PUBLIC WORKSHOP

STATE OF CALIFORNIA

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Public Workshop on Food Packaging with Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs)

CAL/EPA HEADQUARTERS BUILDING

SIERRA HEARING ROOM

1001 I STREET

SACRAMENTO, CALIFORNIA 95814

TUESDAY, JANUARY 14, 2020

9:00 A.M.

Reported by:
Peter Petty

APPEARANCES

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Andre Algazi, Chief, Chemical-Product Evaluation Section

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Dr. Anne Cooper Doherty, PhD, Senior Environmental Scientist, Specialist

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PRESENTATIONS/PANEL MEMBERS: (*Via online/telephone)

Jared Blumenfeld, Secretary for Environmental Protection, CalEPA

Carla Ng, PhD, University of Pittsburgh

Brian Sernulka, Foodservice Packaging Institute (FPI)

*Maricel Maffini, PhD, Independent Consultant

*Malene Teller Blume, Coop Danmark

Cathy Rudisill, SRC, Inc.

Bill Orts, PhD, US Department of Agriculture

PUBLIC COMMENTS/QUESTIONS (*Via online/telephone)

*Pat Rizzuto, Bloomberg Environment (webcast question)

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PUBLIC COMMENTS/QUESTIONS (*Via online/telephone)

*Pat Rizzuto, Bloomberg Environment

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I n d e x

I n d e x (Cont.)

P R O C E E D I N G S

9:05 A.M.

MS. SETTY: Welcome, let's go ahead and get started. I'd like to welcome you all to the Safer Consumer Products Workshop. Thank you so much for joining us for this full day of presentations and panel discussions. My name is Asha Setty and I'm a Public Participation Specialist for the California Department of Toxic Substances Control. We're here today to discuss perfluoroalkyl and polyfluoroalkyl substances, which we will be referring to as PFASs, and their alternatives in food packaging.

I'll be facilitating this workshop and encourage you to provide us with feedback. This meeting is being recorded by a court reporter over here -- thanks for that Jared -- so video recording of this meeting will also be posted on our website.

For those of you here in person, please make sure you checked in at the registration table and picked up an agenda and comment card. There is water in the back of the room. For restrooms you go straight out the exit and go all the way to your left.

In case of an emergency you will be exiting the building by taking the stairs, just take a moment to look around. There are three exits, find the one that is nearest you. And let's see, let me grab the clicker.

Those of you joining us by webcast please email us at saferconsumerproducts@dtsc.ca.gov.

Now it is my great pleasure to introduce you to a special guest for opening remarks. We're really excited to have our Secretary for Environmental Protection here today. Please welcome Jared Blumenfeld.

(Applause.)

MR. BLUMENFELD: Hi, Asha. Thank you.

Thank you to Asha. We also have Meredith Williams, Dr. Meredith Williams, our new Director of DTSC. Let's give her a rousing -- (Applause.) Yeah, and as you know, Meredith came from Safer Consumer Products. And we're lucky enough to have Karl, who is doing that right now. So Karl, thank you so much for being here too.

And thank you everyone in the room.

My basic take is when you think about the public, the public expects some degree of safety. So when you read in the newspaper that PFASs, which most people are never going to get including me, to Asha's level of being to articulate what they mean, they know that they're not good. They know that they last a very long time in the environment. They know that they have human health impacts.

And when you then say that they are being found in things like food packaging, people are like, "What? Where is government? Where is the business community? Where is

academia? Why are these things still happening?" And so I think people like to point the finger. That's not our goal. Our goal is really to work collaboratively as a community, the regulated industry, us, really every stakeholder, to come out with solutions. Because the last thing that people want is just, which I think we have too much in our society, is a lot of blame and not a lot of action. So our goal is to try and remove the barriers.

And that's really what Safer Consumer Products is about. It's about thinking about alternatives. Are there different ways of achieving the same goal? And I certainly hope there are in food packaging if you need to have PFASs in those kinds of consumer products. People are already unsure about their water supply. It's a national issue where there is a lot of uncertainty and then not enough clarity. And our goal in this exercise today, and moving forward, is to bring as much light and clarity to the process. And then work collaboratively across barriers to understand how to solve those problems.

So we at CalEPA and certainly at DTSC and OEHHA and all the boards and departments, actually this is -- PFASs, certainly not in food packaging, but generally is one of the things that nearly touches everything that we do. So we are here with our host, DTSC, but we also are calling upon the full range of experts.

And really expertise is important, right? You shouldn't have to have a PhD to go into a fast-food restaurant and work out what's in the packaging. You should presume that there is safety. And that's obviously a complicated word, what that means. But you should at least presume that there are not toxic, bio-accumulative toxins in there that are going to affect you directly.

So our goal with this workshop today, as with all the work that we do is to think about the problem, understand it, hopefully reach some consensus around what it is that we can and should do to go forward. And then amongst those range of alternatives pick one, working collaboratively with the regulated industries, in this room and outside, to come up with solutions that make sense for everyone.

So it sounds easy, but it isn't, right? We all know, we've gone through these processes before. I think the program itself, Safer Consumer Products, has turned the corner in terms of really having knowledge under its belt. It's working with you all to prove how this can be done differently. This doesn't need to be adversarial. This can be a collaboration.

So that's my goal for this workshop, to come up with solutions that don't take decades to implement, but paths forward to where we understand alternatives that can

be implemented fairly quickly and reasonably. So if we can do it for this, we can continue the trend of doing it for other products.

The Governor in his budget working with OEHHA, but many people in this room, proposed $6 million for doing what we all have recognized needs to be done as the next step on Chemicals Policy, which is computational toxicology. And also obviously looking at biological ways of understanding across a whole set of chemicals whether it's PFASs or other groups. Understanding kind of what are the hazard traits, so that you can read across and understand without this incredibly laborious chemical-by- chemical, individual-by-individual scenario.

So that's an exciting, I think transformative and hopefully collaborative. I'd love to think about how we can collaborate with people in this room. When I've met with other states, Massachusetts and North Carolina, they are all like, "How can we bring in as much of our thinking and computing power to do a lot of this work together?" So I think collaboration is the name of the game.

There's a lot of pressure outside this room for us to fight and for us to be oppositional. That's not what we're here to do today. So if you came here with your boxing gloves on take them off and think about at the beginning of the year how we can work together to solve this

complex problem and many more like it.

Thank you, and thank you to Asha for hosting us.

(Applause.)

MS. SETTY: Thanks so much for kicking this off, Secretary Blumenfeld.

Now we're going to get started with our morning presentations. If we have time after each presentation we will open it up to clarifying questions. Otherwise we'd like to ask if you would hold your questions and comments until we start our panel discussions.

We do have a couple of presentations where the speakers will be presenting remotely. For these, we will have a little extra time since they won't be able to join the panel.

Now I'd like to introduce you to our first speaker Andre Algazi, the Section Chief in the Safer Consumer Products Program, and has led the Chemical and Product Evaluation team since the program's creation in 2013. Previously he worked in the DTSC's Office of Pollution Prevention where he led implementation of laws regulating the use of hazardous chemicals in a variety of consumer products. Please welcome Mr. Algazi.

MR. ALGAZI: Is there a clicker? Thank you Asha, and good morning everybody.

So before we get into the panel discussions today

we would like to kind of give you some context and orientation for what we're talking about today with regard to PFASs and food packaging.

We had a public webinar back in October that many of you may have participated in. And if you did then this won't be new to you, but for the benefit of people who may not remember just to refresh your memory or who weren't there, I'd like to sort of start with an overview of our regulatory framework.

This slide shows in the four horizontal bars the four steps of our regulatory process. It begins with chemicals. We have what's called a Candidate Chemicals List, which is a list of 23 lists of chemicals that have been identified based on either a hazard trait like carcinogenicity or a persistence, bio-accumulative and toxic, or exposure potential. All those lists compiled together comprise thousands of chemicals, maybe 5,000 chemicals depending on how you count groups like PFASs, which in and of itself is maybe 5,000.

The second step is products, our Priority Products. And we are in sort of the preliminary to middle stages of identifying Priority Products with regards to food packaging. So that's where we are today. This process involves compiling, researching, compiling information, publishing technical documents, having dialogues like this

one, and adopting regulations that ultimately identify a specific product-chemical combination as a Priority Product.

