagency task force or agreement that pulls  
10 the right people together. We believe if this is done our  
11 proposal for an 18 month licensing process from the date a  
12 notice of intent is filed can be realized.

13 Finally, we have a serious problem. We all have  
14 a serious problem with preliminary permits. One current  
15 application seeks nearly the entire Long Island Sound. One  
16 applicant claims that it can do what is required for  
17 developing licensing applications for more than a dozen  
18 projects at the same time. In our view the situation  
19 borders on crisis. At this early point locking up prime  
20 sites for three years or more with no real requirement for  
21 action could prove a death knell for us and for others in  
22 this industry.

23 In response to the issues I've identified today  
24 and to the others that will or have been identified, we ask  
25 for your leadership. We're seeking creativity, which you've

1 already demonstrated. We also ask that conventional wisdom  
2 be re-examined. We ask the question of other agencies:  
3 Does the concept of a fishway apply to this technology?  
4 It's a physical structure, a device or facility. Does it  
5 apply? Is there a discharge from these projects within the  
6 meaning of the Clean Water Act.

7 We also ask that before you issue another  
8 preliminary permit for a wave, tidal, or river kinetic  
9 energy project you consider fundamental changes to the  
10 process. For example, in our view permits should be issued  
11 for no more than 18 months. Applicants for permits should  
12 be required not only to demonstrate greater knowledge of  
13 what needs to be done to prepare a license application, but  
14 also to be able to do more than borrow language from an EPRI  
15 report to describe the technology they intend to use.

16 In addition we think applicants should be  
17 required to demonstrate their ability to actually perform  
18 the studies and consultations needed for a license  
19 application and to be held to specific milestones during the  
20 permit period. Failure to meet those milestones should  
21 result in forfeiture of the permit.

22 We believe these steps will result in a high  
23 percentage of permits turning into license applications.

24 Finally, we would like to engage you in a  
25 discussion of more programmatic approaches. Some of that's

1       been discussed today. We can talk about it in the  
2       questions.

3                   Thank you for this opportunity. I look forward  
4       to your questions.

5                   MR. KATZ: Thank you.

6                   Richard, why don't we just go right down the row.  
7       You're next.

8                   MR. ROOS-COLLINS: Thank you, John.

9                   Mr. Chairman, Commissioners, Richard Roos-Collins  
10       on behalf of the Hydropower Reform Coalition representing  
11       130 conservation groups who operate in all the states where  
12       licensed projects operate. We represent approximately a  
13       million members who are interested in continuing the power  
14       generation benefits of hydropower while also enhancing  
15       environmental quality.

16                   Let me answer John's question in two parts,  
17       first, as to the preliminary permits and then as to  
18       licenses.

19                   As to preliminary permits, we believe that the  
20       existing rules are working just fine. Preliminary permits  
21       by their nature are exploratory. You've granted permits by  
22       which permittees are now investigating the patterns of wave  
23       and currents and other conditions necessary for the  
24       development of license applications.

25                   We are concerned about speculation in preliminary

1 permits. Preliminary permits grant exclusive legal rights  
2 and priority for license applications. We believe you  
3 should apply the existing criteria under your existing rules  
4 to discourage speculation. For example, you could amend  
5 your standard article number four and your preliminary  
6 permits requiring the progress reports and assure that the  
7 progress reports are indeed meaningful. Or else the permits  
8 should be returned to the Commission.

9           Is the licensing process working? We don't know.  
10 The first license application was filed two weeks ago.  
11 Based on what we can perceive, we expect that your existing  
12 rules will work for this new technology. The integrated  
13 licensing process in particular has features which we  
14 believe will be helpful, including the requirement for  
15 stepwise study of potential impacts, the requirement for  
16 cooperation between the applicant, FERC, and other agencies  
17 and stakeholders, and the encouragement for settlement as  
18 the basis for a license.

19           Since time is short, let me make three  
20 recommendations respectfully about how you and for that  
21 matter other permitting agencies could use your authorities  
22 to encourage the development of this new form of technology.

23           First, FERC should programmatically develop our  
24 scientific understanding of the environmental impacts of  
25 hydrokinetic technology. In a license proceeding the

1 applicant does the field studies and develops nearly all the  
2 primary evidence in the record. This practice is workable  
3 for traditional hydro power because we have a common  
4 understanding based on decades of cumulative experience.  
5 Given that experience we can interpret field studies when  
6 submitted by the applicant.

7 We don't have a common understanding of the  
8 impacts of hydrokinetic technology. What we don't know far  
9 exceeds what we do. It's neither efficient nor fair in our  
10 judgment to expect applicants in individual proceedings to  
11 develop our common understanding. Based on comments that  
12 we've heard today as well as other interest expressed in  
13 other forms, we recommend that FERC cooperate with the U.S.  
14 Department of Energy and EPRI and individual states,  
15 including Oregon and other stakeholders to programmatically  
16 analyze the environmental impacts of hydrokinetic  
17 technology. This could be based on commercial operations in  
18 Europe and early trials here. That common understanding  
19 could then become part of the record of the individual  
20 proceedings.

21 Second, in an individual license proceeding for a  
22 hydrokinetic project FERC should formally cooperate with  
23 other permitting agencies and publish a joint environmental  
24 document which is the basis for your respective decisions.  
25 You have that authority today. The integrated licensing

1 process encourages you to use that authority. But it is  
2 exceptionally rare for a joint environmental document to be  
3 the basis for a license decision for traditional hydro  
4 power. There are many reasons for that.

5 I will say that I am critical of the states and  
6 other federal agencies -- even more so than FERC -- with  
7 respect to those reasons. But the fact remains that it is  
8 common for FERC to publish one environmental document and a  
9 state to publish another, and so forth, resulting in delay  
10 and expense for this form of technology.

11 Third, we recommend that FERC include  
12 accountability for environmental impact in the actual  
13 license for a hydrokinetic project. As you know, a license  
14 for a traditional hydropower project includes mitigation  
15 measures such as a flow schedule or a fish ladder or  
16 screens.

17 Those measures are expected to mitigate the  
18 project's adverse impacts on environmental quality. The key  
19 word there is "expected." What happens if the expectation  
20 is wrong? It is difficult to reopen a license, and rightly  
21 so given the reliance of the licensee. Did FERC consider a  
22 new paradigm here where a license includes not only an  
23 obligation to perform mitigation but the actual objective of  
24 protecting environmental quality in some measurable form.  
25 That way if the license achieves the objection, so be it.

1 If it doesn't, there is a known procedure to adjust for the  
2 unexpected impact.

3 Such accountability would reduce the risk of the  
4 pre-license study incorrectly predicting environmental  
5 impact and would reduce the time and expense associated with  
6 the licensed study.

7 Let me conclude by emphasizing the importance of  
8 innovation by FERC and other agencies, and for that matter  
9 the conservation community and all of the stakeholders that  
10 will help to shape the future of this technology. Let me  
11 tell a story that takes us back 114 years. I don't think  
12 you'd expected to see a slide on a hydropower project built  
13 114 years ago in this workshop.

14 (Slide.)

15 MR. ROOS-COLLINS: This is Bode, California in  
16 November 1892. Bode became the first place in California  
17 with hydropower. At the time Bode, California was one of  
18 the largest towns on the West Coast. It had silver and gold  
19 mines. The mines were run entirely with steam. The steam  
20 was based entirely on wood. Gathering and transporting the  
21 wood from the high mountains of California was expensive and  
22 unreliable.

23 The engineer for Standard Mines, Tom Leggett,  
24 persuaded his boss, the owner of Standard Mines, to build  
25 the first hydropower project in California. The townspeople

1 knew their future was on the line but still didn't believe  
2 this would work. This was known as Leggett's Folly.

3 One day in November 1892 Mr. Leggett flipped the  
4 switch and the lights came on in this mine for the first  
5 time courtesy of electricity supplied by hydropower. That  
6 innovation kept Standard Mine and Bode in business for more  
7 than 30 years.

8 Given that America has substantial need for  
9 additional capacity, given our need to address global  
10 warning through renewable energy, and also given our need to  
11 protect aquatic biodiversity, we need innovation. I ask  
12 that if you remember anything from my presentation it is the  
13 importance of our working together to innovate to develop  
14 the future of this technology.

15 Thank you.

16 MR. BIGFORD: Thank you to the Commissioners for  
17 your efforts in organizing this, and the Federal Energy  
18 Regulatory Commission staff especially. Thank you for  
19 organizing this. I appreciate all your efforts.

20 I would like to offer a few comments on behalf of  
21 the National Marine Fisheries Service and colleagues in the  
22 rest of NOAA. I see I'm the only representative of the  
23 federal agencies on the panel here. Unfortunately, I can't  
24 dare to speak on behalf of the other agencies. Hopefully we  
25 share some of these views.

1           NOAA supports appropriately scaled hydrokinetic  
2 ocean energy development that insures that NOAA trust  
3 resources will be protected. That's the basis for our work  
4 on conventional hydropower. We carry that same commitment  
5 through dozens of mandates for the resources to the non-  
6 conventional, the so-called alternative energy, hydrokinetic  
7 and wind also.

8           We've been working cooperatively with  
9 stakeholders for years to address these issues, to provide  
10 information and guidance on environmental issues and  
11 permitting issues. We really want to work with these  
12 sectors to avoid impacts wherever possible, and where we  
13 can't avoid the impact let's minimize them. Working with  
14 industry and working with the regulators beforehand is our  
15 view of the best way to proceed, not work after the fact  
16 trying to remedy mistakes, remedy impacts we might have been  
17 able to avoid or minimize. I'd like to offer a few comments  
18 and recommendations.

