Moderator: Good afternoon. Welcome to this news conference sponsored by Physicians for Social Responsibility and Friends of the Earth. You will be hearing from five speakers today. Before we introduce them as a group, and then individually, I want to invite the operator on the line to explain how the Q&A period will work.

Operator: During the Question & Answer sessions you may ask a question by pressing star then 1 on your touchtone phone. If you would like to remove yourself from the queue you may press star then 2. Again, it's star then 1 to ask a question.

Moderator: Thank you. And we will invite the operator back on the line at the start of the Q&A period to repeat those instructions about how members of the news media can pose questions.

As I mentioned, you'll be hearing from five speakers today. Our first is Peter Bradford, former Commissioner with the U.S. Nuclear Regulatory Commission and Adjunct Professor with Vermont Law School.

Second is Robert Alvarez, senior scholar with the Institute for Policy Studies where he is currently focused on nuclear disarmament and environmental and energy policies. And he's a former Senior Policy Advisor with the U.S. Secretary of Energy where he coordinated the effort to enact nuclear worker compensation legislation and worked on nuclear safety issues.

Our third speaker is Ken Bergeron; he's a Physicist and former Sandia scientist where he worked on nuclear reactor accident simulation.

Our fourth speaker is Dr. Ira Helfand, Board Member with Physicians for Social Responsibility.

And our fifth speaker is Aileen Mioko Smith with Green Action of Kyoto, Japan who has been active on nuclear power issues in Japan for 25 years and lived near Three Mile Island from 1980 to '82 working on a project on impacts of the accident there.

Let's begin with our first speaker, Peter Bradford, former Commissioner with the U.S. Nuclear Regulatory Commission.
Peter Bradford: Thanks. As at Three Mile Island and Chernobyl evolving public understanding of the situation in Japan has shown the event to worsen significantly as time goes by. In this case, however, one must have some sympathy with the dilemmas facing the Japanese government in light of the difficulties that it confronts, which are immense and unprecedented.

The imperatives of dealing with the earthquake and tsunami recovery are in some ways opposite to those of dealing openly and fully with the nuclear power plant events.

An early tip-off, the Japanese authorities felt that events at Fukushima were very serious, was the ordering of an evaluation within a couple of hours of the earthquake, though the area was small and the evacuation was called precautionary.

The fact is that ordered several thousand more people into motion during the immediate aftermath of a major earthquake and tsunami is something that no government would do if it could possibly help it.

Neither Three Mile Island nor Chernobyl were accompanied by natural disasters, even then authorities were loathe to evacuate, in part because evacuations are themselves dangerous and in part because they are admissions of a major failure.

But with natural disasters you have many people moving about in panic anyway. They have no place to go, traffic lights aren't working, roads are closed, transport is disrupted. Police have other responsibilities, many are seeing to their own families. Only gravest danger would justify an evacuation at such a moment.

The viability of U.S. emergency plans at densely populated reactor sites may have to be reexamined to determine whether they can be implemented in the context of a nuclear accident precipitated by a natural disaster. This was always a theoretical possibility, but now it's real.

Moderator: Thank you. Again, that was Peter Bradford, former Commissioner with the U.S. Nuclear Regulatory Commission. That takes us to our second speaker, Robert Alvarez, senior scholar with the Institute for Policy Studies.

Robert Alvarez: Well, I would like to echo Peter's concern and sympathy for the Japanese people and the Japanese government to be afflicted by
such a severe event, an enormous earthquake, which destroyed the infrastructure of that area compounded by the problems that are now occurring at their nuclear reactor stations.

And I think it's important to understand that there's a lot that we don't know of what's happening with these reactors and that it's trying to piece together a picture of where you're dealing with just a few pieces of the puzzle.

And so the – there are some concerns I think I would like to express here, and first of all it's not clear, but I think it is of concern whether or not the containment that's holding back the radioactivity from this reactor has failed.

And it's not clear if there's a direct path for radiation release directly to the environment, but the information that has been made public, particularly by the Japanese Nuclear Safety authorities certainly indicate that radioactive elements that – from the fuel itself have escaped and entered the environment.

And even if the reactor maintains its integrity there's a possibility that things like open relief valves on the top of the reactor and things like that may still release large amounts of radioactivity.

The – as I understand the situation right now, the emergency responders are now trying to stabilize the – at least one of the reactors with a combination of seawater and boron, which is an extraordinary thing to do. And so we're just hoping that this situation can be stabilized quickly and that there aren't any major radiological consequences.

Thank you. Again, that was Robert Alvarez, Senior Scholar with the Institute for Policy Studies. That takes us to our third speaker, Ken Bergeron, a Physicist and former Sandia scientist where he worked on nuclear reactor accident simulation.

Reactor analysts like to categorize potential reactor accidents into groups. And the type of accident that is occurring in Japan is known as the Station Blackout. It means loss of offsite AC power – power lines are down, and then a subsequent failure of emergency power on site, the diesel generators.

It is considered to be extremely unlikely, but the Station Blackout is – has been one of the great concerns for decades. The probability of this occurring is hard to calculate, primarily because
of the possibility of what are called common cause accidents where
the loss of offsite power and of onsite power are caused by the
same thing, in this case, it was the earthquake and tsunami.

So we're in uncharted territory, we're in the land where probability
says we shouldn't be and we're hoping that all of the barriers to
release the radioactivity will not fail.

So far the first barrier to release, which is the fuel cladding, has
apparently failed because they are detecting caesium. We now
have to hope that the subsequent layers, including primarily the
containment building, will succeed in preventing release of major
amounts of radioactivity.

The containment building at this plant is certainly stronger than
that at Chernobyl, but a lot less strong than that at TMI. So time
will tell.

Moderator: Thank you. Again, that was Ken Bergeron, a Physicist and former
Sandia scientist. That takes us to our fourth speaker, Dr. Ira
Helfand, Board Member at Physicians for Social Responsibility.