Once we've completed that step we go on to Step 3, which is Alternatives Analysis. In that step the manufacturers of the product that we've listed in regulations do an Alternatives Analysis, which entails identifying what are the functional requirements of the product? Why is the Chemical of Concern being used? What function does it serve? What possible alternatives exist that might meet the functional requirements? And then a detailed comparison of the adverse impacts that might -- the relevant factors for each Priority Product and the alternative.

Based on the Alternatives Analysis, which is a fairly detailed and technical analysis, we then go to step 4, which is regulatory response. So the main kind of takeaway from this process is that we don't determine the regulatory response at the outset. We base the regulatory response on what is shown by the Alternatives Analysis, which is prepared by the manufacturers. So the manufacturers identify what the functional requirements are, want the alternative might be. And ultimately we make a decision based on the analysis.

So as I mentioned we're kind of in the second of these four steps, which is Priority Products. In the

framework regulations that we are working under, there is two key prioritization principles that we need to make a determination on in order to decide to list something as a Priority Product.

The first is that there be potential for exposure to a candidate chemical in whatever the product is. And secondly, that these exposures have the potential to either contribute to or cause significant or widespread adverse impacts. So it's a narrative standard. We don't have a threshold or a risk assessment in order to make that determination. It is just the words that you see here.

As I mentioned we had a public webinar in October of 2019. At that time we released this document, which is our public background document on food packaging with PFASs. And this sort of lays out the basis for what we're talking about today, the scientific and regulatory criteria that we used to determine if this was something that we needed to talk about. And that's why we're here today.

And today what I would like to do is I'm going to give you sort of an overview of some of the information in the public background document. I'm going to talk first about definitions, what we're talking about when we say, "food packaging," what we're talking about when we say "PFASs." I want to talk a bit about the potential for exposure to PFASs from food packaging, the potential adverse

impacts from that exposure. And then finally a little bit about potential alternatives, which we'll get into in the panel discussions in more detail.

So in the public background document when we say food packaging, we're talking about any product containing PFASs placed into commerce in California, marketed or sold for making paper, paperboard, or molded fiber resistant to oil, grease and water or for releasing molded fiber food packaging from the formation molds. So this is our working definition of food packaging.

As far as PFASs, we're talking about any member of the class of PFASs. I mentioned the 23 authoritative lists that make up our Candidate Chemicals List. One of those is the Priority Chemicals List for Biomonitoring California. Biomonitoring California's Science Guidance Panel added the entire class of PFASs to the Priority Chemicals List in the latter part of 2015. And by doing that the entire class of PFASs became Candidate Chemicals under our regulatory framework. So when we're talking about PFASs we mean any member of this class that might be used in food packaging as I talked about on the previous slide.

So this is review for I'm sure most of you. PFASs can be divided in different ways. Sort of the way we think about it and the from the Wang et.al paper in 2017, the four subclasses of PFASs includes the perfluoroalkyl acids, which

include well-known members such as PFOS and PFOA and many others. There are PFAA precursors, which are PFASs that either degrade or may metabolize to perfluoroalkyl acids, fluoropolymers and perfluoropolyethers, which are the fourth class.

So with regards to the use of members of this class in food packaging, there are currently 30 approved notifications for use of PFASs in food contact substances under the FDA FCN program. That really accounts for 19 distinct compositions and there are 6 manufacturers that we're aware of.

And these products are very common in California. There's some examples on this slide: bakery bags, deli wrappers, microwave popcorn bags -- we'll hear a bit about that I think later today -- and molded fiber food serviceware, things like bowls, soup containers, clamshells, things like that.

So with regards to exposure potential, so there are 19 or 30 approved FCNs. They're in a wide array of products that are ubiquitous. And as far as exposure from those products and other sources we do know that PFASs are ubiquitous in the environment. They've been detected in environmental samples and biota collected around the world, even at the farthest corners of the world far from any industrial activity or human population. So they're

ubiquitous in the environment. They are found in plants and animals and humans and in our food and drinking water.

In addition to exposure directly from consuming food that has been packaged or served in food packaging there are other routes by which PFASs can expose people or environmental receptors through migration from landfills, composting, landfill leachate and through recycling of PFAS-containing products.

As far as adverse impacts in our framework regulations we cite OEHHA's regulations, the Office of Environmental Health Hazard Assessments regulations that define the hazard traits that we look at. Any Chemical of Concern we identify, we need to identify what its hazard traits are. And those regulations include what are called "exposure potential hazard traits." And in and of themselves these are reason for concern. And for the members of the class of PFASs we think all of them have at least one of these environmental exposure potential hazard traits, which include environmental persistence, mobility and bioaccumulation.

And then another concern, is a serious concern, is that PFASs are passed on to our most vulnerable population: fetuses and infants through the lactational and transplacental transfer. So the exposure potential for PFASs is well-documented.

As far as hazard traits all the members of this class are not well characterized. The best characterized are the longer chain PFAAs. Their hazard traits can include carcinogenicity, cardiovascular toxicity, endocrine, immuno and reproductive toxicity. The shorter chain, six carbon or less PFASs have a range of hazard traits that can include developmental endocrine, hematotoxicity and the other ones shown on the slide.

So I mentioned on the earlier slide that if you take into account, if you look at the four subclasses they include the PFAAs and the PFAA precursors, fluoropolymers and perfluoropolyethers. Basically this slide kind of shows that all roads lead to or from perfluoroalkyl acids, so they can degrade or metabolize -- I'm sorry -- so like for fluorotelomer-based substances can degrade to PFAAs. The perfluoropolyethers can combust and form PFAAs. PFAAs are used to manufacturer perfluoropolyethers. And similarly the polymers can combust to and are manufactured from PFAAs and can contain PFAA impurities. In fact, this OECD report found that out of 5,000 or so PFASs over 80 percent can degrade to PFAAs.

So in summary we're concerned about potential adverse impacts to sensitive subpopulations, to endangered species, and to sensitive habitats from PFAAs coming from a variety of sources including food packaging.

As far as alternatives are concerned there are a variety of ways of approaching alternatives to using these chemicals. One is using alternative materials to the fibers that are used to make the materials that are coated or use PFASs. Another is to change the processing methods. Use different kinds of coatings or use chemical barriers to prevent the oil in -- or between the PFASs, I guess.

As I had mentioned we put out this public background document in October and we are now reaching the end of our public comment period. We are accepting comments until 11:59 p.m. tonight via our CalSAFER web portal. So if you haven't already submitted your comments I'm hopeful that this isn't the first of you're hearing of it, since this document has been out for a few months. Please submit your comments by 11:59 p.m. tonight.

And I think without further ado I'll give it back to Asha and we can get on with the next speaker in the panel discussions.

MS. SETTY: We do have a few minutes for questions. If we have any from the audience we can take questions. We can come to you with a mic. Questions?

Okay. In that case let's go ahead and thank Mr. Algazi for the presentation. (Applause.)

MR. ALGAZI: Thank you.

MS. SETTY: We're going to move on to our next

speaker. Dr. Carla Ng is an Assistant Professor at the University of Pittsburgh. Her research focuses on predicting the biological fate and potential hazards of PFASs. She develops models to better understand the fate and transport of legacy in emerging chemicals. And also studies the cascading benefits of green infrastructure networks. Please welcome Dr. Carla Ng. (Applause.)

DR. NG: Okay, so those first two talks relate to this nicely, so I'll be able to gloss over some slides. And just to preface this a little bit, this is not going to be a research talk. This is more a little bit of an overview talk, but I will touch upon kind of how a scientist approaches these questions and what we do and don't know. And what we see as our role in helping to provide kind of guidance for scientifically sound policy I would say.

So as we've already talked about, PFAS can enter our food through many different routes. And one of the challenges we have is in really understanding what is the main issue for human exposure to PFAS. So we know that if you live in a community with contaminated water, drinking water is going to be your primary source of PFAS exposure. If you're outside of one of those communities it's thought that food is your primary route of PFAS exposure.

In addition to that we also have the indoor route, which is still sort of poorly characterized in ongoing

research. But we all understand that food is an important route and of course we all want safe food. And so it's an area of concern for communities and scientists.