19           We feel FERC should ensure that appropriate  
20 environmental assessments and consultations with the input  
21 and participation of NOAA and other resource management  
22 agencies should be completed prior to any in-water testing  
23 or the placement of structures under preliminary permits and  
24 licenses.

25           We are concerned with facilities being put in the

1 water at the preliminary permit stage without going through  
2 the processes established under the Endangered Species Act  
3 or the essential fish habitat provisions of the Magnuson-  
4 Stevens Act. We agree with others that as it was stated in  
5 earlier panels here about the need to collect information  
6 about these impacts. We don't know as much as we wish we  
7 did know. But we have to be very careful when we proceed in  
8 that kind of uncertainty.

9 The Federal Energy Regulatory Commission should  
10 require licensees to conduct ongoing monitoring of the  
11 effects of their operations. We would like to work with  
12 them to develop those monitoring protocols. I think that's  
13 the best way to proceed. If we work together the regulatory  
14 agencies, the industry and resource agencies working  
15 together so that everyone agrees with the design, everyone  
16 agrees with the data collection, everyone agrees with the  
17 data analysis, everyone agrees with the data application.

18 Then there's less chance of people sniping along  
19 the way and you're likely to have a smoother passage to a  
20 successful industry. Without full cooperation along the way  
21 I think there's lots of risks. This is the same way we're  
22 trying to approach working with the LNG industry, the  
23 aquaculture industry, and a lot of others. It can work.  
24 And cooperation usually is a way to streamline.

25 We do have one concern. That's that some of

1       these -- it's been stated that these projects could have  
2       less effect than conventional hydro. One of our concerns is  
3       that some of these projects, many of these different types  
4       of projects are near river mouths. That means that they're  
5       at the mouth of the river where fish are going upstream that  
6       would be affected by multiple dams. So it affects the fish  
7       that would end up being addressed by multiple dams. That  
8       means the river mouths are like a bottleneck, a pinch point  
9       for the species that end up in thousands of river miles and  
10       where they might be affected by many different hydro license  
11       processes. So there could be greater opportunity to do  
12       damage, greater opportunity to do good to the species at  
13       these entry points into the rivers where some of these  
14       projects could be.

15               We support efforts to make licensing and  
16       permitting procedures more efficient and effective. That's  
17       been a basic tenet of a lot of what we've been doing in a  
18       lot of sectors. We just today have been interviewing people  
19       to come and work with us so that we can provide greater  
20       service than we have so far.

21               I and many others feel that alternative energy  
22       has got great potential to do good things for the nation,  
23       for the finances, but we have to make sure that we don't  
24       sacrifice any other mandates for the resources and the  
25       people who use those resources. So we have a very broad and

1 very serious charge here to take care of NOAA trust  
2 resources at the same time we're trying to nurture a new  
3 sector.

4 We support efforts such as Verdant's to study  
5 impacts to marine life and encourage other applicants to  
6 pursue similar studies. Working together is the best way to  
7 do that. We wish we had a lot of money to support that. We  
8 don't. We do have expertise that might help those studies,  
9 more applicable, more useful, more efficient, maybe more  
10 cost-effective. A broader understanding of these new  
11 technologies and their effects will help reduce uncertainty  
12 and improve the efficiency of the licensing processes.  
13 That's one of our objectives in everything we do.

14 Given the uncertainty of impacts associated with  
15 ocean energy projects both from individual projects and  
16 cumulative -- and it was nice to hear earlier speakers on  
17 other panels address cumulative impacts -- we do have a lot  
18 of concern about how monitoring affects permit and license  
19 activities.

20 We see the need for adaptive management. It's  
21 very important. We have to monitor; we have to learn from  
22 the monitoring. And we need some sort of a loop that allows  
23 us to apply what we learn into the activities that are  
24 underway. We're doing this with the aquaculture industry  
25 where they also were really concerned about costs. But

1 they're getting a license that's not forever; it's for a  
2 certain number of years with monitoring. And we have  
3 promised, all of us, including the regulatory agencies, the  
4 Corps of Engineers in this case, to revisit the permits to  
5 make sure we made the right decisions. If we did, great.  
6 If we didn't, whichever way we erred there's a promise to  
7 revisit the decisions.

8 NOAA encourages FERC to consider shorter  
9 licensing periods for this new technology so that will allow  
10 us to incorporate new information into a license provision.  
11 There's an awful lot of uncertainty here. And we think that  
12 proceeding a little bit more carefully will allow us to  
13 proceed a little bit more smartly.

14 A few closing comments here. Again, just  
15 reminding people, we have an awful lot of information needs.  
16 NOAA has got some information that could help here.  
17 Physical oceanography, hydrology type information, but also  
18 about the species and the habitat that the species depend  
19 on. It would really help if someone would become a  
20 clearinghouse for this. Maybe Mark.

21 (Laughter.)

22 MR. BIGFORD: It doesn't necessarily have to be  
23 an agency; it can be one of the groups we work with.

24 EPRI has provided a very crucial role on the  
25 research end. There's a lot of information that relates to

1       these sectors. It would be helpful if we had an  
2       accumulation of that information in one place. A lot of us  
3       have called for more information, even called for using that  
4       information in programmatic approaches, which I think is a  
5       very efficient way of doing this. There are similarities.  
6       There are differences, but there are some similarities.

7               NOAA can provide information on a lot of issues,  
8       including the charting that was mentioned a few minutes ago.  
9       That is something NOAA does. The Coast Guard is involved in  
10      navigation issues, but NOAA produces the charts, electronic  
11      and paper charts. These are all crucial issues that we hope  
12      will be considered during the design, developing business  
13      plans, and proceeding with regulatory decisions.

14             Thanks again for the opportunity.

15             MR. KATZ: Mr. Graineey.

16             MR. GIBSON: Good afternoon. Thank you for the  
17      opportunity to present this statement on behalf of Governor  
18      Ted Kulongoski.

19             Wave energy is important to Oregon, as you've  
20      heard from other speakers, both because of our sites and our  
21      locations on the coast, but also because it is renewable  
22      energy.

23             Governor Kulongoski has proposed a real energy  
24      action plan and a comprehensive legislative package, which I  
25      have provided copies for you of, including increasing

1 incentives for wave and other renewable energy, and also  
2 establishing an RPS under which wave energy would receive  
3 full credit as one of the qualifying resources.

4 Under that standard virtually all of Oregon's  
5 electric load growth would be met by new renewable energy.  
6 So in answer to John's question earlier, we would still be  
7 expecting to burn natural gas as well as coal and use  
8 existing hydro facilities. But our hope and expectation for  
9 new resources is we would not be relying on natural gas or  
10 coal.

11 Let me mention a few points. First on the  
12 licensing process, I believe that your licensing process is  
13 not well suited for ocean energy. I invite you to work with  
14 the states on a quicker, simpler process for ocean energy  
15 that allows this new technology to go forward while still  
16 protecting the environment. I offer you a couple of  
17 options.

18 One, I think you can take another look at your  
19 definition of hydroelectric facilities and whether ocean  
20 energy and wave energy in particular are even hydro. These  
21 are power plants. The issues that are presented are power  
22 plant siting issues that FERC doesn't traditionally do. The  
23 states do power plant siting. Raising this issue, I'm not  
24 talking about in hydro systems or in river systems. I think  
25 you should consider exercising jurisdiction over those but I

1 think you should reconsider the question of ocean energy.

2           Secondly, if you're not willing to go that far,  
3 you could delegate to the states the siting under your  
4 general authority. The Clean Air and Clean Water Acts with  
5 EPA provide a good model of successful delegation of the  
6 federal government to the states. Under that each  
7 individual state submits a plan for approval to EPA. You do  
8 a similar process here.

9           We'd be willing to work with you for clarifying  
10 legislation under either of those paths. In either event I  
11 would urge and I would beg you not to use the process you're  
12 currently using either for hydro facilities or LNG  
13 facilities. That's simply too long for this industry to be  
14 able to go forward.

15           Let me mention a couple of specific things on  
16 both permits and on the license process.

17           As other speakers have mentioned before, the  
18 permitting process in a sense is too easy and too open-  
19 ended. FERC's permits have been used by speculators to lock  
20 up sites prematurely. As a result two of our counties have  
21 actually filed permits in an attempt to preserve other sites  
22 for the general public and they've actually encouraged the  
23 state to file an application for the entire coastline of  
24 Oregon. We're not sure that's necessarily the right path to  
25 go. But the permit process needs reevaluation.

1                   We've had a couple of suggestions by others for  
2                   due diligence requirements which I think would be excellent.  
3                   You should also look at the financial and technical  
4                   expertise of the applicants and make sure there's a standard  
5                   for issuing the permits. And if there's failure to act  
6                   within a certain period of time on existing sites that  
7                   permit holders already have, limit the number of permits  
8                   that an applicant can have.

9                   Second, on the licensing process itself, Mr.  
10                  Chairman, I believe earlier you mentioned it would take  
11                  three years under normal FERC licensing process exercising  
12                  your best efforts. In Oregon we can site a power plant with  
13                  a centralized siting process for large energy facilities in  
14                  one year from the time of the completed application. That  
15                  process has sited thousands of megawatts of power plants,  
16                  hundreds of miles of transmission lines, as well as natural  
17                  gas storage facilities and underground natural gas  
18                  pipelines.