Ira Helfand: Thank you. You know, at the moment, we're receiving a lot of
reassuring statements from the nuclear industry and from some
government officials that the amount of radiation leaking out is
very low and doesn't pose a public health hazard and that the
chance of a major release is very remote.

And I think that what we've just heard are – from the previous
speakers – is that in fact, at this point, there's an enormous amount
of uncertainty as to what is actually going on and what is going to
happen.

And the bottom line is that we just don't know what's gonna
happen over the next couple of days, and frankly, neither do the
people who are operating these power plants.

They're very complex systems that are clearly way out of whack
and whether they're going to be able to contain the radiation inside
the reactors or not is simply not known at this point. What we do
know is how much radiation there is inside these reactors, and it's
an enormous amount and it is potentially extremely dangerous.
After a year of operation, a large commercial reactor of the type involved in these incidents in Japan typically has about as much radioactivity as a thousand Hiroshima-sized bombs released.

And there are a whole number of different radioactive isotopes from a health perspective. Four of them are most important. Iodine-131, which causes thyroid cancer and the release of which at Chernobyl caused several thousand cases at least of thyroid cancer in children.

Strontium-90, Caesium-137, which are both quite long – have quite long half lives. They each remain dangerous for about 600 years and are associated with a number of different forms of cancer if they were released in the environment.

And finally, Plutonium-239, which causes lung cancer primarily, though some other cancers as well, and has an extraordinarily long half life and remains dangerous for roughly a half a million years.

The quantities of radiation can be distributed over a vast area as we saw at the time of the Chernobyl accident and we have to understand, basically, that any nuclear power plant contains within it this kind of destructive capability.

They are essentially weapons of mass destruction that we build ourselves and site next to our cities and thereby hold huge numbers of people hostage to acts of nature or occasionally perhaps acts of man that we cannot control and in that setting it is increasingly untenable to build our energy future around nuclear power plants.

Moderator: Thank you. Again, that was Dr. Ira Helfand, Board Member with Physicians for Social Responsibility. Let's proceed to our fifth and final speaker, making brief opening comments. Aileen Mioko Smith with Green Action of Kyoto, Japan.

Aileen Mioko Smith: Thank you. In Japan, we have 54 nuclear power plants and 8 additional plants to be constructed. These are all located in very seismic areas; all of Japan is very seismic. Many of the sites are located near active fault lines or actually some of them are on active fault lines.

We're very concerned in Japan that the government has emergency planning for earthquakes and emergency planning for nuclear accidents; however, there is no comprehensive plan whatsoever for...
when these two events occur at the same time. There is no official emergency plan for this type of situation for the public.

And the other thing that we're concerned about is that right now, the evacuation has extended to 20 kilometers. We don't believe that this may be safe enough but also the implications which have _____ are great if this 20 kilometer – now that this 20 kilometer evacuation area is a reality.

There's very large populations in areas in Japan within areas of 20 kilometers of nuclear power plants. This would require potentially evacuation for many, many more people than had been previously believed, because the evacuation was 10 kilometers until yesterday when it became the reality that it's gonna be 20 kilometers.

We're concerned about exposure of people in the area. There's very little information. The latest news report is that three people were exposed that are exposed high enough that they need to be decontaminated and that's the other – there were other – 90 people waiting in the same area and there's a possibility that these people were also contaminated. What we need right now is accurate information from the government and this is not forthcoming.

Japanese nuclear policy is currently being reviewed. This was – the review was happening from last December. It's taking a period of one year right now and it's very clear that we need to review many, many things about this policy.

We're very concerned about the communication system and how people don't have information. Just as the Three Mile Island accident, many people in the areas that have – near the nuclear power plants and that have been hit with the tsunami and are evacuating or in – are facing problems – do not have communication and many of the people are finding out about the severity of concerns about this nuclear situation from relatives from very far away in other parts of Japan.

Other places in Japan know much more about what's going on than the people that are near the areas of the nuclear power plants in many cases. Thank you.

Moderator: Thank you. That was our fifth and final speaker making opening comments today, Aileen Mioko Smith with Green Action of Kyoto, Japan. That takes us now to the Q&A portion of the call.
want to invite the operator back on the line to explain once again how the Q&A period will work.

Operator: If you'd like to ask –

Moderator: Operator?

Operator: I'm sorry. At this time, if you would like to ask a question, please press star then 1 on your touchtone phone. If you decide to withdraw your question, please press star then 2 to remove yourself from the list. Please limit yourself to one question and a single follow-up. If you need to ask an additional question, please know that you may press star 1 to rejoin the queue.

Moderator: Thank you, Operator. I believe we do have a question, so let's please proceed to the first question.

Operator: Okay. Our first question comes from Stephanie Simon at the Wall Street Journal.

Stephanie Simon: Hi, thank you. I just wondered if the speakers could address what they expect the political implications of this disaster to be in the U.S. on nuclear policy with a number of plants and permits are under review right now and if you could just talk about what you expect to happen and what in your view should happen in that regard for this country.

Robert Alvarez: This is Bob Alvarez. I think that the – especially for the reactors located near seismically active zones where there have been large earthquakes previously are really gonna be subject to much more scrutiny particularly the two reactors in California at San Onofre and Diablo Canyon. And these reactors are also seeking to extend their operating licenses and in a way, there might be a political tsunami from this event in Japan that could impact the – that process.

And it certainly also adds another puncture to the nuclear renaissance balloon, which may discourage Congress, which is already in a budget cutting mood, to not be willing to fund things like loan guarantees for new nuclear power plants.

Peter Bradford: This is Peter Bradford. The nuclear renaissance in the U.S. was on the rocks in any case. That is, the 20 or so applications for nuclear plants that were filed as of the end of 2008 in order to meet the deadlines for federal subsidies had winnowed their way down to
As Bob says, the fundamental reason for that has been economic. The power from those plants would just be much too expensive in comparison to a number of different alternatives including energy efficiency, natural gas and some renewables.