And I'm going to speak specifically about packaging today even though that's not my normal area of research. I've been studying PFAS for some time now. The years keep going by. But I'm kind of an application agnostic researcher, so I'm interested in looking at the PFAS structure and understanding how it behaves. But not necessarily focusing on a particular application.

As has already been discussed PFAS is used in food contact materials in a lot of different ways, directly in packaging, which is I think the focus for today. But also more indirectly in other things such as in the food processing industry in materials that are used that are in contact with food and even more esoteric applications like in greasers and oils to keep the moving parts in the machinery running. And so just trying to get a handle of all of those uses of PFAS can be challenging.

So when we're thinking about PFAS in food packaging, and really any chemical in food packaging, there are three essential things that we need to understand. We need to know how the chemical will transfer from packaging to food, so the migration behavior. We need to understand how or whether it will transform within the packaging itself

or within the food once migration has occurred. Is the chemical staying with the same identity as it was first put into the packaging material and very important, whether it's going to be bioavailable, bio-accumulative, and/or bioactive? And all of these will depend on the identity and properties Of the PFAS in question.

Of course this seems really logical, but that's kind of a challenge, right? So we don't necessarily have a lot of information about the identity and importantly the concentration of PFAS that are used in a lot of applications. And I speak as a scientist who just kind of goes on the Internet to try and figure out what's been published and what's available for public consumption, right?

So which PFAS are used in food packaging? A lot of the PFAS already been discussed today in general are those that are used for what's called "sizing of materials." So if you're trying to make paper grease-proof this could be as a coating on the surface of the paper. It could be impregnated throughout the paper fibers, so that figure just kind of shows an impregnated paper and what that looks like.

The problem from the scientific perspective of somebody like me trying to say, "Okay, what are the properties of these chemicals," is really that it's difficult to find public information about specific

chemicals structures and composition. There is this FDA inventory of food contact substance notifications, so these FCNs that will be discussed further today. But if you've ever, and I'm sure a lot of you have, looked at these this is what one of these looks like. So I go to their website and I look up, okay what kind of notifications are there on food contact materials, the food contact substance is given up there.

So I have a PhD. I have a background in chemical engineering. I study environmental engineering now. That does not jump out at me. I look at that sentence and go, oh I know what that does. It's very opaque, right? And so it's useful if we can actually see what a chemical structure looks like.

So I understand that we're going to have a couple of talks after me. There will be a specific presentation talking about this EDF FOIA request that was able to find some of these more detailed information about specific FCNs, so I'm not going to get into the source of these documents. But I will just point out what I see as a scientist looking at some of these structures.

So these are three different FCNs that I downloaded from that EDF site. And all of these are what we call side-chain fluorinated polymers. I think this is important to think about, because in the overview that we

were just given about PFAS there's been a lot of focus on PFAAs, these perfluoroalkyl acids, because that's what a lot of things break down into, that's what we know the properties of. But there's also a lot of conversation right now about whether fluoropolymers should be considered like other PFAS. There's a little bit of a push to consider them as less problematic, because they are supposed to be persistent and not break down.

Side-chain fluorinated polymers in particular are the ones that we do know break down. And so if you're trying to figure out how to look at this structure, just know that the backbone is a normal polymer backbone not a fluorinated. And they have these side chains that stick out, some of which contain a fluorotelomer group on it. So there are fully fluorinated carbons, there are partially or non-fluorinated carbons. And what's going to happen is at that non-fluorinated carbon those groups are going to break off. And that's how you get PFAAs entering into the environment or potentially into the food from this polymer material.

So here just is one of the examples, FCN 1676, and you can see that they have a C_6F_{13} group there. So when that breaks off, you're basically going to have a hexa-fluorinated acid that forms.

And so this is as I said, this is a side-chain

fluorinated polymer. And there is this argument that fluoropolymers are substances of low concern, because they are not bioavailable based on the monomer size, but not based on the size of these substances that break off. So even if we accept the argument for the polymer itself there are ways for these smaller substances to migrate into food. Either through residual monomer, this is something that should be taken care of in the FCN, through the migration of impurities or through the degradation of the polymer and subsequent migration into food. And then once this migrates into food there should be some measure of what is the exposure that could result from this.

So most of these submitted FCNs will exclude migration studies, because what they say instead is let's assume the worst-case scenario. We're going to be extra vigilant and say we're just going to do the worst case and just assume that it's the low molecular weight. Oligomers that are left over and impurities and all of those are going to be migrating into the food.

And my question looking at this critically is, "Is that actually a worst-case assumption?" Because stability testing, to understand whether these break down or not, usually only take into account heating of the food contact material. They don't think about what are the properties of the food it's in contact with that might interact with the

chemicals that are there? And the exposure estimation only takes into account the low molecular weight oligomers and the impurities, and not any potential degradation products. So if we know that side-chain fluorinated polymers may degrade that's not taken into account in these calculations.

Furthermore, at least for some of them, it would appear that the detection limits where the low molecular weight oligomers are not that high. So given what we are now seeing what we think of as concentrations of concern for PFAS, are those detection limits low enough to catch them?

And there are recent data emerging -- even not all that recent, 2014, which is now six years ago -- show that side-chain fluorinated polymers do degrade the environment. So this is a study looking at the amount of analyte. And you can see here that you have your precursors. And then these are the breakdown products from this polymer here that are appearing in soil after a few months' time. And as you can see, these go up.

The big spike here, that's PFOA, certainly of concern. And this will occur in soil on the order of months. So it's not fast. The question is what happens if you have food that's packaged that's sitting on the shelf for a while? Can you expect to see any of this degradation occur there as well?

This is another study that was looking

specifically at fluoropolymers used in clothing. But again, they saw substantial opportunity for degradation. This is a paper from 2019, so would this also happen for food contact materials?

UNIDENTIFIED SPEAKER: (Indiscernible)

DR. NG: Oh I'm sorry. Can you hear it, was it I was just holding it too low?

UNIDENTIFIED SPEAKER: Right.

DR. NG: Sorry about that.

And so we know that there is a potential for human exposure to materials from food contact materials, because we see it in biomonitoring, right?

So this is a study that came out just last year in "Environmental Health Perspectives" showing a correlation between an increase in PFAS serum concentrations versus typical types of food consumption habits, so consumption of fast food or food not prepared in the home. And that this was corrected against whether there are specific foods that tend to have higher concentrations of PFAS through environmental accumulations, so it really pointed out that consumption of fast food and specifically consumption of popcorn was associated with increases in serum PFAS.

So it's more associated with where food is being consumed that is at restaurants or from packaged foods, than which food is being consumed. And so then that points to

the point in the food cycle where PFAS are entering and might be causing exposure.

So one of the other issues with this, especially as we think about the degradation of materials, is that we have this potential of causing this forever loop, right? So they enter it into the packaging. It might enter into the food from the packaging causing direct exposure, but then once that packaging is disposed of there is a potential for additional entry into the food system when materials such as compost and biosolids are used in agricultural applications.

And so we've seen stories like this popping up again and again. Here is a particular sad story in Maine about a farm that applied biosolids from a pulp and paper mill years ago. And after 15 years there the milk was so severely tainted that they could no longer sell it. And basically the farm is lost.

So because, keeping in mind this idea about the slow degradation of side-chain fluorinated polymers, are we kind of making ourselves a little time bomb where the slow polymer degradation and high persistence of the products could represent a near-constant source for legacy contamination of the environment? And what can we do? That's kind of depressing.

We should think about this from a life cycle

perspective, of course. Especially thinking about things like polymers you need to think about the production side, the use side, and the disposal side. We need to understand what constituents are going to be released from the material when it's manufactured, when it's integrated into products, while it's being used and when it's disposed of.

And if we want to quantify risk, which is what a lot of us want to be able to do, we want to be able to prioritize and use our resources wisely; we need to know the quantity and identity of all the chemicals involved. And I know that there are different levels of interaction at which this happens, so sometimes governments are privy to information that the public is not privy to. But definitely there needs to be some sort of agreed-upon data sharing so that we as scientists can help in designing models that can help predict the risk of these substances.

And of course even while we're trying to reduce our uncertainty we really need to be able to find safer alternatives. And so just a couple of words about this, and so I'm not going to get deep into it, but is something that I do as my bread and butter is developing models to predict the properties of PFAS.