19                  We think it's a good process, a process that has  
20                  standards; and it's a simplified process in which the  
21                  applicant goes to one license authority. That process  
22                  covers all other state and local permits that would normally  
23                  be issued by other agencies.

24                  California and Washington State, which we work  
25                  closely with, have centralized siting processes as well. So

1 at least for the entire West Coast I think there's the  
2 opportunity to work collectively and cooperatively with us  
3 on a new process.

4 Finally, once again I would urge you to avoid a  
5 central preemption. We've seen that with LNG it has caused  
6 confusion and sort of left us with the worst of both worlds  
7 where applicants, based on their own counsel's legal advice  
8 and in some cases advice from federal and state agencies and  
9 local agencies, have been applying to everybody. They've  
10 been applying to FERC; they've also been applying to local  
11 agencies, and independently to separate state agencies.

12 It's a process that wouldn't have happened if we  
13 had continued with our review, which we were underway for  
14 three different facilities in Oregon proposed for LNG. We  
15 would have one process where the applicant and the public  
16 would know where the process was going and where to bring  
17 their issues and where to try to get their issues addressed.

18 I encourage you to take a look at a process like  
19 that, on a much faster, simpler scale, for wave energy.

20 Thank you very much.

21 MR. MC GINNES: Thank you very much for giving me  
22 this opportunity. I feel like the fox in the hen coop. I  
23 am not a big fan of the current system. If you'll allow me  
24 some latitude I'll explain why. I come to this from a UK  
25 perspective.

1           What I'd like to do is open up again some  
2 grounding so you'll understand some of the later stuff that  
3 will follow and the basic systems that we have to deal with  
4 in the UK. And I'll then tell you the current state of play  
5 and close off by hopefully talking about some of the things  
6 that we do.

7           First of all, you have to negotiate a lease to  
8 use the seabed. That is a very rigorous process with all  
9 the business plans and the financial aspects of the company,  
10 and they have a very strong emphasis on decommissioning  
11 plants. They don't want any legacy stuff left on the  
12 seabed.

13           Thereafter having achieved this you can go forth  
14 to the various government departments in the UK. There are  
15 two of particular interest: There's the DTI, the Department  
16 of Trade and Industry, and the other one is the Department  
17 of Environment, Farming and Rural Affairs. To keep the  
18 system simple the DTI takes the lead; they do all the  
19 overall coordination. That's one thing that doesn't  
20 currently happen here. There's still quite a bit of  
21 confusion as to who has jurisdiction for MMS.

22           Then through the one-stop shop, if you like --  
23 which is a target -- within a year to 18 months you go for  
24 things like the connection to the grid. That comes under  
25 the electricity. Stuff on the seabed comes under the Food

1 and Environmental Protection Act. Marine construction is  
2 the Coastal Protection Act. So you can see there's a  
3 plethora of acts much similar to what you have here.

4 What you don't have is an overall one-agency  
5 focus to bring the whole thing to fruition.

6 Whatever you do in the UK you have to carry out  
7 environmental studies and assessments. Then, depending on  
8 what you do, the degree to which you have to do this, if  
9 you're doing a demonstration project you have to submit an  
10 environmental impact assessment. And the DTI have taken the  
11 view that this should carry a fair degree of proportionality  
12 to the risks associated with these area demonstration  
13 projects.

14 Also the DTI has taken the lead and they have  
15 published clear guidelines as to the steps required to go  
16 through this process. There's a lot of clarity. If you go  
17 for commercial projects, the minute you talk commercial you  
18 are talking about -- it's mandatory that you have a  
19 strategic environmental assessment. That's under EU law.  
20 Then subsequent to that you have to submit your individual  
21 environmental impact assessment.

22 Things become a wee bit more muddy beyond this.  
23 In Scotland we have devolved government. We have very  
24 strong renewable energy, more so than the UK in general.  
25 The devolved government has jurisdiction over the renewable

1 energy policy. And we also have the best wave resources  
2 probably in the world, and we have a high percentage of the  
3 base development in Scotland.

4 When I say that, it certainly tempers and  
5 encourages Scottish enthusiasm for this technology. And we  
6 want to bring this technology into commercialization. We  
7 have two main sets in the UK.

8 We have overlapping jurisdiction with the DTI,  
9 which has taken the view that things are progressing. The  
10 technology is still not quite at the commercial stage. It  
11 will take about one or two years to do an environmental  
12 survey, a strategic environmental assessment. So they feel  
13 we have time enough at our disposal to just watch the  
14 process develop.

15 The Scottish are a lot more bullish. They see  
16 the opportunities and they very much want to grasp this  
17 particular method and get commercial projects in the works  
18 as quickly as we can.

19 Now to flip back to DTI, their emphasis is very  
20 much on small scale demonstrations currently. And they have  
21 a funding mechanism to suit that constrains projects to  
22 within about 9 million in terms of expenditure. The  
23 Scottish system has an enhanced funding mechanism. We're  
24 really looking to be talking about installations and the  
25 first 75 megawatts installed to bring these technologies to

1       fruition.

2                   Contrary to the UK DTI, the Scots have also  
3       commissioned a strategic environmental assessment. That  
4       work has already been completed and the paper will be  
5       published in the spring of this year. That sends a clear  
6       signal to the market that both areas are very much behind  
7       this, and it makes it a lot easier for companies like ours  
8       to attract investment that's necessary to do this sort of  
9       work.

10                   I'll turn now to what's actually working just to  
11       re-emphasize some things.

12                   There's definitely quality in the UK market. We  
13       know what to get and from whom to get it. We know the  
14       bodies themselves have clear jurisdictions over the decision  
15       process. There's no ambiguity as to what organization is  
16       responsible for what measures. We have the DTI one-stop  
17       shop, which is a very easy way to conduct the whole process.

18                   As I said before, there is an expectation that  
19       this should be able to come about within 18 months. I  
20       should flip back and say that strategic environmental  
21       assessment was done within one year. It needn't take a long  
22       time to get this sort of work carried out if the will is  
23       there and the budget is there.

24                   Some previous speakers talked about the need for  
25       shared knowledge. Both the DTI and the Scottish Exec will

1 fund environmental assessment work and they will fund  
2 generic work, specifically technologies. But if it has a  
3 generic bias to it they will fund that portion of the study.

4 And there's one issue that is common to both  
5 markets, the U.S. and to here. That's the duration of the  
6 leases that are required. Depending on where you are and  
7 your own learning curve, you may be happy with a seven-year  
8 lease, as is the current expectation from the DTI. But if  
9 you're in a situation to put in commercial projects as soon  
10 as possible, a seven-year lease with no guarantee or no  
11 provision for extension causes us problems in financing  
12 projects. So that's a fair problem to our industry.

13 And I don't want to preach too much. But I'll be  
14 happy to field any questions.

15 COMMISSIONER KELLIHER: Thank you very much. I  
16 have some; my colleagues probably do as well.

17 I wanted to ask the panelists to respond to each  
18 other. Basically there are a couple of interesting points  
19 you all raised. One was -- I think Mr. Sperling raised and  
20 Mr. Grainey raised. Some of the applicants for preliminary  
21 permits have identified very large swaths as the site that  
22 they want to study. And the swaths are too large.

23 I'm going to make an analogy that you didn't  
24 make. But you're stressing that we wouldn't do the same  
25 thing -- we wouldn't allow the same thing for a river, we

1 wouldn't allow someone to say. 'I want a preliminary permit  
2 for the Columbia River.' We'd say, 'That's not a site;  
3 that's a river system.'

4 Are you saying that we should reject the  
5 preliminary permit that proposes that large of an area as  
6 the site? If so, would we reject it for both the counties  
7 that have filed those permits as well as other applicants?

8 MR. GRAINEY: Mr. Chairman, I was suggesting --

9 COMMISSIONER KELLIHER: I was wondering if  
10 basically the other panelists should respond. Should we say  
11 you can't have too large of an area as a site for a  
12 preliminary permit for an ocean project?

13 MR. GRAINEY: I think the issue is not the area  
14 of the site so much as what happens with that permit, and  
15 the fact that there's no obligation of due diligence on the  
16 permit holder.

17 There's three years in which that permit can sit.  
18 We also have a situation in the case of some in-river  
19 permits that have been filed I believe by one firm that has  
20 no technical dealings in hydroelectric. Around the country  
21 there are a number of different sites that are very narrowly  
22 defined but they've locked up those sites. That's their  
23 intent with new technologies. I think that's wrong. I  
24 think what the permit entitles the permit-holder to do is  
25 what needs to be looked at.

1                   MR. SPERLING: Mr. Chairman, we have some  
2 specific experiences with this. We filed a preliminary  
3 permit application with a specific footprint. That was  
4 based on the knowledge we have of the velocity of the East  
5 River, the flows in the East River, and what we would need  
6 in order to generate ten megawatts, which we have described  
7 with our partner, Nicerta, who has provided us with funding  
8 on the project.

9                   As we got into the project and began the  
10 consultations we had to move. The Coast Guard didn't want  
11 us in the middle of the river. We had to move closer to the  
12 shore. We had to deal with recreational impacts. We're now  
13 on the west side primarily of the East River channel. The  
14 end result is our license application is going to have a  
15 significantly expanded footprint over the preliminary permit  
16 area.