So the entire structure of the renaissance is dependent on the shifting of economic risk either to customers or to taxpayers and there are different ways of doing that, but the arguments around doing that seem very likely to shift in a much more skeptical direction as a result of what's happening in Japan.

For example, those who base the justification for doing it on climate change and they say nuclear power is an essential part of a climate change strategy will have now to deal with a greatly heightened skepticism and heightened, I would think, unwillingness to have nuclear power plants located in one's own neighborhood.

I mean, most of the plants that were proposed in the U.S. are combined ventures of General Electric and Westinghouse with Japanese companies. And so a number of the issues and assurances that have been given about those plants, about the possibility of hydrogen generation and hydrogen explosions, about the seismic design can only worsen in light of what's happening in Japan.

**Stephanie Simon:** Um-hum.

**Ira Helfand:** This is Ira Helfand. I would certainly agree with the point that Bob made about the special scrutiny needed for plants that might be in seismically active areas, but I would also point out the neither Three Mile Island nor Chernobyl were in areas with a lot of earthquake activity and in this era when we are concerned also about acts of terrorism, I think that same scrutiny is gonna need to apply to all new power plants and indeed to existing plants that are coming up for re-licensing.

What this accident in Japan is reminding us of is the terrible destructive capability that these plants contain within them and whether there is an accident because of a natural disaster like an earthquake or a terrorist attack, we have put the people who live around these plants for some distance at risk by building them.
That's gonna have to be part of the discussion as we move forward with the decision and what kind of energy future we're going to have.

Moderator: Okay. I know we have a number of questions in the queue, so Operator, let's please proceed to the next question.

Operator: The next question is from Brian Vastag at Washington Post.

Brian Vastag: Yeah, hi there. I'm wondering how Japan's safety record with its nuclear facility compares to the record in the United States and say, in France where they get a lot of their power from nuclear facilities there, you know, there was an incident in 1999 where several workers died and a scandal in 2002. So are there chronic problems with the Japanese safety record or how does it compare?

Ken Bergeron: Well, this is Ken Bergeron, I have had some extensive workings with the Japanese safety establishment and I would say that that refueling accident that you referred to was – was one outstanding example of something that went wrong. But I believe that they have a relatively good record up until now.

They had some problems with their experimental reactors, their fast breeder reactors that involved some sodium leaks and so forth, but as far as light water reactors, I think this is the first major accident they've had.

Moderator: Okay. Operator, let's proceed to our next question.

Operator: Darren Samuelsohn from Politico.

Darren Samuelsohn: Hi, I guess my question was asked right at the very start about the political implications here in the United States. I guess if I had a follow-up, it's, you know, at this point in time climate legislation is on the backburner and it seems like nuclear power seems to be in a weird place right now going forward, not a lot of momentum.

Does this, do you feel like put a – this accident put a dagger in all new construction going forward or do you think that the industry is still gonna see some life here?

Peter Bradford: This is Peter Bradford. I think it's too early to generalize broadly on that topic. It's certainly going to shift the political ground somewhat, but, you know, at this stage on the Three Mile Island accident, we probably knew 10 percent of what we came to know
about that accident, a lot we didn't know for years, and a lot of what we thought we knew in the first week turned out not to be correct.

So I'd be very leery of a broad generalization. That said though, there's no way that this is a positive, and for a technology that is dependent in this economic situation, dependent entirely on political support because it's just not justified economically. This is a real setback.

**Darren Samuelsohn:** If I could quickly follow – go ahead. I was gonna say, just to follow-up, talking to some people in the industry today, there's a lot of, "Please wait and see, please don't jump to conclusions," attitude that you hear from a lot of people and you feel like making some of the statements that I heard a little bit earlier, that you guys are jumping too quickly to conclusions?

**Peter Bradford:** I haven't heard any conclusions that I'm uncomfortable with on this call. And this is obviously a significant setback for the so-called nuclear renaissance; the image of a nuclear power plant blowing up before your eyes on the television screen is a first.

And significant radiation releases, the generation of hydrogen, which for U.S. licensing purposes is deemed an impossible event, and having it explode. Those cannot be good things when, for an industry that's looking for votes in the Congress and in the state legislatures, but how that will actually play out 5 or 10 years from now is – that's where I'm leery of telling you that I know the answer.

**Ken Bergeron:** I'd like to also reinforce the importance of the fact that there was a hydrogen explosion. You know, hydrogen generation is something that's characteristic of a core damage accident. It's something that has been intense focus of concern since TMI and what we just saw yesterday or last night was what reactor safety analysts have been worrying about for 30 or 40 years. Hydrogen explosion. It's gonna be difficult to erase that image from people's mental picture of nuclear power for a long time.

**Ira Helfand:** I'm sorry. Go ahead.

**Moderator:** Are we – are we done with that portion, then?

**Ken Bergeron:** Yes.
Moderator: I know we have a lot of questions, so let's proceed to the next questioner, please.

Operator: We have Henry Fountain from the New York Times.

Henry Fountain: Hi, thanks for doing this. I would just like to follow up on the first question and ask, what, you know, what might be the impact on the Japanese nuclear industry, particularly sort of curious about the – how you all feel about how forthcoming the government is and whether they may need to, you know, sort of learn from this and become more communicative.

Aileen Mioko Smith: Well, this is Aileen of Green Action. Well, we're very, very concerned about the lack of information coming out of the government. Local people and also people far away worried about their relatives living in the prefecture of Tokushima also the other places.

They're not getting the information that they want and need from the government and the residents feel that that this government isn't completely prepared at all for this kind of situation and that especially at that press conference that happened hours and hours after the explosion and yet they had no information, they postponed the press conference once.

But when they finally – Chief Cabinet Secretary Edano, when he finally spoke, he had no information to offer, so people are very concerned about that situation.

Also right now, there's a tremendous push to build new nuclear power plants in spite of very vocal local opposition and yet really bulldozing and getting the people out of the area, the site, in order to build it.