So we develop models to help predict whether and why they bioaccumulate. We do a lot of prediction of protein interactions with PFAS and subsequent tissue

distribution. We're starting to make models of PFAS bioactivities. So I have a recent application using machine-learning to try to find which PFAS are bioactive just for kind of large-scale screening of many thousands of substances. And then we do some more detailed tissue-level models to understand the toxicokinetics of these substances so we know which ones are going to stick around in the body and may have a chance to have bioactivity.

And these models are really useful, because they can really help to screen and prioritize substances when we don't have any experimental data. And then say okay these look kind of nasty. Let's go and try and get experimental data for these to confirm what we see.

And then beyond the models I've been working with a group of international scientists to kind of think about ways that we can move forward even in the absence of total surety, which we will never have about anything. And we've been talking a lot recently about this essential use concept which we think can be very powerful in moving forward.

So we need to think about what separates substances that are kind of non-essential that are there, because they are kind of cool or they impart something. But the function that it imparts is not essential for the health, safety or functioning of society. And so some of the examples we have here, are for example the use of PFAS

in dental floss.

Substitutable, so these are uses that have become regarded as essential, but there are other alternatives available. Most uses of AFFFs, certain water-resistant textiles, and I would say a lot of the paper board. I think there's somebody here from Denmark who will be talking about this, which is great because they've made huge steps forward in this and I don't see why we can't follow their model.

And then some of the essential uses for which there are currently no substitutes, but which we can think about now this is where we should focus to find substitutes as quickly as possible. And for now food contact materials are kind of in that 1, 2, or 3 zone, depending for which application we're talking about.

And I just want to point out that in these FCN data that I look through they usually use this result of a kit test to give as a means to demonstrate the efficacy of fluorochemical treatment in paperboard. So they just have to show that it's really good at repelling oil and grease. How much do we need that? So efficacy is not the same as essentiality. So just because we have a substance that can make something have this function we still need to ask ourselves how much do we need this function? And is there something else that we can have that is not quite as good but certainly good enough and doesn't pose the same risks.

So I think that's the question that I think will be key for us to discuss today.

And with that I'd be happy to open up to questions or panel discussion later. Thanks.

MS. SETTY: We do have time for questions. Do we have any questions from the audience today? (No audible response.)

Okay, great. Well let's thank Dr. Carla Ng for the presentation. (Applause.)

We're going to move on to our next speaker. Brian Sernulka is a Director of Government Relations for the Foodservice Packaging Institute. Previously he worked with regulatory agencies and policymakers while managing government affairs and sustainability at Graphic Packaging International. Please welcome Mr. Sernulka. (Applause.)

MR. SERNULKA: Good morning everyone. Yeah, so I'm a little bit of the opposite of what we just heard. I am not a chemist or a scientist. I started with the Foodservice Packaging Institute in October of 2018. As you mentioned, I previously -- I came from the industry though. I worked for a paper company for several years on sustainability and government affairs. But most of my career has been on government relations working at all levels of government. And I'm certainly interested in this conversation, because we are -- obviously we have a stake in

how this is regulated and future policy that's going to be used surrounding this as the debate kind of unfolds. I also went to Georgia State University and have a Master's in political science.

I'll give you a little background on FPI. The Foodservice Packaging Institute was established in 1933. It's the only trade association in North America that solely focused on all single-use food service packaging products. We represent roughly 90 percent of the industry. We have several members here in the audience today too. Basically what our association does is we have the entire supply chain in our membership. So from the raw material, the person who is actually creating the item, to the converter, to we have an associate membership where the suppliers or the users of the products are actually members of our association too. So I think this is probably one of the most important pieces of this.

What I want to bring to the talk today is following up on the introduction to the meeting, was that we look forward to this collaboration. We look forward to being a part of this process. And what we can do as an association is really take this information back and deliver it to our members. And then when we need to we can bring them into this discussion and have them part of whether it's specific examples or discussion about the supply chain. I

think that's going to be really important.

Foodservice packaging, the items that we represent, it's basically everything you could possibly imagine on the single-use food service packaging side. So cups, plates, platters, bowls, trays, beverage carriers, bags, containers, lids, domes, wraps, straws, cutlery, utensils; it goes on and on. This is stuff that we use every day. This is stuff that is sanitary, it's cost-effective, safe, convenient, helps drive the economy. These are critical items that we all -- I don't think we realize how much we actually use as a part of our lives. So I think this is a great association that really covers all this stuff.

I want to jump through this real quick, because we've kind of already done the PFAS and what it is discussion. And like I said I specialize in government relations and not chemistry.

Before us we're looking at the applications for PFAS, so non-stick cookware, small appliances, repeat-use food contact applications. So actually a good reference here is we saw some policy in the northeast last year that would have been introduced, unintended consequences where they were talking about specific packaging items. It actually would have brought up the tubing and hoses that are used in soda machines, so trying to get Coke or anything

like that actually would impact it, because it does have a component of PFAS in it. Food processing equipment, food wrappers, obviously paper/molded fiber serviceware, take-out food containers, pizza boxes, popcorn bags, pet food containers.

As we've kind of covered off already today it prevents oil and grease from seeping through food packaging materials and onto clothing, skin, furniture, car interiors, etcetera. I mean, you realize what a to-go, based-on-the-road fast-driven economy that we have in this country. And consumers rely on these products to not leak grease into their car or on them, especially if you imagine being like a traveling salesman or something like that. I mean you're eating on the road a lot. You're using these products on a day-to-day basis. And you rely on them to be convenient and safe and perform to the degree that you're not having some sort of issue with this.

We've talked about this a little bit already today, but I will say that on the long-chain materials that we had talked about here earlier, PFOA and PFOS, these were voluntarily phased out and are no longer used in the U.S. and Canada. Though I do believe some countries still allow it.

So really, what we're here is to talk about the short-chain chemicals. These chemicals are approved by the

FDA and Health Canada. For us as an association we cover the U.S. and Canada -- that's why I continue to mention Canada -- plus many regulatory agencies around the world.

The FDA process, the FDA requires pre-market review of food contact substances including data on chemical composition; levels of those substances that may be released under intended use conditions and the resulting potential dietary concentrations; toxicity data on the substance, including all impurities and degradation of the products. I think we kind of saw a little bit of that in the last presentation, so I'll move on quickly here.

Again, I think the biggest point to take away from this is that the FDA does do a rigorous process to review these products and they are approved. Right now today there is less than three dozen PFAS chemicals that are allowed by the FDA in the U.S. So when you see that big chart that says 5,000 different chemicals when we're talking about food packaging we're talking about a much smaller subset, something that's typically never mentioned in the media articles or anything else. But that is really where we're trying to focus in on the discussion for food packaging.

So right now, again, I want to kind of go back to the FDA. So FDA actually put out a statement earlier this year on PFAS substances, there's a lot of material available on their website, certainly will reference you back to the

FluoroCouncil on their collection of scientific studies that they have around PFAS substances that are currently allowed in food packaging today. And they right now present no significant risk to consumers.

"Using FDA's methodology for calculating estimated dietary intake, the maximum levels of PFAS used in food packaging today are 13,000 times lower than estimated safe levels, meaning the specific PFAS substances approved by FDA for use in food packaging pose no appreciable risk to human health or the environment." This statement came from FDA itself in June of 2019. It's available online. It's something that our industry follows by.

So some things that we just wanted to point out, again this gets back to that big large number that is referenced constantly treating all PFAS chemicals the same. That's not the way to approach this discussion. I mean we're talking about less than two dozen chemicals that are actually in food packaging, not the reference to 5,000.

And then certainly looking at The FDA approval process, FDA's approval process is one of the most stringent in the entire world. The U.S. consistently has one of the safest food supplies in the entire world. And this is in part due to this approval process and looking through the chemicals that we've submitted.

So the Foodservice Packaging Institute put out a

position on PFAS last year. FPI supports the continued use of FDA reviewed and approved PFAS in food service packaging. FPI also recognizes that alternatives may be introduced to replace PFAS, and both should be able to compete in a free and open marketplace. So we have more information on this that's found on our website. This was just recently updated and put out last year by our Board.

And I just wanted to kind of run through a few other brief comments that we had on things that we see as an industry that continues to be brought up.