17                   You learn during the permit process, and during  
18 all the things that you have to do to get a license, where  
19 you can be. So geographic limitations don't make a lot of  
20 sense to us.

21                   What does make sense is imposing more of a  
22 burden, as was just described, on the permit-holder. If  
23 there are substantive things they have to know in order to  
24 get a permit. If there are capabilities they have to  
25 demonstrate, if there are milestones they have to achieve,

1       you don't have to worry about the geographic scope.

2               MR. BIGFORD: One additional thought on that.

3               All of us have limited resources. If there are  
4       speculators out there it dilutes our ability to provide  
5       service to the serious applicants. I think that's a real  
6       problem. We would love to be able to help everybody, but  
7       we'd really like to be able to dedicate most of our  
8       assistance to the people who are most serious instead of  
9       people who might just be moving along very slowly. I think  
10      that just hurts the entire industry.

11              COMMISSIONER KELLIHER: And you'd separate the  
12      two through requirements?

13              MR. BIGFORD: If their application is not flush  
14      with details; if they're just parroting back information in  
15      EPRI reports. Some of the real vague criteria we've heard  
16      here, I think there would be a way of testing the veracity  
17      of an application. And it could be that some applicants for  
18      permits are not as serious as others.

19              It would be nice to not give preliminary permits  
20      to anybody unless they were serious and remain serious.

21              COMMISSIONER KELLIHER: Not just imposing a due  
22      diligence requirement on recipients of preliminary permits  
23      but somehow rejecting some initially as somehow not being  
24      serious?

25              MR. BIGFORD: Not being as complete, not being as

1 serious once they do get a permit and they do not proceed,  
2 through quarterly reports and things like that that were  
3 discussed by others. They have to be serious from the  
4 beginning and they have to remain serious. If they're not  
5 and they're using up some of our resources -- and I'm  
6 talking about time and technical assistance capabilities --  
7 it hurts the others who are serious.

8 MR. SPERLING: We think applicants should include  
9 a demonstration of financial capability to conduct the  
10 studies. It should include specific knowledge of the types  
11 of studies and consultations that have to take place. It  
12 should include a discussion and a demonstration of  
13 familiarity with the specific technology that's going to be  
14 deployed.

15 There may be a range of technologies, but it has  
16 to demonstrate capability -- financial, substantively,  
17 engineering-wise, all that -- to use the word, adds up to a  
18 serious applicant. If it's not in the application and it's  
19 not required in the application, the applicant should be  
20 rejected.

21 COMMISSIONER KELLIHER: Would that leave us with  
22 two very different types of preliminary permit applications,  
23 one for the convention projects where there's a certain  
24 threshold and a very different threshold for the new  
25 technologies?

1                   MR. KATZ: I was going to abuse my privilege as  
2                   facilitator to speak to this a little bit, although I am not  
3                   at all in disagreement with the panel that there is a  
4                   tension between the preliminary permits and not just for  
5                   unconventional hydro but also for conventional hydro under  
6                   our ILP which takes a long time and yet a permit is only  
7                   three years. So does someone run the risk of engaging in  
8                   good faith in the ILP and then running out of their  
9                   preliminary permit term.

10                   A couple of things. One I'll defer to Mark if he  
11                   wants to hop in.

12                   MR. ROBINSON: Yes.

13                   MR. KATZ: This is a regime where the Division of  
14                   Hydropower Administration in compliance reviews regular  
15                   progress reports. I believe they've been increasingly  
16                   vigilant in terms of pushing people so that if they do see  
17                   someone who is just sitting on their hands telling them they  
18                   need to get moving or lose the permit.

19                   I guess the tension with preliminary permits is  
20                   that Congress created them for a specific purpose as  
21                   separate from a license application. If you're ready to do  
22                   a license application and you have the money and the  
23                   wherewithal and the knowledge to do it, you can come in for  
24                   a license application.

25                   The whole idea of preliminary permits was to

1 encourage people to in some sense speculate, to try and work  
2 out ideas, to think, 'well, maybe I want it on the left  
3 bank, no I want it on the right bank' over the course of the  
4 permit. There's a long history of Commission precedent  
5 talking about how inchoate things are during the preliminary  
6 permit stage and that the Commission won't require too much  
7 because that sort of is antithetical to the very purpose of  
8 a permit itself. So if you do too much in terms of  
9 demanding a lot in the preliminary permit stage it's not  
10 really a preliminary permit; it's some other instrument.

11 That's not to say that there aren't tensions that  
12 don't need to be worked out under the terms of the statutory  
13 construct. I think the Commission has to be careful in  
14 terms of not going against what Congress's intent was for  
15 this particular instrument. That doesn't mean that perhaps  
16 it wouldn't be fruitful to explore with Congress -- for  
17 Congress to look at whether that mechanism still works. But  
18 it does sit there in the statute and we have to pay heed to  
19 it to some extent.

20 MR. GRAINEY: Mr. Chairman, I would just add the  
21 criteria that Gil mentioned, I support those, too. As a  
22 policy matter those are the same types of criteria that we  
23 have on the state level for all energy facilities.

24 MR. MC GINNES: I'd like to add, I'm wondering if  
25 it might be more prescriptive in the process. At the moment

1       it would appear to me that the device developer or  
2       speculator could always set the agenda for what studies are  
3       done by when. I feel there may be scope for some outlying  
4       work done very quickly to discover which milestones have to  
5       be kept open in what time horizon in order to keep the  
6       momentum on any application that comes through.

7               MR. ROOS-COLLINS: Mr. Chairman, I agree one size  
8       won't fit all. Folks should not adopt a policy that  
9       prescribes the geographic scope or other elements of due  
10      diligence. On the other hand, you could require an  
11      application to include in a permit application a plan for  
12      the due diligence they will do. And you could assure in  
13      review of that plan and consideration of comments from other  
14      potential applicants whether the plan was truly expeditious  
15      and diligent. So if they say they need three years to  
16      investigate currents and another developer says no, that  
17      could be done in six months, you would take that into  
18      account before you approve the permit.

19              COMMISSIONER KELLIHER: I'd like to follow up,  
20      unless there are any more on the right side here, on the  
21      notion of a programmatic EIS.

22              I think it was Mr. Roos-Collins or Mr. Sperling,  
23      one of you all raised the possibility of a programmatic EIS.  
24      And I'm curious as to what Mr. Bigford here thinks about  
25      that.

1           I know a programmatic EIS is used in nuclear  
2 energy for independent spent fuel storage installations,  
3 basically a concrete pad, you put NRC-licensed storage  
4 canisters on it. And a concrete pad doesn't vary remarkably  
5 from one site to another. The NRC has a programmatic EIS  
6 for that. That would seem to be appropriate for that kind  
7 of facility.

8           Do some of these technologies lend themselves to  
9 a programmatic EIS, some of the ocean projects? Do they  
10 lend themselves to a programmatic EIS, or would NOAA think  
11 about that?

12           MR. BIGFORD: I'll go first.

13           We do programmatic EIS's, programmatic  
14 consultations, programmatic anything whenever it's  
15 appropriate, whenever we can our arms around an issue with  
16 enough confidence that multiple actions in different places  
17 have similar impacts and could be addressed with similar  
18 reactions.

19           We did a programmatic EIS on the ocean thermal  
20 energy conversion, the ocean thermal energy concept when the  
21 law was first past in the early '80s. We have not done too  
22 many nationwide.

23           I really think programmatic and a regional  
24 approach might be the way to go here. It could be  
25 programmatic from a regional perspective on a certain type

1 of energy where you have a similar species, similar types of  
2 habitat, similar types of activities -- maybe tidal in Maine  
3 or wave in the Northwest, something like that. I think you  
4 could address these. You would not have to do it on a  
5 project by project basis. But you might not be able to do  
6 it for the entire country. Somewhere in between there there  
7 are efficiencies.

8 COMMISSIONER KELLIHER: Is a programmatic EIS  
9 inappropriate for some such as the tidal projects? We'll  
10 need to do a programmatic EIS? It seems you could do a  
11 programmatic EIS -- perhaps it limits the scope of issues --  
12 but then you'd also need to do a site-specific one for the  
13 East River.

14 MR. SPERLING: We think that's correct, although  
15 let me caveat. I don't want to say our warm enthusiasm but  
16 somewhat enthusiasm because I did raise the idea of  
17 exploring a programmatic EIS with you.

18 To the extent a programmatic EIS involves a  
19 demonstration of technology -- which is how I've often heard  
20 it -- we have to be careful of the cost of that technology.  
21 We are in the private sector. We have institutional  
22 investors and we have individual investors. Our investors  
23 will not support spending \$20 million to put ten megawatts  
24 or five megawatts or three megawatts or whatever number of  
25 turbines are required for the purpose of conducting a

1        programmatic EIS with the idea that we will take those  
2        turbines out of the water and we won't have an opportunity  
3        to earn a return.

4                    We do think that discussion of programmatic EIS  
5        at the regulatory level ought to be combined perhaps in the  
6        Congress with the notion that perhaps there are some unique  
7        aspects of this technology that would make sense to have  
8        public funding. We have suggested -- and I think it's in  
9        the Ocean Renewable Energy Coalition Conference -- the  
10       notion of a revolving fund that would fund these  
11       demonstrations. And then when they are successful the  
12       developer would pay it back with interest that would be used  
13       for financing development projects. And we would have a  
14       revolving fund that would demonstrate these on a technology-  
15       specific or regional basis. We think that's a real good  
16       idea.