This is happening as we speak, actually, in another part of Japan, so I think that those – there will be really large implications in the public's mind and politically in Japan as to the way the government's proceeding with nuclear power in Japan and continuation of the current policy.

Ken Bergeron: I guess I would like to add, this is Ken Bergeron, another factor. I mean, it remains to be seen how forthcoming the Japanese government will be, but it's important to keep in mind that evacuation is an intrinsically hazardous activity itself and panic can lead to as many casualties or more than might be saved.
We don't know how bad the situation is there, but there's a real possibility people could die in traffic accidents and these are things that people who analyze evacuation strategies have to keep in mind, so a certain amount of reticence may be a desire on the part of the Japanese government to prevent a disorderly evacuation.

**Peter Bradford:**

This is Peter Bradford and I would just add to that thought that it's a hundred times more true in the context of a post-earthquake, post-tsunami scenario.

I was on the Nuclear Regulatory Commission during the accident at Three Mile Island when the Commission had to transmit its evacuation recommendation to the Governor of Pennsylvania. And as Ken says, you do – one is conscious of the dangers inherent in evacuation.

One's also conscious of how little early in an accident and see what one really knows about what's going on in the plant, that's why I attach considerable significance to the fact that the Japanese government in fact did issue an evacuation directive within a couple of hours of the earthquake.

The initial relatively limited evacuation directive came out very quickly and that says a lot about the seriousness of the reports that they must have been getting about the condition of the plant because they cannot possibly have wanted to do that.

Since then, the evacuation has, of course, been widened a couple of times and that does reflect the deterioration of conditions in the plant. But even the initial recommend – when you recommend evacuation out to three kilometers, which I think was the initial recommendation, you can be absolutely certain that people beyond the three kilometer limit are going to start getting in their cars and moving around.

And if you're trying to recover from an earthquake and a tsunami at the same time you don't do that lightly. So they knew very quickly that they had a major problem on their hands.

**Ira Helfand:**

This is Ira Helfand.

**Aileen Mioko Smith:**

This is Aileen again.
Ira Helfand: I have a quick thought, Aileen, that I want to share. I think the Japanese officials are obviously dealing with an incredibly difficult situation. I think what is clear though is that they don't know fully what's going on with several of these plants.

And it's that that makes it a little bit disturbing that we're already seeing people from the nuclear industry side put forward the message that, "Well, we've had this terrible earthquake and tsunami and the plants are still okay."

Hopefully that's true and that there won't be a major release of radiation, but the fact that we don't know what's going on with these plants to me is very, very disturbing and indicates that even if we are very lucky and the plants do survive without a major release of radiation a good deal of that is just luck.

We're operating in the blind, the people who are trying to control the situation are operating in the blind, and if we get a good outcome it doesn't mean the system works. It means that we were real lucky, and that has to be kept in mind as we decide how we go forward.

Aileen Mioko Smith: This is Aileen. I think the ton of calm on the part of the government when they were talking about evacuation was very good in that it's very important that people do not panic. So I agree with that.

I would like to say that I feel it's important that we have to hear from the people who have actually had to do the evacuation, and that actually are concerned and worried about lack of information, and to hear from them because we don't know what their experiences are right now.

They can't be on the radio, they can't be in communication, they're not on Internet. There's a total blackout for us of people communicating from several prefectures here right now.

So we need to find out what experience of people are actually before we can really say how well this whole situation is being undertaken.

Moderator: Okay, thank you. Operator, let's proceed to our next question.

Operator: The next question comes from Richard Knox, National Public Radio.
Richard Knox: Hi, thanks very much. I'd like to take advantage of the fact that you're gathered here and have this experience to ask a public health kind of question about the possibilities here.

We have heard unconfirmed reports that they might be finding readings of 100 millirem per hour of gamma radiation on the site. And you mentioned earlier, and we've also heard that, you know, caesium release may be detected. What are the implications of that level of radiation at this point in public health terms? What are the mitigation issues and strategies that might be undertaken here?

Robert Alvarez: Well, this is Bob Alvarez. Background levels of gamma radiation are 100 millirem per hour, and I assume these are on site readings is what I've been able to at least glean from the information that I can get access to.

This is an extraordinary high dose rate. This is – if you were – if this kind of dose rate were being experienced even in the 1950s at a nuclear weapons plant when a lot of corners were being cut, they would take extraordinary measures to protect workers.

In one hour it represents essentially the total amount of radiation the U.S. government would allow a U.S. citizen to receive living nearby one of these plants, or at least an Energy Department plant. So this is not an insignificant amount or radiation.

The presence of Caesium-137 is also a disturbing piece of information, assuming it's verifiable. That because it's really clear-cut evidence that this is coming from debris from the reactor core itself.

How it's getting there is still not clear, and whether or not the, you know, the structural containments that are built into this plant have been compromised or not is also a big question.

But the only sort of evidence we have to go by in terms of, you know, taking this situation to a logical extreme is Chernobyl which is not quite a fair comparison because it involved a much different type reactor and a much different set of circumstances.

But the – that event ultimately resulted in nearly a million emergency responders and cleanup workers and rendered an area – and also required the permanent evacuation of about 180,000
people and rendered an area that is still uninhabitable, roughly the size of half of New Jersey.

So hopefully none of that is going to come to pass in Japan. And so – but at least if you want to know what – if you were to take this situation to a logical extreme this is – Chernobyl is one of the only sort of experiences that we have on the planet to tell us what might be the very worst possible consequence.

Ken Bergeron: Well, I hate to sound even more pessimistic, but it could be worse than Chernobyl. Chernobyl had a tremendous radioactive release but a great deal of it was dispersed into the stratosphere far away from the populations that were most at risk. And as a result the actual exposure to people was much reduced.

Now I don't think that the accident in Japan has gone far enough to – it doesn't appear to have gone far enough to represent a really large release of that type. But if it does it will be a slow release due to a – the molten core leaking – melting through the pressure vessel then melting through the containment vessel.