Right now we don't really see a great, consistent test method I guess is probably the best way to say it. Is that where we look at it and how it's consistently tested, a lot of the articles that you will see will be testing for the presence of fluorine in the environment, but not specifically down to these 13 exact chemicals that are used in food service packaging items. So a lot of the articles could be misleading around exactly what they're looking for, how they're testing, and the chemicals that are under discussion.

The presence of fluorine does not mean the presence of PFAS, and certainly doesn't show the type of PFAS. So again a lot of the media attention around this is getting caught up in this larger conversation, but not down to the specific details that are related to food service

packaging items.

We know of certainly a lot that are out there in the industry: Notre Dame, Iowa State, some of the others that are putting together some of the testing programs around this. And you certainly look at, from a policy perspective each state that is working on this issue is certainly looking at different ways for testing and trying to find a presence for it, which at the end of the day is going to make an inconsistent marketplace and a difficult supply chain for large manufacturers of food service packaging items.

This is my contact information. I'm really looking forward to the panel discussion; because I think we can kind of get into some of the more specifics around this. And again I think one of the biggest things is talking about the supply chain and how these products are actually produced and entered into the marketplace. I think it's going to be a really big component to how it could potentially be regulated at the statewide level, certainly.

So right now if anybody has any questions I'm happy to answer them. If I don't have the answer to the question we can find it. We'll get back to you and try to get you the answers on the questions.

I appreciate the time.

MS. SETTY: Thank you. We are ahead of schedule,

so if we have any questions for Mr. Sernulka we'd like to go ahead and see first if we have anyone from the audience? And if not -- okay, we've got one.

ACTING DEPUTY DIRECTOR PALMER: Hi Brian, it's Karl Palmer from the Safer Consumer Products Program. First, thanks for being here and sharing with us your perspective.

I have a general question. You know, we've seen in different industries with similar type challenges, industry or trade organization is getting together and actually being somewhat proactive about making a commitment to move to safer chemistries and looking at alternatives. And I would point to the apparel industry in this space, which started with restricted substances lists and then has I think made a bigger, broader commitment to move forward.

Can you speak a little bit about what FPI is doing in terms of being proactive in terms of looking at the challenges in this class? Can we expect to see something out of you in that regard, rather than being sort of being reactive?

MR. SERNULKA: Yeah. I think that's a great question. As an industry yes that's what we want to do, is we want to pull all the stakeholders to the table and have this discussion. I think the problem is as you're seeing -- this is a great example on the testing side -- is you see a

lot of different groups, BPI and others related to composting that are kind of going different directions on this in how they regulate it, how they address it, how they test it. So trying to pull some of that together as an industry is going to be important and it's something that we're currently having internal discussions on.

So like I said we put out a statement in 2019 that really kind of sums up our position on this. But it will continue to evolve and grow as the industry continues to have this discussion. So as we sit we represent roughly 90 percent of the industry. That's where this discussion is unfolding at right now and I think you will probably see some new things that come out around it in the future. But again it's just something that hasn't been totally discussed or worked out yet for a lot of the groups. So I think that that's something we're working on right now.

And certainly we want to try to pull everybody together, because if we all go different directions it's going to make it really difficult on the supply chain, a national supply chain.

MS. SETTY: Thank you. Do we have any other questions from the audience? (No audible response.)

Okay. Thank you so much for the presentation, Mr. Sernulka. (Applause.)

All right, we do have one more speaker before the

break who will be presenting remotely so bear with us. Dr. Maricel Maffini specialized in researching carcinogenesis, reproductive biology and endocrine disruption. She has spent the past nine years conducting research on the U.S. Food Additive Regulatory Program with an emphasis on food chemicals, risk assessment and science policy.

We will leave some time for discussion with Ms. Maffini after the presentation since she won't be able to join us on the panel discussion this afternoon.

Are you ready for us Dr. Maffini?

DR. MAFFINI: Yes, can you hear me and can you see my screen?

MS. SETTY: Yes, yes. We can hear you great.

DR. MAFFINI: Can you see my screen?

MS. SETTY: Yes, we can see your screen.

DR. MAFFINI: Great, thank you.

Well thank you so much for the invitation to be with you this morning. I apologize. I had plans to be there in person, but life got in the way and played some tricks with me this weekend on health-related issues. But I appreciate the opportunity to participate in this workshop. And today I'm going to share with you some of the information we learned from a Freedom of Information Act request to the Food and Drug Administration regarding the use of PFAS in contact with food.

So first of all this is my disclosure. I work with public interest organizations with the private sector. I was a co-author of a petition to the FDA to ban long-chain perfluorinated chemicals and that was accepted in 2016. And this work in particular was done in collaboration with the Environmental Defense Fund. But in this talk, the preparation of the talk, the opinions are my own.

So very briefly here, since Carla and Brian discussed this already, but I just want to make sure that we're on the same page that PFAS can be used in contact with food because one, The FDA approved the uses in the regulations.

Or manufacturers determine that the use of that particular PFAS is generally recognized as safe. And this doesn't mean that the manufacturers have to tell the FDA what they are doing. It doesn't have to go to the FDA for safety review. They can just bypass it and use it based on their own declaration. And of course we don't know anything about those substances the entity uses and their safety.

And the third one, that is the one I'm going to focus on today, because it is the basis of our FOIA request, is the Food Contact Notification Program that is based on the review by the agency of the safety assessments submitted by manufacturers to the agency. The agency reviews that. Prepares an opinion and then publishes its decision at a

website.

That is the inventory that Carla already showed you how it looks like. This is again another caption. It has the search box where if you write the word "fluoro" it will come up with 70 records.

And then, if you click on any of the numbers under the column "FCN No." it will lead you to this page, as I said Carla mentioned this already, and show you. But I just wanted to stress a couple of things to highlight kind of the opacity of the program. We can figure out the intended uses and we can figure out the limitations and specifications of uses of the food contact substance, but that is pretty much it.

For instance, the limitation of this substance by the company Daikin, it can be used up to 1 percent in the dry fiber. So these are not very small amounts, but just to show you what the FDA is looking at.

So because of the lack of information in the public domain we submitted this FOIA request for 31 food contact notifications that had a clear description that the uses were in contact with food. These were 19 distinct chemical mixtures, mostly polymers, 14 of which were used to coat paper and cardboard. Others were used for making gaskets and other pieces of the manufacturing equipment. And this covers six chemical companies.

We've received thousands and thousands of pages. Many of them were greatly redacted. But we got visibility in to some of the information submitted to the agency when it comes to the quality and the quantity of information the manufacturers submitted. But also it was important to figure out to get visibility into the agency's reasoning for some of the decisions that they made.

So today I'm going to focus only on the chemistry and exposure aspect of the response. As you can see on the right-hand side of the form, it's called 3480, is that is the food contact notification. That is all the information that the manufacturers have to submit. And then FDA prepares reviews and memos for each of these three pieces: environmental, toxicology, and chemistry and exposure.

So just for the sake of time these are the seven different sections within the chemistry information. I'm going to focus today on the identity, the impurities, migration and exposure estimates.

Again this is something that Carla already mentioned, but this is the type of information that you can see that is submitted by the manufacturers. What I have here in boxes are some of the names of the monomers, the PFAS monomers are used. And in some cases the information is provided in many different ways, some I think in a graphic way and some others just like very long formulas.

This is another example of more detailed information that we collected in a few cases where that was not redacted. So this is for instance a description of what the commercial polymer is. That in this case of the Archroma product is approximately an 18 percent polymer and 80 percent impurities and reagents.

And then the Asahi product is 15 percent polymer and the rest are expected reagents and impurities. And this is important. It will be more important later on in the talk, but this is just the few cases where we have more visibility.

So other issues that or other information that the companies have to provide is the list of all the ingredients and the monomers, the solvents, everything that is used to make these polymers. And as you can see here the red box is coming from FDA. It's not mine, all my boxes are green. And you see on the left-hand side a mark there with the green arrow is the PFAS monomer.

But also, they have to describe whether or not there will be a residue expected to remain in the final paper or carbon. And as you can see here there are in three cases there will a residue.

This is something that FDA already published in 2013, of their own research looking at paper, commercial papers. So on the left-hand side the second column is the

concentration of the polymers, the two different polymers on the paper. And on the right-hand side between the dotted lines are the concentration of PFAS monomers that FDA found in those papers. So, residues are there and in different ways.