17                   MR. MC GINNES: Could I just add to that?

18                   There's a precedent in the UK in the off-shore  
19       wind industry, when there was competitive bidding there was  
20       a slush fund created to do just that.

21                   COMMISSIONER KELLIHER: Is that what you called  
22       it?

23                   (Laughter.)

24                   COMMISSIONER KELLIHER: It has a different  
25       meaning here.

1 (Laughter.)

2 MR. GRAINEY: It looks at the issue of noise,  
3 operation and construction of the devices and that sort of  
4 stuff, vibration and magnetic interference or whatever.  
5 That fund is there, is talked up; and as the next issues  
6 come up as an industry that fund will be deployed to do that  
7 sort of programmatic research. So the call for some sort of  
8 central funding to do that in the absence of any other  
9 mechanism I think is a very valid one.

10 COMMISSIONER KELLIHER: Any other comments?

11 Yes, sir.

12 MR. ROOS-COLLINS: Mr. Chairman, a programmatic  
13 EIS would be helpful if it were structured to cover the four  
14 geographic categories or other appropriate categories that  
15 constitute this technology. Namely, it's not going to be a  
16 perfect fit for any given site. But if the studies done at  
17 that specific site confirm that the impacts are likely to be  
18 within the box already developed in the EIS then of course  
19 there's less need for study or review and we get to a  
20 decision quicker.

21 I think it would also be useful if the  
22 programmatic EIS were jointly undertaken by coastal states  
23 and the Army Corps of Engineers and the other permitting  
24 agencies so that they did not have to reinvent that wheel  
25 when they came to their permitting issues.

1                   COMMISSIONER KELLIHER:  When we do an EIS we do  
2                   consult with other federal agencies.  We tend to have one  
3                   federal EIS document issued.  We can't, of course, compel  
4                   other agencies to join us in an EIS -- and they sometimes  
5                   issue a supplemental EIS on their own.  But I don't think  
6                   that the practice is for states to join us in an EIS because  
7                   EIS is under NEPA; it's governing major federal actions.

8                   MR. ROBINSON:  It varies by program.  On the gas  
9                   side the states very commonly will participate with us.  In  
10                  the hydro program we put a considerable amount of effort to  
11                  work with the states to have them join us, with less  
12                  success.

13                  COMMISSIONER KELLIHER:  On the gas side they  
14                  sometimes forego their own independent review?

15                  MR. ROBINSON:  No.  It's a coordinated review.  
16                  They're satisfying their state environmental laws while  
17                  we're satisfying the National Environmental Policy Act.

18                  MR. KATZ:  Richard, let me pick on you for a  
19                  question since this is a question I got from some of the  
20                  Commissioners and their staffs when I was preparing this.  
21                  And I'm not sure we could answer on your behalf.

22                  There was some interest in folks knowing whether  
23                  there was a view in the environmental community -- and  
24                  certainly anybody else who has an opinion can answer this  
25                  question as to whether there was a distinction between small

1 -- traditional small hydro and the type of technologies  
2 we're talking about here in terms of whether it was viewed  
3 as less environmentally intrusive, whether there were more  
4 opportunities for developing a different regime for the  
5 wave, tidal technologies as opposed to small traditional  
6 hydro.

7 Can you possibly address that?

8 MR. ROOS-COLLINS: There's no conventional  
9 wisdom. And NHF doesn't have a policy so this is my  
10 personal opinion.

11 My personal opinion is that there is a  
12 significant difference. Traditional hydro power, even if  
13 it's small, typically blocks downstream passage of sediment  
14 and can affect upstream passage of fish and other aquatic  
15 life, whereas the hydrokinetic technology in all of its  
16 forms does not completely block passage at any location. It  
17 may affect it but it doesn't block it. As a result I  
18 personally think that hydrokinetic has promise, which small  
19 hydro power does not, to provide capacity while also  
20 protecting aquatic biodiversity.

21 MR. KATZ: Thank you. That's a helpful view.

22 COMMISSIONER MOELLER: I want to thank the panel  
23 for another interesting discussion.

24 But I want to particularly thank Mr. Grainey  
25 because we worked together in the past when our states dealt

1 with nuclear waste issues. I'm happy to say we're on a  
2 happier subject today, particularly from the Oregon  
3 perspective. And also, Mr. McGinnes, from the UK  
4 perspective.

5 I'd just like your observations on the  
6 sensitivity of fish migration, particularly in the  
7 Northwest. Salmon as we know is a very big issue.  
8 Obviously that's come up. I'd like to hear your  
9 observations on that.

10 MR. GRAINEY: Commissioner Moeller, certainly  
11 that's an issue that's going to have to be looked at at any  
12 specific site. But the reaction in the coastal community so  
13 far has been very supportive of proposals for wave energy.  
14 I think they view these technologies will be much less  
15 intrusive than, say, the hydro, traditional hydro.

16 I think with adequate monitoring and studies we  
17 can design sites that are good sites in terms of energy  
18 production and also protective of fish and other wildlife,  
19 for that matter. I look at the wind turbines as an example.  
20 We require monitoring before beginning our review for a  
21 year-long monitoring of patterns, of bird patterns for  
22 potential wind kills. That's a criteria for successful  
23 siting to minimize or avoid significant bird kills. We've  
24 been successful at doing that.

25 I think we can do the same thing in the case of

1 wave energy.

2 MR. MC GINNES: Our device -- and I'm sure there  
3 are a number of other devices -- is to be placed in deeper  
4 water, 30 meters-plus type water, so bottlenecks isn't as  
5 relevant. We are also fairly flexible given a good  
6 connection point where we locate the site. It gives us some  
7 flexibility, if you like.

8 I should say that in the UK the fishermen, the  
9 fishing community welcomed with open arms the introduction  
10 of the EMEC Center that you talked about before. They have  
11 used it positively. They felt -- it's heavy calving and  
12 lobstering area and they felt like having certain area that  
13 were designated fish reserves, if you like, would be a good  
14 thing for the overall industry. Even the fisheries people  
15 generally considered wave energy to be a rather benign form  
16 of renewable energy. To date they have been very supportive  
17 of wave energy in the UK.

18 COMMISSIONER MOELLER: If I can follow up, we had  
19 some material on this site. Are there any fish studies that  
20 have come out of that so far that you're aware of? I  
21 presume it is deeper.

22 MR. MC GINNES: The depth I think is somewhere  
23 around 40 meters.

24 But there's an ongoing process of monitoring.  
25 The EMEC Center has the capability of four lines of two

1 megawatts each, so it has a limited application. And it's  
2 part of the UK's methodology to do some study. And we'll be  
3 doing next year some noise studies using a device with EMEC  
4 to flesh out some of our understanding. It's work in  
5 progress, I would say.

6 MR. BIGFORD: A few thoughts in response to that  
7 question.

8 Whether it's migrating fish or resident fish,  
9 fish don't use the water column the same everywhere. And  
10 the species are not the same. In some places if a project  
11 is put near the shore, for instance, that might be where the  
12 fish tend to be. A lot of species are near the edge of the  
13 water. That's true in the ocean where there are continental  
14 shelves. The shore is a lot more productive than the middle  
15 of the ocean. It's true in a river, too.

16 It might be that by moving a facility away from  
17 recreational boat traffic, for instance, away from  
18 navigation, moving it into the more valuable habitat where  
19 you might be increasing the potential connection to  
20 affecting fish and their habitat is something we might have  
21 to work on together. It could very well be site-specific.

22 COMMISSIONER MOELLER: A good perspective; a lot  
23 more to learn. But at least we know they're not nets which  
24 will indiscriminately take fish whether they're endangered  
25 or not.

1                   COMMISSIONER KELLY: Mr. Grainey, if FERC were to  
2 adopt a preliminary permit process that included due  
3 diligence aspects, would that solve the State of Oregon's  
4 and the county in Oregon's controls about land use off the  
5 coast?

6                   MR. GRAINEY: Commissioner Kelly, that would  
7 address the problems that we were encountering on the  
8 preliminary permit filings. You still have the basic  
9 question of the licensing process that traditionally you've  
10 used; and whether that's appropriate for this technology, I  
11 think that needs to be looked at as well.

12                   COMMISSIONER KELLY: As I recall, your primary  
13 concern about that process was the length of the process?

14                   MR. GRAINEY: The length and complexity and cost.  
15 And I think the states, it's not only a quicker process but  
16 I think they can address issues of local concern in a more  
17 timely manner, whether that's approval or disapproval. I  
18 think it can be a quicker process that's more readily  
19 accepted by local communities.

20                   COMMISSIONER KELLY: If I could ask staff, if  
21 there are fewer permits that need to be obtained from other  
22 agencies would the process need to be as long as it is for  
23 hydro?

24                   MR. KATZ: No. That's probably the case not.  
25 I'm not sure how the statutory regime would change. There

1 is the Clean Water Act, there is the Endangered Species Act,  
2 there is the Magnuson-Stevens. I don't think any of those  
3 statutes are going anywhere.

4 So I'm sure if Congress were to say there's one  
5 agency, whether it's FERC or the Oregon State government or  
6 whoever, and they have the authority to make all decisions  
7 regarding any type of project, yes, it's going to move much  
8 more quickly. I don't know what the possibility of that is  
9 occurring.