And all of that radioactive material is gonna be right there on the surface of the earth and much more available for exposing populations.

Richard Knox: Okay, who was just speaking?

Ken Bergeron: That was Ken Burgeon.

Robert Alvarez: This is Bob Alvarez again. The other issue, too, which is in the back of my mind that I don't know what is going on in this regard, and Ken and others have done a good deal of research on this, is the spent fuel pool at the reactor.

This is a boiling water Mark I reactor design where the spent fuel pool is elevated several stories above ground and it basically is next to the reactor top to facilitate transfer.

And one of the – not knowing what the inventory is of the spent fuel pool, one of the concerns that I would have is whether or not the earthquake and any other events like the hydrogen explosion, impacted the ability to cool the spent fuel.

And if the spent fuel basin is leaking, this is something that is not as fraught to hazard as the reactor would be, but over some time if
the spent fuel is – the water somehow is drained, especially when – in a way where the fuel is exposed to open air, this still takes a considerable amount of time.

But the risk of a zirconium fire arises, and then you have a very large release of – particularly of Caesium-137. So that's another sort of question, you know, about what's going on that we need to have a better understanding of.

Richard Knox: Can you also comment about the mitigation strategies?

Ira Helfand: This is Ira Helfand. The primary mitigation strategy that ought to be implemented, and it sounds like it is, is a distribution of iodine because the most immediate threat, aside from people who are right on the site there is the release of radioiodine and its incorporate into thyroid tissue and subsequent production of thyroid cancers.

And that was probably the largest health affect that followed the Chernobyl accident. And people if they're given non-radioactive iodine prophylactically it blocks the uptake of the radioiodine and helps to prevent that.

And there have been news reports that the authorities in Japan have begun to distribute radioiodine or about to begin distribution in the areas around all of the plants that are involved.

I think here in the United States we need to be giving some thought to what our own policies are with regards to radioiodine in the even that there were a very large release from this plant. We would be affected by the iodine just as many parts of Europe were affected after the Chernobyl accident in ’86.

Just two – one other point. There are two separate issues here. One is the ambient radiation that is being experienced on site, which is usually relatively locally experienced and primarily of concern to people who might be in the plant either now or going in to do cleanup afterwards.

The other is the effect of radioisotopes which even if the total dust radiation they're giving to the whole body is not very great are still very significant carcinogens, as radioiodine, for example.

And caesium, strontium, plutonium, other isotopes that may be leaking out, even if they're not generating a very high rate –
ambient radiation level at the site there may be very significant health hazards to people who ingest or inhale these materials and subsequently become prone to developing cancers from them.

Moderator: Thank you. Operator, let's proceed to our next question.

Operator: We have Bernie Woodall from Reuters.

Bernie Woodall: Hello?

Moderator: Yes, hello.

Bernie Woodall: I'm sorry; I thought I accidentally hung up on you. You mentioned Mr. Alvarez, earlier that there was a great concern about the – it sounds like dousing of seawater and boron. If you could explain that. And also, I know that this is mostly U.S. people but I was wondering if you think that this event has the potential of dousing the renaissance in other places where there is a true rebirth and actually in China where I guess there's the most growth? Thanks a lot.

Robert Alvarez: My understanding is that the situation has become desperate enough that the apparently don't have the capability to deliver fresh water or plain water to cool the reactor and stabilize it and are now in an act of desperation are having to resort to diverting and using seawater which they are, I understand, mixing with boric acid or some boron compound to sort of stymie other potential nuclear reactions.

I would describe this mission as a Hail Mary pass, but if it – if they succeed, you know, there's plenty of water in the ocean, and if they have the capability to pump this water in the necessary volumes at the necessary rates to remove the decay heat then they can stabilize the reactor.

In terms of the, you know, what this does to the global enthusiasm about nuclear power in places like China, I think that I'm not prepared to speculate on what that might be, what happened. I mean, I certainly – certainly it's going to cause some reappraisals and – because this is what you call a show stopping event.

So at the minimum, you know, I think there's gonna be some reappraisal going on about the degree to which countries want to pursue a nuclear future.
Moderator: Okay, thank you. Operator, let's proceed to our next question.

Operator: We have Marianne Myleck at Dow Jones.

Marianne Myleck: Hi, sorry. I missed the first part of the call, so I apologize for that, but wanted to just get a basic understanding of what exactly is – could be going wrong and then like what are – what's going wrong and what are the different scenarios that could be going wrong?

Ken Bergeron: Well, I guess I could attempt to – this is Ken Burgeon. Based on what we understand the reactor has been shut down in the sense that all the control rods have been inserted, which means there's no longer a nuclear reaction.

But what you have to worry about is the decay heat that's still in the core that will last for many days. And to keep that decay heat of the uranium from melting the core you have to keep water on it. And the conventional sources of water, the electricity that provides the power for pumps has failed.

And so they are using some very unusual methods of getting water into the core. They're using steam driven turbines that are operating off of steam generated by the reactor itself.

But even that system requires electricity in the form of batteries and the batteries aren't designed to last this long. So they have failed by now. So we don't know exactly how they're getting water to the core or if they're getting enough water to the core.

We believe, because of the release of caesium that the core has been exposed above the water level, at least for a portion of time, and has overheated.

What they really to – what we really need to know is how long can they keep that water flowing and it needs to be days to keep the core from melting. If the core does melt then it will slump to the bottom of the reactor vessel, probably melt through the reactor vessel onto the containment floor.

The containment, I believe, is still intact, but that itself will probably not be sustained and the containment vessel will fail. All this if it were to occur would take a matter of days or portions of days.
Marianne Myleck: In a situation like this are the rods physically in the metal encasing? What exactly has to melt for it to slump?

Ken Bergeron: Well, if your rods are long uranium rods clad in a stainless steel and they’re held in an array – cylindrical shaped array and the water covers all of that, if the water descends below the level of the fuel then the temperature starts going up and the cladding bursts, releasing a lot of fission products and eventually the core just starts slumping and melting.