So this is just a list of PFAS monomers that we have gotten from the FOIA response. I don't expect you to memorize this, but I wanted to show you that there are different synonyms. When you look at the FOIA papers it is incredible how they changed the names with time. Some things that used to something demonstrated that had 13 fluoro suddenly became a C_6 X Y and Z. So there is an evolution also in the way that companies name their products.

In addition to the reagents, the initial ingredients, they have to provide a list of impurities. In most cases again it is redacted. That is important for the manufacturers to not disclose that information, because it gives information about what's the manufacturing processes. That is what they are protecting. But in one particular case somebody forgot to redact this and we have some visibility here on a long list of impurities for this particular food contact substance that is Food Contact Notification 518 from Chemours. Everything that is within those green boxes are PFAS, so you have oligomers, you have

a great variety of impurities that the company describes are present.

Again, regarding impurities they have to demonstrate whether or not they will migrate from the final product into the food. And in this case that are here -- I forgot to box one at the end -- but there are seven impurities that will migrate into the food.

And this is again from the same 2013 FDA researcher's paper, again demonstrated that there is migration up PFAS from two different food packaging materials into food simulants representing in this case as acidic and fatty foods.

This is another example demonstrating that there is migration from a variety of PFAS. This is a research group in China. And their migration efficiencies for this particular PFAS will depend on the length of the carbon chain as well as the composition of the food. So that's why you have different results in each of the different columns. And this was a study performed in paper bowls. So because there are residues in the paper and the final product and there is migration the manufacturers need to estimate what the exposure would be. Again, the red boxes are not mine; that came from the FOIA.

And in many cases here you can see the values. But in only a couple of cases you see those values, the

estimated daily intake, or the dietary concentrations associated with chemicals. All the other impurities here we have an exposure estimate, but we don't know what they are. So that was very common in many cases, so actually we didn't even have this ability into the numbers.

So this is a particular case from Food Contact Notification 820, where they have this table with the exposure estimates for impurities. I want to call your attention to the reflection that FDA wrote in a memo saying that these exposure estimates are "vanishingly small." I was just surprised to see that qualification coming from a regulator, but it was interesting to see how their reason on whether or not these exposures can actually have any particular biological effect. So that reasoning that this, the exposures are very small is pretty much what is done in informing the toxicology review that the agency does.

So the main focus of the toxicity testing or the toxicity information that needs to be submitted to the agency is whether or not there is genotoxicity, either the monomer or a further monomer or the impurities.

Then basically the toxicology session of reviewers are looking at what the exposure estimates are. And in most cases the conclusion is that as I copied here at the bottom, toxicology has no questions regarding the safety of proposed use of the food contact substance based on the exposure

estimates and the toxicological evaluation of the data. That is in most cases just genotoxicity and mutagenesis testing.

So, what have we learned from the FOIA request? And here I want to just highlight a few, what I see as shortcomings from FDA's reasoning. That safety is driven by the exposure estimates, so if the PFAS monomer is not a genotoxic then the oligomers are also assumed not to be genotoxic. With a dietary concentration of less than 50 parts per billion of the monomer or the low molecular weight oligomers the assumption is that there is no safety concern. And just to make sure, the 50 parts per billion in the diet corresponds to 150 micrograms of PFAS per person per day.

These are estimates for each individual food contact substance. These are not grouped in any way. And at the toxicity testing again, other than genotoxicity it says they are very rare for PFAS monomers or even oligomers. Even when they know that they remain in the final product and they migrate.

So other shortcomings are the fact that all of these food contact substances are usually the monomers are this so-called short chains, so they are six carbons or less. And the assumption is that they don't bioaccumulate. We didn't find any information in the thousands of pages where companies submitted data on bioaccumulation.

There aren't any estimates of collective or cumulative exposures through the diet that include other PFAS in not only in food contact packaging, but also environmental contamination. And this is important, because FDA's responsibility by law, this is in the statute of the Food Additives Amendment of 1958, that the FDA has to assess the cumulative effects of chemically and pharmacologically-related substances in the diet basically taking a class approach. And this has not been done as far as I can tell by FDA in a consistent manner.

So again, this is to show you on the left-hand side are the PFAS monomers that were allowed by FDA to be used in food contact materials. And on the right-hand side is this list of PFAS that FDA has tested in the last few years. And they published, as Brian mentioned, first in June and then there was another publication in the last month. So none of these that you can see, they don't coincide. So what FDA is testing in food to figure out human exposures are environmental contaminants. They are not testing so far for PFAS that they have approved to be used in contact with food, so there is a disconnect there.

And with that -- oh, I think I skipped one -- yeah, here. Just to summarize that the agency has the position that low exposures are of no concern. We are lacking estimates of cumulative exposures to PFAS in the

diet. If the agency doesn't want to look at environmental sources such as PFAS they should be looking at the PFAS that are allowed to be in packaging and they are in the diet. We're not eating one of them at a time.

Again, toxicity testing beyond genotoxicity is lacking. There is no information about bioaccumulation or how the body deals with these monomers and even the oligomers. There is nothing on this short chain, the low-molecular weight oligomers. And it's unclear how they determine the size of the oligomers.

Again, this is unclear to me at least what the rationale for some of the assumptions are. Analytical methods to measure this PFAS are also lacking. And just the FDA approved another PFAS for use in contact with food contact a few months ago.

And that's all I have. Thank you very much.

(Applause.)

MS. SETTY: Thank you Dr. Maffini.

We do encourage you to ask questions of Dr. Maffini since she won't be joining us for the panel discussion. We want to make sure that those of you joining us by webcast if you have any questions for the speaker, please email saferconsumerproducts@dtsc.ca.gov. We'll go ahead and start. Do we have any questions in the audience?

MR. ALGAZI: Hi, Dr. Maffini, this is Andre Algazi

here at DTSC.

DR. MAFFINI: Hi.

MR. ALGAZI: In the table you were showing the PFASs that were being analyzed in the material. And those are not the same ones that were listed as contaminants on the FCN, do I understand correctly, when you spoke about the disconnect?

DR. MAFFINI: No, on the left-hand side is where the list of PFAS that were approved to be used in packaging. And on the right-hand side are the PFAS that FDA has been testing in food.

MR. ALGAZI: Oh, in food.

DR. MAFFINI: Food from retail or from farmers markets. And for instance they are running what is called a "total diet study." That is something that the agency has done for many decades.

They buy foods in different retail locations. This one specifically was in the mid-Atlantic. And then let's say they buy three different cereals of the same kind of cereal. They mix it together and from that composite then they measure PFAS.

The PFAS that they chose to measure are not those that they approved for use in food contact materials.

MR. ALGAZI: Thank you. I understand.

DR. MAFFINI: All right.

MS. SETTY: Thank you. We have another question over here, if you don't mind stating your name.

DR. BRUTON: Hi, this is Tom Bruton with the Green Science Policy Institute. Thank you, Dr. Maffini, for the presentation. My question is --

DR. MAFFINI: Hi Tom.

DR. BRUTON: Hi. Based on what we know about the toxicology of PFAS does it make sense to you that genotoxicity is the main metric that FDA is using in these reviews?

DR. MAFFINI: It should be complemented with other toxicity testing. There are no dietary exposures that I could see. There were a couple of studies submitted that FDA dismissed, they didn't consider they were technically correct. Both I think were 14 days oral dietary exposures for the monomers. And in some cases it was just they actually fed the polymer to the rats. And FDA sort of figured out that they were of low quality.

What we found was that one of the companies, Daikin, had dietary exposure studies done. So they have run, I believe it was either a 28-day feeding study or a 90-day feeding study, I'm not sure what the duration was. But in both cases -- well first of all they never submitted that information to FDA. And in both cases they saw liver damage, they saw kidney damage, and they saw tooth damage in

the rats.

We found those studies in the company's website. They had in their attempt to be transparent they had listed many of the studies they have done. And then we had some conversations with them about that and then they realized that that was a mistake and they took that out. The website, you can't find it anymore, but you can find it with the Wayback Machine. In any case, some information is available.

Unfortunately it was not submitted to the agency. And when it was submitted to the agency the agency considered it of low quality. So there was a lot that should be done since we know that these are multi-organ toxicants. And they are acting at extremely low levels and we know very, very, very little.