10 COMMISSIONER KELLY: It was stated I think by the  
11 environmental panelists earlier that there's no water  
12 quality impact. So do we still need a water quality permit?

13 MR. ROBINSON: I think that's one of the things  
14 to be determined, whether or not a 401 would be required for  
15 an industry and facility like this.

16 What worries me more than a coordination of  
17 permits or in terms of the speed of the process would be the  
18 information. That's really where we're going to have to  
19 extend some staff resources to figure out what it is that we  
20 can and can't do, given sort of the stage of development of  
21 this industry. We know the factors associated with the  
22 impacts but we don't know how they will actually play out.  
23 We just don't have that information.

24 I know that you all will be asking us, well, what  
25 is going to happen to that migratory fish that are coming

1 in; will they be ten percent reduced or no percent reduced  
2 or 50 percent reduced. I'm not sure how we get to that  
3 right now with the information we have. So I'm more worried  
4 about just the base of information that we have with this  
5 industry than I have with coordination with the state or  
6 federal agencies.

7 MR. KATZ: Let me hop in and give an unsolicited  
8 legal opinion on the 401 issue.

9 Given the Supreme Court's very broad  
10 interpretation of discharge in the S.D. Warren case I would  
11 be very hesitant to state that it would not apply. It might  
12 not, but I would not be counting on that.

13 COMMISSIONER KELLY: Mr. Sperling, have you had  
14 dealings with water quality agencies? Have they been  
15 concerned about --

16 MR. SPERLING: We've adopted an approach in the  
17 demonstration to consult and work with all interested  
18 parties. So whether it's a legal jurisdiction or an  
19 interest they've expressed, we've been willing to sit down.

20 We are pretty confident. I raised issues of  
21 whether Section 18 applies; I've raised issues whether  
22 Section 401 legally applies. Those are good intellectual  
23 arguments. For us moving through the licensing process and  
24 wanting a quick result we're going to sit down with  
25 everybody. And we are hopeful that everyone will send

1 people to the table and work in the timeframe we have, and  
2 that we will not have to present those legal issues because  
3 we've been able to resolve those types of things. In the  
4 long term I still think those are legitimate issues on the  
5 table.

6 COMMISSIONER KELLY: One other issue that was  
7 brought up by Mr. McGinnes that was of interest to me is the  
8 decommissioning plan that you said was a requirement of your  
9 lease.

10 MR. MC GINNES: It always goes back to the due  
11 diligence. The states do have a very rigorous process of  
12 due diligence for any or all permit or lease applications.  
13 And a big emphasis is to make sure there is enough financial  
14 resources and engineering capabilities to remove any devices  
15 that have proven not to be successful. They don't want to  
16 be stuck with stuff on their seabed.

17 MR. SPERLING: Commissioner Kelly, we were asked  
18 that exact issue in our conversations leading up to the  
19 demonstrations. One of the agencies implored the Corps of  
20 Engineers to impose upon us a requirement for a  
21 decommissioning fund. We implored the Corps of Engineers  
22 not to do that, and ultimately they decided not to. It's a  
23 very, very significant cost issue.

24 As we move forward to commercial development of  
25 these projects one of the ones we haven't talked about today

1 is the need to get the debt markets into this. Most energy  
2 projects are capital-intensive and most are heavily debt-  
3 financed. If we're to do nothing but equity financing on  
4 these projects we're not going to have a lot of them.  
5 There's just not enough money.

6 To get the debt markets in has a whole set of  
7 parameters and requirements about assured returns, the time  
8 frame of a return, the overall cost of the project, that are  
9 confronting these new emerging technologies. So types of  
10 burdens at this time would be extremely detrimental.

11 COMMISSIONER KELLY: Would that be the type of  
12 thing that federal money would be helpful?

13 MR. SPERLING: Absolutely.

14 COMMISSIONER KELLY: Would it be more helpful in  
15 decommissioning?

16 MR. SPERLING: If I had federal money I would  
17 have federal money in the programmatic approach, the  
18 demonstrations of the technology. We would love to deploy  
19 turbines in the East River and we would love to commit to  
20 take those turbines out if the impacts are much larger if  
21 somebody else is paying for it. We'd be happy to do that.

22 COMMISSIONER KELLY: So would I.

23 (Laughter.)

24 MR. SPERLING: We're good citizens.

25 MR. KATZ: At this point if there aren't any

1 further immediate questions, this is the time we'd reserved  
2 for an open forum to give the folks out in the audience and  
3 on the phone the chance to make any comments they might wish  
4 to.

5 You can stay seated if you want to or you can  
6 head back to the crowd.

7 Folks, you're going to need to wait until someone  
8 from the staff comes around to you with a microphone.  
9 Please identify yourself.

10 I see the gentleman in the front row.

11 COMMISSIONER KELLIHER: Why don't we ask the  
12 panelists to stay where they are.

13 MR. CINQMARS: My name is Rob Cinqmars. I came  
14 here at my own expense as a concerned citizen. I bring to  
15 this forum a little bit of a unique experience.

16 I'm an old experienced electrical engineer, a  
17 former commercial fisherman of salmon, halibut and lobster,  
18 and a licensed master, having worked in the waters off the  
19 New England Coast, Alaska, and the Gulf of Mexico. I came  
20 here specifically to make a few comments -- they'll be very  
21 quick -- to encourage FERC to approach ocean energy  
22 permitting slowly, cautiously, and methodically.

23 I have nine very quick points to make.

24 In discussion with Roger Bedard, EPRI itself did  
25 not generate a single watt of electricity. It's a wonderful

1 study, but that does speak to the fact that there may be a  
2 significant difference between expectations in ocean energy  
3 projects and the reality.

4 Number two, many believe that the energy crisis  
5 is not so much a technical problem but rather a cultural and  
6 social problem of local consumption. That would say that  
7 FERC should not be in a whole lot of rush or sense of  
8 urgency to allocate ocean energy resources to solve that  
9 problem.

10 The preliminary permit applications thus far have  
11 a striking lack of specificity, not revealing the who, what,  
12 how, and where of what they're proposing. More reliable  
13 accurate information and expertise is often required on a  
14 job application for the typical hourly job than of  
15 applicants applying for vast ocean energy resources at this  
16 time.

17 Many of the manufacturers of underwater turbines  
18 have notably not applied for permits, which beckons the  
19 question -- is the actual energy production potential and  
20 possible payoff so low that they're not interested in  
21 applying their own technology? They are certainly the most  
22 qualified and experienced in this matter.

23 Point number five, many of the resources FERC is  
24 considering for permits are already allocated. You won't  
25 find the coordinates in FERC applications but in the well-

1 guarded log books of commercial fishermen, who will pass  
2 these precious and valuable numbers through generations. It  
3 is their legacy. I'd like to introduce a new acronym,  
4 NIMFH: Not in My Fishing Hole.

5 (Laughter.)

6 MR. CINQMARS: Applicants intending to insert  
7 gear in certain areas will be doing it as interlopers.

8 With few or no exceptions, the applicants for  
9 preliminary permits have not even taken basic or cursory  
10 measurements, current measurements at surface or at depth.  
11 Some of these measurements are very affordable and perhaps  
12 should precede the expensive passionate legal process  
13 associated with the permitting process. Even carpenters  
14 measure twice and cut once.

15 The first-come, first-served approach may not be  
16 the best. Fishermen, for example, successfully share these  
17 very same resources without an individual claiming priority  
18 to exclusive use over the years.

19 I do want to mention briefly one of the  
20 environmental impacts that seems to have been overlooked is  
21 the actual objective of the technology, which is to extract  
22 energy from the water. By analogy, point to wind, that  
23 distributes pollen and food and pollinates plants. The same  
24 is probably true when extracting energy from water streams.  
25 There's probably an environmental impact there.

1           As the technologies improve FERC may want to  
2           consider the possibility of small-scale implementation as  
3           the owners of waterfront properties and businesses will want  
4           to capture the energy from their water. And I certainly  
5           believe that FERC might want to look at a way to constrain  
6           the size of the permitting.

7           While I agree with Mr. Sperling that a little  
8           more exploration may be necessary, requesting an entire  
9           deep-water channel of the river seems like overkill.

10          In conclusion, I'd like to echo Mr. Hageman's  
11          recommendation of merit-based competition.

12          I'd actually like to conclude with what would  
13          certainly be my father's advice to me in similar matters:  
14          Let the applicants have one, do it well, learn from the  
15          experience, and then ask for another.

16          MR. KATZ: Thank you for those very thoughtful  
17          comments. That was very thoughtful.

18          Before I turn to someone else in the room I'm  
19          going to ask the folks who have been very patiently sitting  
20          out there on the telephone whether there's anyone out there  
21          who has a comment or question.

22          MR. COMPSON: We have a comment in Portland.

23          MR. KATZ: Please go ahead, Portland.

24          MR. COMPSON: My name is Terry Compson.

25          With over 40 years in all kinds of fishing on the

1 West Coast, what we're worried about is that we may develop  
2 a \$40 million energy resource along our coast, but we may  
3 lose a \$40 million crab industry. This is where we believe  
4 local governments become involved, and that's in the  
5 development of the site, of these wave-action energy sites.  
6 It's the local people who know the information best in the  
7 area.

8 We absolutely want to move forward in the State  
9 of Oregon. We want to encourage this development as soon as  
10 possible. We encourage FERC to reduce the time frame in the  
11 process so as not to take any potential loss to the  
12 environment.