A little bit of this happened in TMI, or actually quite a bit of it happened in TMI, but the pressure vessel did not fail.

Male: The other thing that happens is that the cladding, which is really just the outside of the tube, at a high enough temperature interacts with the water and it's essentially a high speed rusting in which the zirconium becomes zirconium oxide and the hydrogen is set free and hydrogen at the right concentration in an atmosphere is either flammable or explosive. And _____ and that's what happened.

Male: Hydrogen combustion would not occur necessarily in the containment building which is inert, doesn't have any oxygen. But they've had to vent the containment because this pressure is building up from all this steam. And so they've been venting it and the hydrogen is being vented with the steam and it's entering some area, some building, where there is oxygen and that's where the explosion took place.

Moderator: Thank you. Operator, let's proceed to our next question.

Operator: Our next question comes from Kim Chipman at Bloomberg News.

Kim Chipman: Thank you. First of all, may I just confirm that it was Mr. Alvarez who was speaking about the seawater and boron and the Hail Mary pass?

Robert Alvarez: Yes.

Kim Chipman: Thank you. And a related question, is there, in your opinion, a next step if that doesn't work? Is there anything else they could do?

Robert Alvarez: I'm not sure. I mean, this is an extraordinary event that I'm sure is involving a significant part of U.S. and Japanese military assets at this point.
And so, you know, airlifting in generators, water supply, all these other things, are – have been going on for at least a day. And I'm really at a loss to say what they could do after – if the seawater plan does not work out. Ken, do you have any thoughts about that?

Ken Bergeron: What's crucial is restoring AC power. They've got to get AC power back to the plant to be able to control it. And I'm sure they're working on it, as you say, external generators are one of the ways to go.

Peter Bradford: But if all that fails – this is Peter Bradford – then essentially, Ken, you'd know better than I, but I think at that point, it's a Chernobyl-like situation where you start dumping in sand and cement and just immobilizing as much as you can.

Ken Bergeron: I think so, I think so. That's the worst case where the core slumps to the containment, the containment – the core slides off to the edge of the containment, melts through the steel liner and now you have core exposed to the external environment. And nobody will be able to do anything with it for, you know, weeks and months. And a lot of first responders would die, so it's not the kind of thing you want to think about.

Kim Chipman: And if I may ask one more question – and I realize there's very limited information, so I don't know the extent to which you'll be able to answer. But given the fact that Japan is obviously seismic and that these reactors, these plants, are supposed to be built to withstand earthquakes, could you talk about even generally, you know, what's gone wrong and what wasn't taken into account? What the failure was?

Robert Alvarez: This is Bob Alvarez. I think the most troubled reactor began operation in 1969 and it's called a General – it was a General Electric boiling water reactor design. And I think that what has become real clear is that this and other reactors that are now having trouble being stabilized were not designed to envision an earthquake of this magnitude followed up by a tsunami, which probably greatly worsened the situation.

Moderator: Operator, do we have additional questions?

Operator: We do.
Moderator: Okay. Let's proceed to our next question.

Operator: We have James Kitfield at National Journal.

James Kitfield: Yeah, thanks for doing this. I just want to make clear, because both my original questions have been answered, but I want to make sure I have this clear. This seawater effort to cool it is a Hail Mary, so if that Hail Mary doesn't work, and most Hail Mary's don't have a high percentage, are we saying that worst case scenario that you're describing then becomes likely because you cannot cool it? Is that – so does the worse case scenario suddenly look probable?

Robert Alvarez: I don't know. I mean, I don't know what the menu of options are available to the emergency responders right now and, you know, I agree with Ken is that their number one priority is to restore AC power and to bring in power generators that could – and adequate water supplies, and so I can't say that if this fails then, you know, all bets are off. I just don't know.

Moderator: Okay. Operator, let's proceed to our next question.

Operator: Our next question comes from Mike Dresser at Baltimore Sun.

Mike Dresser: Hi. Thank you. I would – in our particular area of the United States, it's not a seismically active zone, that being the Mid-Atlantic States, but we do have several nuclear reactors in Pennsylvania and in Maryland. Should we be reassured at all because we are not in a seismically active area that things are okay here?

Ira Helfand: This is Ira Helfand from PSR. I think you don't have to worry as much about earthquakes, although they sometimes do occur in areas which are not previously thought to be seismically active.

But there are many other ways in which a power plant could fail and I think the one that is probably highest on our list at this moment in time is terrorism. And certainly, nuclear reactors in the Pennsylvania and Maryland areas would probably be very tempting targets for terrorists who had chosen to try to disrupt the functioning of the nuclear power plant and hopefully cause a large radiation release.
Mike Dresser: If I can just follow-up, there is, right now, a proposal out there for a third reactor at Calvert Cliffs. Do you see this like putting the nail in that coffin?

Robert Alvarez: This is Bob Alvarez. I think the nail might have already been struck when the Department of Energy insisted on an upfront subsidy payment for its loan guarantee that caused the deal to pretty much fall apart.

Peter Bradford: This is Peter Bradford. The other thing to keep in mind with regard to the seismic activity in various parts of the country is that the seismic requirements that the individual plants have to meet are a reflection of the expected maximum earthquake that they're likely to see.

And so what you're seeing in Japan is a plant that received, apparently, a greater impact from the earthquake than it was designed for and then the tsunami on top of that.

But it would take someone more versed in seismic standards, certainly than I am, to say with confidence that – that the likelihood of any given reactor seeing an earthquake larger than it was designed for is greatly different in different parts of the U.S.

Because of this fact that the level of seismic activities is taken into account in imposing the seismic requirements in the first place. I'll leave it at that.

Moderator: Okay, thank you. Operator, let's proceed to our next question.

Operator: We have Bill Freebairn at Platts.