DR. BRUTON: Thank you.

MS. SETTY: Thank you.

Let's take a question from the webcast. So this question is from one of our online attendees, Pat Rizzuto from Bloomberg Environment. She's wondering, "Even if you don't know the impurities in food packaging fluoropolymers, has your research suggested any differences in the amount of impurities in the PFAS used for low-value paper applications versus other products such as high-value fluoropolymers uses in semiconductors or other high-tech purposes?"

DR. MAFFINI: Ooh, I am not a chemist or a chemical engineer. Maybe Carla can help me with that information.

When we looked at those notifications the FCNs that were for uses in gaskets for instance, for manufacturing equipment, I think most of them if not all were submitted by Chemours. And in their assessment of migration it was basically no, they didn't see anything coming out from that particular use and in the way the PFAS was used and manufactured. So that was a different kind of material. It was not paper and cardboard.

That is the extent of the information I can provide to Pat.

DR. BALAN: Was it also a different polymer like a fluoropolymer where the fluorine is in the carbon chain as in the backbone of the polymer as opposed to a side-chain fluorinated polymer?

DR. MAFFINI: There was a lot of redaction.

DR. BALAN: Okay. Thank you.

MS. SETTY: Okay, do we have any questions from the audience?

MS. MOLIN: Hi, Maricel. This is Daphne Molin from CalRecycle and I have two questions.

DR. MAFFINI: Hi.

MS. MOLIN: Hi. I have two questions for you. In

the FOIA evaluation that you did and the statement about very small levels of exposure, do they consider accumulative exposure in their evaluation?

And then my second question is about end of life and if the FDA evaluation of having these chemicals in the products, do they only look at the use of the product from the direct consumer or do they consider the full life cycle and consider what may happen from say composting or recycling of those paper products?

DR. MAFFINI: I will start with the last one. And no, they only look at the safety of the intended uses.

So for instance you will see that the same polymer, there are two food contact notifications, different numbers submitted at different times, but they are for the exact same polymer. And that could be that the first one was submitted for uses in paper and paper board but not microwave uses and the second one was for also microwave uses. So every time they change the use they have to submit a food contact notification to the agency. It's not an obligation, but they usually do that.

In the same way there are several notifications that have different -- they have the same polymers, the same monomers, but they are different notifications because they changed the manufacturing process. And they continue to change the manufacturing process to reduce the number and

the type of impurities. So every time they change the manufacturing process they should inform the agency. But the safety that FDA looks at is just about the use that is reported to them. They are not looking at life cycle.

For accumulative exposures I haven't seen any of that. There are memos written by FDA scientists indicating a list of other food contact notifications that were either for the same polymers or very similar polymers and monomers that could be considered under the same class when you're looking at them from the chemical structure perspective. In one case there were like five different ones. And the FDA said these are related chemicals, but they didn't do accumulative exposure for those.

And in addition to that, the mandate to the agency is to do accumulative exposure of chemicals in the diet. So if you have PFOA coming an impurity from packaging into the food, and you have PFOA from water, contamination both are part of the diet. And those should be considered together, but that is not the case.

Did I answer your questions?

MS. MOLIN: Yes, great. Thank you.

MS. SETTY: One more question from the audience.

MS. RUDISILL: Great thanks. Hi, Dr. Maffini, this is Cathy Rudisill from SRC. I had a question about the total diet study that you compared to the approved monomers.

In the total diet study the FDA does are they testing some of the foods that are used at high heat, you know high-fat foods that tend to increase potential for food migration? Or are they more of the sort of retail-shelf type products?

DR. MAFFINI: No, this is a very broad group of foods. They test everything. They test fish and meat and poultry and yogurt and dairy and pasta. And even not just things that you buy at the grocery store that are in a package, but they also buy from restaurants. Like they do chocolate cakes and ice cream and produce, fresh produce, and canned fruits and fresh fruits and no, it's a big variety of foods.

MS. RUDISILL: Thank you.

MS. SETTY: Do we have any other questions from the audience? Do you want to go ahead and answer? Okay. All right, in that case we'll check again with the webcast. Do we have any questions from the webcast?

(No audible response.)

MS. SETTY: Okay, in that case that takes us to the break. We will reconvene in a little bit more than 15 minutes, let's say 10:45, and begin our morning panel discussion. So see you then.

(Off the record at 10:28 a.m.)

(On the record at 10:47 a.m.)

MS. SETTY: Welcome back from break, everyone.

Now we're going to get started with our panel discussion of the lifecycle of food packaging products containing PFASs. I'll start with introductions at the far left and then introduce our moderators at the end.

So on the left, Brian if you could wave, we've already met Brian Sernulka who is the Director of Government Relations for the Food Service Packaging Institute.

Next we have Dr. Carla Ng who is Assistant Professor at the University of Pittsburgh.

Next to her we have Daphne Molin who is a Supervisor at CalRecycle with ten years of experience implementing chemical regulations. She oversees the unit focused on the end of life of plastic materials and developing regulations that require food service facilities to use packaging that is reusable, recyclable or compostable. Her unit is also engaged in evaluating innovative recycling processes, the compostability and degradability of new materials and the impacts of plastic materials. Ms. Molin would you like to make some opening remarks?

MS. MOLIN: Sure, thank you. I think that was a pretty good and kind of fast summary. Yes I was at DTSC for ten years and recently moved to CalRecycle as a Supervisor, formerly with the Safer Consumer Products Program, so I'm well-versed in the types of questions Simona will be asking

us.

Also as my unit in CalRecycle we focus on plastic recycling and issues that relate to that. So we have some upcoming regulations that will be coming out that also address foodservice packaging, thinking about the reusability, recyclability and compostability of those. And then woven into that is consideration for impacts to public health and to wildlife. So we've put out regulations last year, and PFASs are a consideration in that.

And then the other element that my unit works on that kind of relates to this area is when we think about compostable plastics it's a really complicated landscape, especially for consumers not understanding the distinction between the words. So there is a state law about how those types of products can be labeled. And CalRecycle got some funding from some settlements from the district attorneys and some product manufacturers about their products.

And so we are using some of that funding to evaluate total fluorine in compostable products, if they get into compost and into compost leachate. And then the researchers are also looking into possible remediation approaches as well. Thank you.

MS. SETTY: Thank you. And we are going to skip over our moderators for the moment. And next to them, if you don't mind waiting, we've got Jen Jackson who manages

the Toxics Reduction and Healthy Ecosystems Program at the San Francisco Department of the Environment. Ms. Jackson's team has led several initiatives to reduce the demand for PFASs, including legislation to ban PFASs in single-use food serviceware in San Francisco. Ms. Jackson would you like to make some opening remarks?

MS. JACKSON: All right, thanks for having me. Can you hear me okay? So in San Francisco in 2018 we passed legislation that bans the use of fluorinated chemicals in takeout food serviceware. And that actually is grounded in work that we did in our own purchases. So we run two hospital cafeterias and when we found out that perhaps some of the products that we were purchasing for takeout food serviceware might contain fluorinated chemicals we decided to investigate.

We did some testing and we found that about 40 percent of the products that we were purchasing did have fluorinated chemicals and about 60 percent did not. And so the good news is that lots of them did not, and that that showed to us that they were not essential uses, that PFAS is not an essential use in that product category.

So we actually had a term contract come to term and we were able to put out for a bid a new contract, and had a number of bidders that in that contract specified that there would be no PFAS in any of the food serviceware that

we purchased. And we had a successful bidder. We've been working with that contractor for the last couple of years and ensuring that what we buy does not have fluorinated chemicals.

In that process we found that some of the products that we were looking at were certified as compostable that did have fluorinated chemicals, so we reached out to the certifying body, the Biodegradable Products Institute with Rhodes who's right here, he's from there, and we contacted Rhodes and said, "Hey, did you know that there's this issue?" And at the time they weren't aware of it.

And so in the spirit of what Jared said earlier today we worked really collaboratively to address the issue. And they updated their certification standard, which meant then we could look at our whole entire city since BPI continues to maintain a product registry of products that would not have fluorinated chemicals. And their new standard went into effect in 2020 and just two weeks ago. And so our ordinance specified that no food serviceware in San Francisco would contain fluorinated chemicals.