13 That's my comment.

14 The county stands ready and able to work with  
15 Oregon. We're in the process of developing an MOU with the  
16 State of Oregon. We stand ready and willing to work with  
17 anybody in the energy resource area.

18 I would make one other slight comment. It  
19 reminds me of the situation if we were about to fly an  
20 airplane and we were the Wright Brothers standing at Kitty  
21 Hawk, it takes a lot of permits today that they wouldn't  
22 have had at that time.

23 (Laughter.)

24 MR. COMPSON: More than I'm sure the Wright  
25 Brothers would have ever conceived.

1           But there's two technologies here. There is the  
2 development of the technology of the airplane. But there's  
3 also the technology of the siting of the airport. That's  
4 where the local people become involved and should be  
5 interjected early on in the process.

6           Thank you.

7           MR. KATZ: Thank you very much. If we have  
8 projects in your area we will need be able to avail  
9 ourselves of your expertise and other local people that do  
10 know the area so well.

11          Yes.

12          MS. RAMM: Bonnie Ramm with Energetics. I'm a  
13 subcontractor to the National Renewable Energy Laboratory.  
14 We're a partner with the EPRI study looking at permitting  
15 and environmental effects and have been working with Roger  
16 Bedard.

17           I just wanted to ask the FERC Commissioners, I  
18 guess, or staff: It's a little bit surprising that they're  
19 not here to talk about their initiatives stemming from EPAct  
20 to develop a whole program on ocean energy and that they've  
21 initiated a programmatic EIS that is in process right now  
22 and will be done next year.

23           I just wanted to raise that very important issue  
24 and perhaps you can explain how FERC authority is related  
25 and how you're going to work together with other federal

1 agencies that are in the midst of developing regulations and  
2 licensing and environmental studies.

3 MR. KATZ: We did indeed invite MMS here. They  
4 were going to attend. At the last minute they were not able  
5 to, which we regret.

6 We are aware of MMS's efforts. We've talked to  
7 them any number of times. We have filed comments in their  
8 proceeding. And I won't speak for the Chairman, but I think  
9 we anticipate working closely with all federal agencies and  
10 state agencies as the policy and rules get developed in this  
11 area.

12 MS. RAMM: I'm confused about legally how --  
13 where it begins and ends between your agencies.

14 MR. KATZ: That's a matter that is still being  
15 worked out. The Federal Power Act speaks of the Commission  
16 having jurisdiction over, among other things, navigable  
17 waters, commerce clause waters. And the Energy Policy Act  
18 of 2005 contained a provision that gave Minerals Management  
19 Service authority over energy projects generally on the  
20 outer continental shelf. That statute also contains a  
21 savings clause which says it would not affect the  
22 jurisdiction that any other agencies had.

23 If you grant that FERC had existing jurisdiction  
24 over this type of project, at least in theory that savings  
25 clause would be met. And that has not changed.

1                   MMS and the Commission sort of had a little  
2 collegial discussion back and forth as to how that was going  
3 to wind up. And I can't really tell you -- I think we're  
4 certainly all committed in the federal family to working  
5 together.

6                   MR. HALL: My name is Doug Hall.

7                   I'd like to make a point with regard to what  
8 Richard Roos-Collins said, comparing a small hydro with  
9 hydrokinetic installations. There are configurations where  
10 you could develop small hydro in which you used secondary  
11 branches of the stream or excavated a power channel. That  
12 probably would have less impact than putting submerged  
13 turbines in the stream.

14                  I think there are ways that small hydro could be  
15 developed in a way that would probably have less impact.

16                  The point I really want to make is that, you  
17 know, with this kind of technology the parallelism between  
18 wind energy and water energy is becoming closer and closer.  
19 If you imagine a river canyon in which there's a fairly  
20 large river in which one could install hydro technology, and  
21 on the hill of that canyon is a prime spot to go to a wind  
22 farm, there isn't a lot of difference in some senses between  
23 that wind farm and the watermill farms that will be perhaps  
24 installed in the river below that bluff. But the  
25 difference, as we all know, is that we have a lot of wind

1 capacity going in because FERC's not involved.

2 It's a lot cheaper to do wind installation than  
3 it is to do water installation. And so you have to ask the  
4 question is there a fundamental difference between the wind  
5 as a natural resource and our rivers as a natural resource.  
6 If the answer is that rivers are a lot more complicated  
7 resource with a lot more environmental issues, then  
8 certainly the additional regulation -- and I have added this  
9 up. Even if you didn't do the studies it's two and a half  
10 years just to get through the process if you use this as a  
11 serial set of activities.

12 So if you ask the question why is it the wind  
13 folks can do this in so little time, because FERC has  
14 regulatory authority here that it takes two and a half,  
15 three and a half, four years, I hope the answer isn't  
16 because we can do it. There needs to be a fundamental  
17 difference between these resources to justify the additional  
18 scrutiny that is required with regard to in this case  
19 watermill farms as opposed to wind farms.

20 Thank you.

21 MR. KATZ: We have heard comments like that from  
22 developers. And I think essentially what I can leave you  
23 with is that it's up to Congress as to which agencies it  
24 gives jurisdiction over what. And we as civil servants are  
25 here to carry out Congress's will as best and efficiently as

1 we can.

2 I'll also add on that note we've also heard  
3 anecdotally from folks who have talked about a slightly  
4 different side of that equation, which is using small hydro  
5 of this type to balance off the uncertainties of wind so  
6 that you can create synergies between wind power and hydro  
7 power to produce a stream of power that's regular and useful  
8 to those who need it.

9 I saw another hand.

10 MR. SPERLING: Can I make a comment on that?

11 Just from our perspective there's a huge  
12 difference between what we do and wind power. As far as I  
13 know, there is no wind power project that impacts one of the  
14 most critical resources in our nation, which is fisheries.  
15 So there is a good reason to take a very close look at this.  
16 There is a good reason to have that difference with wind.  
17 We believe that. We believe we can be consistent with it.

18 MR. KATZ: Again, the woman in the gray coat.

19 MS. CLARK: Liz Clark with Oregon State  
20 University.

21 You might have expressed concern over the chicken  
22 and the egg in terms of the permitting process. And as a  
23 research institution, we're actually interested in what kind  
24 of chicken are we trying to hatch. That problem raises for  
25 us in this process what kind of permits do we need as an

1 academic research institution who is now trying to be the  
2 leader in establishing a wave park or being a leader in  
3 establishing the commercial entity to be located.

4 We do have a special concern in this process,  
5 though. We do want to deploy buoys and deploy different  
6 kinds of chickens. I urge you to take that into  
7 consideration as you address those processes for our  
8 researchers, not just at OSU but elsewhere who are  
9 interested in investigating this question.

10 MR. KATZ: That's helpful.

11 I think we referenced earlier that we discussed  
12 that internally a little bit. And we've heard about those  
13 initiatives. And to the extent that those institutions are  
14 not interested in commercializing the power, i.e., putting  
15 it into the grid and making money, it well might fit within  
16 the strictures of the burden which allows for certain kinds  
17 of testing without a requirement of a Commission license.

18 Before we go further I want to see whether  
19 there's anyone out there in the regions who has some  
20 questions.

21 (No response.)

22 MR. KATZ: Hearing nothing --

23 MR. FISHER: One more in Portland. Sorry.

24 MR. KATZ: Go ahead.

25 MR. FISHER: Tom Fisher with Milhouse Energy.

1 We're a private developer mainly of hydro power.

2 One thing I'd like to point out is I think it's  
3 really important to limit the size of the project. Assuming  
4 that FERC's going to continue licensing these projects you  
5 should limit the size to ten acres or some size that doesn't  
6 preclude other development.

7 If you're building a dam on the Columbia River  
8 you're just taking a real small slice of a long river. And  
9 you're trying to get power out of a specific area. If  
10 someone truly is interested in developing the site they'll  
11 want to develop a particular site, not the whole coast of  
12 Oregon; but maybe a particular bay in Oregon or Alaska or  
13 wherever this might be. If you don't limit it then you can  
14 in effect take areas off the market that other developers  
15 who might be able to develop it could do.

16 So I guess I'm just going to encourage you to  
17 somehow limit the size of the applicant of the preliminary  
18 permits.

19 MR. KATZ: Thank you.

20 Any hands in the room? I see Frances, I think.

21 MS. FRANCIS: Frances Francis with Spiegel &  
22 McDiarmid. We represent the City and County of San  
23 Francisco which has filed comments in this rulemaking.

24 I think, John, one of the key issues that I hear  
25 is an urgent concern that we use what available regulatory

1 tools we have, besides just having Congress act on some of  
2 these issues. People are saying they have a long lead time  
3 and there are two different groups. One is people who want  
4 to make money and people who, by the nature of their  
5 institution, want to study the project and get more into a  
6 sort of national information base.

7 I guess I'm asking or thinking or wondering  
8 whether or not the Commission wouldn't be interested in a  
9 rulemaking in which it could try to use or satisfy both what  
10 I would call the public sector, who wants more information,  
11 and also speed up the process for those who are willing to  
12 take the risk of putting their money where their mouth is.  
13 And with some states it's hard to work collaboratively, I  
14 guess, with the private developers because if you don't get  
15 the answers for this for some of the problems you're talking  
16 about we're all going to sit and wade through the case by  
17 case process waiting for the right case to come along. Or  
18 is this going to be the lead case for FERC and are we going  
19 to have to watch it go to the Supreme Court on the 401 issue  
20 or whatever? This is more time I think than Gil Sperling  
21 and his investors are willing to wait.