Bill Freebairn: Hi, and thank you for making yourselves available on a Saturday. I was just wondering if there's anything in particular that relates to the Mark I GE boiling water reactor design that is apparently involved here that gives you particular pause or that may have made the unit more vulnerable to a problem like this?

And if somebody could also explain a little bit more about the seawater mitigation and sort of exactly what might be involved in that from what you understand, whether it's pumping seawater into the actual – flooding the containment so that's full or seawater or is it pouring it on the outside?
Ken Bergeron: Well, I guess I can – this is Ken Bergeron – I can make some general comments about the Mark I's. They – this is a boiling water reactor, it's one of the first designs ever developed for commercial reactors in this country and it's widely used in Japan as well.

It – compared to other reactors, if you look at NRC studies, it has relatively low, according to calculations, a low core damage frequency. And that means a likelihood that the portions of the fuel will melt. And in part, that's because it has a larger variety of ways to get water into the core compared, for example, compared to pressurized water reactors, for example.

So they have a lot of options and they're using them now, using this – these steam driven turbines, for example, there's no electricity required to run these steam driven turbines, but they still need battery electricity to operate the valves and the controls, so that's not winning.

So there's kind of some advantages to the BWR in terms of severe accidents but one of the disadvantages is that the containment – the containment building structure, it's a light bulb shaped steel shell that's only about 30 or 40 feet across, thick steel, but it's relatively small compared to big – large dry containments like TMI.

And it doesn't provide as much of an extra layer of defense from reactor accidents as containments like TMI. So there is a great deal of concern, if the core does melt that the containment will not be able to survive, and if the containment doesn't survive we have a worst case situation.

Robert Alvarez: With respect to the seawater – this is Bob Alvarez – as Ken has pointed out, there are different pathways that they may be using to allow for the use of seawater and I just don't know, and nor am I aware of any information as to what the specific steps they're taking to use the seawater other than it's been reported that – at least they have reported, the Japanese official authority said that seawater is now the option being pursued.

Ken Bergeron: I'd be willing to speculate that knowing how contingencies are really analyzed very thoroughly by the safety analysts that the use of seawater as an ultimate coolant was something that's been – that's in their accident management plans. This is not something that just came up as a brilliant idea.
My guess is that they've got some pumps that are bringing seawater to some storage pools near the plant and they are – if saltwater is being used, that is the way it's being done, and the water is being used as a – a coolant of the core just because of the fact that offsite water supplies have been depleted, possibly due to the earthquake. That's speculation.

Moderator: Okay. Operator, let's proceed to our next question. I know we have a few more; I want to make sure we're able to get through them.

Operator: Okay, we have Amy Harder at National Journal.

Amy Harder: Great. Thanks so much for taking my call. I know you talked about, in the beginning of the call, this could likely have – will have some type of protocol impact. I want to – I'd like to hear from you whether or not you think that would be justified given the differences between, you know, Japan being entirely on a fault line and, you know, a lot of the United States not and whether you think those concerns would – are justified? Thank you.

Ken Bergeron: Well, I think that they are certainly justified for the reactors in California, which are in perhaps the most seismically active zone in the United States. So I think that there are some justified concerns with respect to the San Onofre and Diablo Canyon reactors.

Peter Bradford: You know – this is Peter Bradford – all of the nuclear accidents, all three of them that have occurred in the last 30 years, have involved some pattern somewhat like the following. After Three Mile Island, the Soviet Union came to Pennsylvania and held press conferences about how nothing like that could happen in the Soviet Union because they didn't have Babcock & Wilcox designs. And of course, they were right, nothing like it happened in the Soviet Union, they got Chernobyl instead.

So after Chernobyl, the number of nations were quick to say, "Well, we don't have anything like the RMBK, we have stronger containments. We don't have the same type of ability of the plant to unexpectedly go critical, so that can't happen here." And of course, they were right.

So now we've got this accident and Amy, your question suggests one can take some comfort because their areas aren't as seismically active as Japan. First, as I indicated before, seismic design is, to
some degree, takes into account how active the area is so there is the possibility of exceeding the design basis – seismic design anywhere – without an earthquake as severe as this one.

But more importantly, the question each of these accidents raises isn't just whether it can be replicated somewhere else, it's whether the types of events that for licensing purposes have been deemed impossible, the generation for free hydrogen, the occurrence of earthquakes above a certain size. Whether those assumptions really hold water when it comes to providing adequate protection of the public health and safety.

And as others have indicated on this call, the next event may be terrorism, it may be some other type of natural disaster, but fundamentally, if one is to go on relying on nuclear power, the challenge that events like this pose isn't just to foresee whether they can be precisely replicated somewhere else. That's kind of a fool's errand.

The challenge is really to rethink the licensing and design process in ways that are less self-confident about deeming certain events to be impossible.

Moderator: Okay. Operator, let's proceed to our next question.

Operator: I have Sandi Doughton at The Seattle Times.

Sandi Doughton: Hi. Can you hear me?

Male: Yes.

Moderator: Yes.

Sandi Doughton: Okay. You mentioned the possibility of radioactive iodine releases and the fact that Japan might be distributing iodine tablets around the reactor site. How seriously should the public health officials in the United States take that, particularly here on the West Coast?

Ira Helfand: Well – this is Ira Helfand from PSR. If there were a very large release from the reactor or any one of the several reactors actually in trouble in Japan, it would take about 6 or 10 days, given prevailing winds, for the cloud of radioactive material to reach the West Coast of the United States and that's the amount of time we'd have to react to that situation if it develops.
That's roughly comparable to the amount of time that people had in Northern and Western Europe after the Chernobyl accident. It would be worthwhile to be looking very carefully at whether we have adequate plans to distribute iodine if that happens because the doses that people could receive even here in the United States are potentially doses that would be of concern for thyroid cancer and other forms of thyroid disease.

Sandi Doughton: Were they able to successfully mitigate that in Europe after Chernobyl? Did they get iodine tablets out to everybody in time?