22 On the other hand, it's not fair to a lot of the  
23 environmentalists who really don't want to take a position  
24 until they're more sure of the effects.

25 I'd love to see a national information base. I'd

1 love to see FERC using what tools it has. I'm not saying it  
2 shouldn't go to Congress eventually -- maybe soon. But I  
3 think you ought to consider what tools you have. And there  
4 are enough questions here, I think, and the beginnings of  
5 enough good answers.

6 This would be unusual, Mr. Chairman, but maybe  
7 you should have a follow-up technical conference now that  
8 everyone has been so forward with their concerns and come up  
9 with a possibility because I do think you've used rulemaking  
10 in the past before to solve a lot of problems or to surface  
11 those that needed legislative resolution. Maybe you could  
12 try that and get it moving.

13 I would hate to see it die, a good idea die just  
14 because you couldn't come up with a reasonable solution to  
15 help these people.

16 Thank you.

17 MR. KATZ: While we've got two mikes going, let's  
18 go over to the left side.

19 MR. O'NEILL: I'm Sean O'Neill, with the Ocean  
20 Renewable Energy Coalition.

21 MS. OLIPHANT: And I am Carolyn Oliphant, CEO of  
22 the Ocean Renewable Energy Coalition. I'll try to be a  
23 little more specific, and Sean will give a broader overview.

24 As Sean said, I'm with the Ocean Renewable Energy  
25 Coalition. I've also been involved with ocean energy legal

1 issues in the U.S. for 15 years now. I've seen a lot of  
2 ideas. I've thought quite a bit about these issues. I just  
3 wanted to offer a couple of suggestions.

4 First of all, one reason why it's so important  
5 for the Commission to act is I think that inadvertently,  
6 through inaction, we're developing precedents. For example,  
7 when I look at the list of regulations that Verdant has  
8 complied with or AquaEnergy has complied with, the water  
9 quality certification and a whole bunch of other things  
10 which have sort of questionable applicability I cringe. At  
11 the same time I realize there are realities.

12 You want to get a project in the water; you do  
13 whatever it takes. You file the extra permit or the extra  
14 application. But that isn't necessarily what the law  
15 requires. But you're inadvertently creating a precedent.  
16 So the Commission should re-examine and revisit the issue of  
17 the water quality certification and some of these other  
18 issues that have some questionable applicability.

19 The second issue is I'm very familiar with the  
20 Federal Power Act. Actually I was going to say, too, I  
21 started my career here at FERC with Chris in the Office of  
22 Hydroelectric Licensing. So I'm intimately familiar with  
23 the Act and its constraints. At the same time I've lost  
24 enough Court of Appeals decisions to know that FERC has very  
25 broad authority to construe its statutes.

1           I think that one tool FERC has made very good use  
2 of in the past is the MOU. The Corps of Engineers has  
3 authority under Section 10 to issue a Section 10 rivers and  
4 harbors permit for hydro projects. You rarely see Section  
5 10 issued. The reason for that is because the Corps and  
6 FERC have an MOU that dates back to 1975 where the Corps  
7 agreed that FERC takes the lead on licensing the Corps will  
8 pull back and will make recommendations on navigation. But  
9 it won't issue a Section 10.

10           I think that same MOU structure, that same type  
11 of MOU, that same type of agreement can be negotiated with  
12 other federal agencies. So you might enter into the MOU or,  
13 for example, even on a 404, perhaps FERC is taking ultimate  
14 jurisdiction over these projects and issuing a license and  
15 considering 404 issues in that context. Perhaps the Corps  
16 will pull back.

17           And there are many other MOUs of that type that  
18 perhaps FERC should consider. It doesn't require extra  
19 legislation. But it involves the situation where FERC is  
20 making full use of its authority.

21           My final comment is I've done a lot of work in  
22 the electric utility industry and the hydro industry. But I  
23 really feel that my work in the ocean energy community, I  
24 feel that in the electric utility environment this is really  
25 an opportunity to build a legacy, to build an industry, and

1 to create a new source of energy which isn't previously  
2 available. I ask the Commissioners to keep that in mind.

3 This is an opportunity for the Commission to  
4 leave a legacy for today and also for future generations.  
5 So even though these projects seem small now, even though  
6 there hasn't been a lot of money invested from private  
7 industry, the Commission can really take the lead here and  
8 really build a legacy and make these projects a lasting part  
9 of our economy and our nation's energy supply.

10 Thank you.

11 MR. O'NEILL: Sean O'Neill, President of the  
12 Ocean Renewable Energy Coalition.

13 It's that kind of forward positive thinking, the  
14 coalition of which six of your panelists today are coalition  
15 members, we've provided a framework on the docket which is  
16 our positive proactive suggestions, some directions you  
17 might go in. We didn't come to kick FERC or any of the  
18 other agencies. We're lovers, not fighters.

19 (Laughter.)

20 MR. O'NEILL: But our members did get together  
21 and we tried in four and a half pages to put down -- and  
22 really I have to credit Carolyn very much because she took a  
23 bunch of diverse ideas and distilled them into something  
24 that we hope will be helpful to you in figuring out exactly  
25 where you want to go.

1           Thank you very much for having today's workshop.  
2           I have two quick questions for you.

3           With all the preliminary permit applications that  
4           are on file with you right now, I don't know if you have a  
5           plan for when you're going to get back to these applicants  
6           or how you're going to deal with those applications. I  
7           suspect part of that is today's workshop.

8           The second question has more to do with if the  
9           Federal Power Act does not allow you to treat our industry  
10          in a way that will support this industry. There is a sense  
11          of urgency in acting, and acting quickly. We've got small  
12          companies that will die on the vine if we don't get some  
13          action.

14          So my second question is from a legislative  
15          perspective, if we have to change the Federal Power Act  
16          could you tell us exactly which sections we need to change.

17          (Laughter.)

18          MR. KATZ: I recommend hiring good counsel.

19          (Laughter.)

20          MR. KATZ: We've got time for a couple of more  
21          questions. But I will first ask if there's anyone in the  
22          region --

23          MS. PARKS: Hi. This is Johanna Parks in San  
24          Francisco.

25          MR. KATZ: Go ahead.

1 MS. PARKS: We filed comments on behalf of eight  
2 different cities and counties in California, including  
3 Oakland, Berkeley, Marin, San Jose, Los Angeles, and Santa  
4 Monica. I wanted to highlight our concerns and reiterate  
5 some of the comments that were made.

6 You know, given the public nature of the tidal  
7 wave and river resources we really wanted to highlight the  
8 involvement of local stakeholders especially in our cities  
9 and counties where these facilities are located and all the  
10 local organizations, environmental and otherwise. They  
11 really are local issues.

12 And I'd reiterate the other comment that has been  
13 made already about scrutiny, accountability, and a shorter  
14 licensing process and so forth. I'd be happy to make those  
15 comments available to anyone who hasn't heard them.

16 MR. KATZ: Thank you very much.

17 I guess we have time perhaps for one more comment  
18 in the room.

19 (No response.)

20 MR. KATZ: If not, we will go to closing  
21 statements.

22 Tom Bigford reminded me that we were severely  
23 remiss in not mentioning the staff that worked so hard on  
24 this. He mentioned one person in particular: Christopher  
25 Murphy. But we would also mention the other staff who put

1 in such a lot of time.

2 MS. MILES: Well, Tim Welch was the manager over  
3 this project. Kristin Murphy was the team lead. Steven  
4 Boller is our ocean energy lead also and he worked on this.  
5 From our compliance division, Anne Hogan. We have those  
6 standing around the room, some of the new employees, Michael  
7 Hamilton and Matt Cutliff over here to the right. Ed Abrams  
8 has participated in a lot of the ocean energy speaking about  
9 recognizing that things were going on out there and that it  
10 was important that we start learning and gathering  
11 information and get to the point where we thought it would  
12 be a good idea to have a conference.

13 MR. KATZ: Thank you very much.

14 Mr. Chairman.

15 COMMISSIONER KELLIHER: I just want to thank  
16 everyone for coming today, particularly the panelists and  
17 the staff for their excellent comments, this panel as well  
18 as the previous panels, and the staff had the fine idea of  
19 having this subject. It proved to be a much more pleasant  
20 way to spend the afternoon than looking at the status of the  
21 Escondido Project.

22 (Laughter.)

23 COMMISSIONER KELLIHER: These technologies do  
24 have very significant potential. And as we've appreciated  
25 during the day, there are some challenges in front of them.

1 We have some ability to provide regulatory flexibility in  
2 the Commission, but there are limits to the flexibility.  
3 Those limits are dictated by the law itself.

4 We'll work with you all. We are focused on the  
5 potential. And we'll consider the record of this  
6 proceeding.

7 I think we should hold the record open for two  
8 weeks to get any other comments from panelists as well as  
9 the general public. We will, once the record is closed,  
10 consider what the next steps are going to be.

11 With that, colleagues, any comments?

12 (No response.)

13 COMMISSIONER KELLIHER: Thank you, everyone, for  
14 coming today.

15 (Applause.)

16 (Whereupon, at 4:55 p.m., the Technical  
17 Conference in the above entitled matter was adjourned.)

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