Ira Helfand: There was some distribution of iodine; we certainly didn't get it out to everybody. There were thousands of cases of childhood thyroid cancer that resulted from the Chernobyl accident.

Robert Alvarez: Well, and there are other sort of emergency things that have to happen. I mean, for example, the Food and Drug Administration in this country, and I'm sure in Japan, have what are called protective action guides that if a nuclear accident were to occur and radiiodine, for example, was released in large amounts, if it's detected in a certain – above a certain level in foods where it tends to concentrate, in the case of Iodine-131, it tends to concentrate in dairy products, there would be a removal of these products from the market.

They would not be allowed to be consumed, so there's more than just taking iodine tablets involved in these circumstances.

Ken Bergeron: I guess I'd like to disagree with one of the participants. This is Ken Bergeron. I think concern about distributing iodine tablets in the United States due to this accident is vastly premature. The health hazard is to the Japanese and I think that's where the attention should be focused.

It's a big ocean and these releases are gonna be at essentially ground level, not stratospheric levels like Chernobyl. This is a Japanese health issue of great significance and we shouldn't confuse it with health issues in the United States.

Moderator: Thank you. Operator, I know we have a couple more questions; I'll just proceed to our next question.

Operator: We have Kate Sheppard at Mother Jones Magazine.
Kate Sheppard: Hi, I wonder if you'd speak more to this particular design model. Is this one more or less – containment model less resilient if there's a meltdown? I mean, are any – are there any containment types that would be able to withstand this kind of thing? I mean, I'm just trying to get a better sense of whether this one's particularly vulnerable of, you know, what's ____ _____.

Ken Bergeron: I guess I could try to answer that. This is Ken Bergeron. The BWR Mark I containment is not particularly robust. There are containments designed that would provide a much more significant barrier in the event that core material is released from the primary system.

I'm sorry, that's jargon. In the event that the molten core melts through the reactor vessel, that's when the containment comes into play primarily.

And the best containments are what are called large dry containments. TMI was one of those and they can really handle a very large insult of that type and still protect from release.

BWR Mark I's are quite small, and they cannot handle that much steam, that much gas. They're venting in order to keep the containment vessel from failing, but if a core melts and flows the pressure vessel onto the floor it's likely to spread as a molten pool like lava to the edge of the steel shell and melt through and thus, you know, that would result in a containment failure in a matter of, you know, less than a day.

So it's good that it's got a containment – a better containment system than Chernobyl but on the scale of most reactors in this country it's not as strong as most of them.

Moderator: Okay, Operator, let's proceed to our next question.

Operator: We have Michael Collins at LA Weekly.

Michael Collins: Hi there, thank you for this. I'm hearing a couple of things here, of course, people care about the folks in Japan but we are on the most part here reporting in the U.S. If this – if we get to the worst-case scenario, if it breaches the containment thing and it hits the ground there, what is the worst-case scenario?

Will this radioactive material become volatilized? Will it get into the atmosphere? Will it take the prevailing winds across the
Pacific? If it takes 6 to 10 days to get to the U.S. what are the possible effects on the population? And who in the U.S. measures for this, and how will the public be made aware of any radiation possibly reaching the western coast? And that could be for Ken or Dr. Helfand.

*Ira Helfand:* This is Ira Helfand; I don't think Ken will actually disagree much about this. I think that the chance of our having a major exposure here in the United States is not real high. But the problem is we still don't know exactly what's happening.

We don't know how this is gonna play out, if there's gonna be a major release, and if there is under what circumstances? And there are circumstances in which it could – there could be fires and there could be significant amounts of this lofted into the air.

We will have sometime to sort of look at that if it develops and figure out if there's gonna be a threat to the United States or not. But certainly Ken's point that the primary danger here is to the people in Japan is absolutely correct.

*Robert Alvarez:* This is Bob Alvarez. I think the – we just don't know how – what the magnitude of release might be if things really turn out to be the worst. So – but in terms of answering part of your question about, "Well, how would we know in this country?" Right now I'm very sure that the U.S. Department of Energy and Department of Defense are deploying their assets around these reactor sites in terms of aerial radiological surveillance and that if there are any major releases, especially those that would travel over great distances, there would be quite a bit of tracking of the plume, particularly by the Energy and Defense Department aircraft.

And that on the ground in terms of picking up radiological measurements that becomes problematic because states have their own radiation monitoring systems but because of the tremendous problems of funding state functions now a lot of these activities in the United States are being curtailed.

And if there were a major release that would go over the United States in some way or form, it would be up to the Federal government to warn the public and the actual on the ground measurements would be very, very sparse, and that's a concern.

So you'd have better measurements at the nuclear power plants and they would probably be the primary sources of radiological
monitoring information, or the Energy Department plants. But state radiological programs are like all the other programs, they're taking huge hits and they're having to curtail their normal activities, which are pretty minimal as it is right now.

Peter Bradford: This is Peter Bradford again. In part to answer your question you need to know something about the – what the weather is at the site when a release takes place. I mean, you get very different results from a still day with a drizzle than you do from a day that's clear and the high wind blowing from one direction to another.

And as a previous speaker said, if things are being propelled over by a fire that makes a difference, too.

Moderator: Okay, Operator, I think we're gonna bring things to a close now. I know we've been on for quite a long time. So reporters, I just wanted to let you know that if you have any additional follow-up questions or needed to speak to any of our experts, you can call Ailis Wolf at 703-276-3265 and she can connect you to any of the speakers that are on the call today.

In addition, some related news materials, including a new releases, and I believe contact information for all these reporters is gonna be on the web along with the streaming audio replay of this news event at the Friends of the Earth website which is www.foe.org. Again, that's www.foe.org. And again, to be connected with any of the speakers from today you can call Ailis Wolf at 703-276-3265.

I'd like to thank all of our experts for joining today and you've been listening to a news conference sponsored by the Physicians for Social Responsibility Friends of the Earth. Thank you for joining us. That concludes today's news event.

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