And we operationalized that by pointing to the BPI certification. So if you are a taqueria and you're buying food serviceware, if you look for the BPI logo then you will be in compliance.

So that went into effect two weeks ago for us as

well, and so we're really in a transition period working with a lot of the different food service operators, from big chains to small mom-and-pops to educate them and then help move them towards the right products.

MS. SETTY: And next to Jen Jackson we've got Rhodes Yepsen. Could you wave please? Great. He's the Executive Director of the Biodegradable Products Institute. He's a national expert in residential food scraps collection and processing with a focus on maximizing organics diversion through the use of compostable packaging. Mr. Yepsen do you have some opening remarks?

MR. YEPSEN: Sure, yes. Thank you. Here at BPI we are primarily a certifier of compostable products. We also advocate and educate around their use an organic waste collection and processing systems. And I think it's fortuitous that I'm between Jen and Tom.

As Jen mentioned we started talking about this at BPI around 2016, which was in my first year as the Executive Director of BPI. And we had had some previous relationships I had with the San Francisco Department of Environment. And as we started discussing that and what BPI's role could be, it led me to a workshop at the Green Science Policy Institute that really helped inform what our position could be around fluorinated chemicals.

And so throughout 2016 with initial discussions

and then the 2017 workshop, by the end of 2017 we had come to a decision about what our rules should be. So our rules were passed in 2017 to forbid the entire class of fluorinated chemicals, which we do through an initial screen of 100 parts per million total fluorine, and then also looking at intentional use, so looking at the safety data sheets for every ingredient used.

I think it was interesting this morning to connect it back to this morning looking at hazard traits versus toxicological hazard traits. And we were really looking at the hazard traits in trying to figure out what our role was -- we're not the FDA -- in looking at persistence, mobility and bioaccumulation specifically for compost quality. So that's why we decided to enact that policy.

MS. SETTY: Okay, thank you. And our last panelist is Dr. Tom Bruton who is a Senior Scientist at the Green Policy Institute. He leads research on PFASs and works to bridge science, policy and business. His previous research at UC Berkeley focused on the cleanup of chemical contaminants including PFASs in soil and groundwater. Dr. Bruton, would you like to make some opening remarks?

DR. BRUTON: Sure, thank you. So if you don't know it, the Green Science Policy Institute is a scientific NGO based in Berkeley. And we work with a variety of stakeholders to reduce the use of harmful chemicals in

consumer products like food packaging.

As you heard before my current gig at Green Science Policy where I've been for about three years, I was a graduate student at UC Berkeley researching ways of cleaning up PFASs once they become groundwater contaminants, specifically in the context of firefighting foam that contained PFAS. So I've been thinking about this group of chemicals for what feels like a long time now.

Our perspective at Green Science Policy is that the entire class of PFAS, all of these chemicals are a concern. And the main reason for that is the high persistence that we've heard about. That's a characteristic across the class. You know, some PFAS are more persistent than others. Some break down in to other PFAS that are then highly persistent. But that is a characteristic that is shared across the class.

And because of that, that leads to the potential for widespread exposure. We see that these chemicals can be transported long distances through the oceans, through the atmosphere, and end up in food chains far from where they were produced or used.

Also, some or a number of the PFAS that have been the most studied, and that's a growing handful now, are associated with adverse health effects. So for all of these reasons we think that this entire class needs to be

approached with precaution and should really only be used in applications where they're necessary.

And I'd submit that food packaging, or food service packaging is probably one of those applications where they're not truly necessary. And the reason that I can say that is because we were involved in the study a number of years ago, actually it was headed up by Simona, in which we and our colleagues collected about 400 samples of fast food packaging from around the country from different types of establishments, different types of packaging, wrappers, boxes, etcetera. And we screened all of those for total fluorine as a proxy for PFAS. That's not exactly the same thing, but a good proxy. And what we found is that only a third of those samples contained total fluorine at levels that looked like PFAS.

What it tells me is that two thirds of those samples didn't contain PFAS. And so there are alternative materials out there already. And so that's how we approach this.

MS. SETTY: Great. Thanks, Dr. Bruton.

Now we're going to jump back to the middle and introduce our moderators. First I'm going to introduce you to Dr. Simona Balan, if you can wave please. She's a Senior Environmental Scientist in the Safer Consumer Products Program where she leads the teams working on PFASs. Prior

to joining the DTSC she was Senior Scientist at the Green Policy Institute managing international projects on the use of flame retardants and PFASs in consumer products.

And then next to Dr. Balan we have Jennifer Branyan, if you could wave. She's an Environmental Scientist also in the Safer Consumer Products Program. Prior to joining DTSC she spent the past seven years as a chemist and project lead in a large-scale manufacturing company.

So with that I'd like to pass it on to our moderators to lead the panel discussion.

DR. BALAN: Okay. Thank you so much, Asha.

And thank you everyone for taking the time to be here today on the panel and in our in-person and online audience. I think that this is a very fascinating topic and I look forward to the next hour-and-a-half of our panel discussion.

So the purpose of this workshop is really to help us understand what we here at the Safer Consumer Products should do, what would help for us to do under our regulatory framework.

So Andre started the day off by explaining the four steps of our process. For food packaging we are very much at the beginning. We're trying to understand if it makes sense for us to propose a Priority Product that

contains -- food packaging containing PFASs, and if so what food packaging products. So I'm hoping that our discussion today can help us kind of shed some light on this universe food packaging with PFASs and where it makes sense for any kind of regulatory involvement as part of our program.

So I welcome everybody in the audience, in-person and online, to contribute to the panel discussion throughout. But I'd like to get us started with something where actually Carla left off in her talk and then Tom picked that up, the question of essential uses.

All right, with food packaging Tom mentioned that paper that we did a while ago. There we looked specifically at fast food packaging, but there are a lot of different types of food packaging that contain PFASs currently. And so if I remember correctly, on Carla's slide food packaging was listed as either 1, 2, or 3 depending on the application, right? So for some of them potentially the use is essential, for some of them the application is essential and useful for society, but there are alternatives. And in some applications perhaps it's easily substitutable, because either it's not essential or there are very readily available alternatives.

So I'd like to see if we can unpack that a little bit and see within the universe of food packaging, which types of products would fall under these three different

categories. What's really essential and what's easily substitutable.

DR. BRUTON: I'll start. I'll just throw something out there. I think that Carla mentioned food contact materials being in those categories 1, 2 or 3. And I think some of the food contact materials that are not packaging maybe are the ones that (Audio drops out) -- to move?

UNIDENTIFIED SPEAKER: Your mic.

DR. BRUTON: Am I too far away?

UNIDENTIFIED SPEAKER: Yes.

DR. BRUTON: Okay, thanks.

I was just saying that there is more, that food contact materials are a broader universe than food packaging. And they include things used in food processing for instance that I have a feeling might be harder to move away from. And part of that is that personally I just know less about what those materials are and what those applications are. There's not a lot of publicly available information out there about them.

DR. NG: So yeah, maybe I'll pick up from there. So that's exactly right. So we, when we put the paper together we're talking about food contact materials in general.

And also, before I start that let me put in the

most important caveat. And that is when we have something that's Category 3, which we call an essential use, we want to make sure we say that this is essential, not because it's going to stay there forever, but because there is no current substitute for it. And we would like everybody to focus on quickly finding substitutes for those things if it is deemed that the presence of PFAS in those uses poses a risk.

And so the ones that are, as far as I remember from the paper, the ones that are currently classified as 3 are more the terraqueous (phonetic) that I mentioned as sort of like the greasers within the moving parts of the big machinery that's used for processing food. Whereas the things that we're talking most about, which is direct contact food packaging materials were definitely Category 1 because one of the basis for us making these classifications in the paper was a lot of the work that is being done in Denmark right now where they've basically removed PFAS from paper products in contact with food. And so we know it's possible, has already been done.

MS. JACKSON: May I jump in? For us we mostly are buying sort of your typical takeout foodware, so we're not looking at the larger universe. But in the presentation, I think it may have been yours Carla, where you talked about this broader universe. And I was thinking to myself the lubricants, the mold release agents, these

kinds of things are potentially in the food packaging whether or not it was intentional. And so to me I feel like that the definition of food contact or food packaging materials that DTSC is looking at should be broader. I noticed that you did say that it would include mold release agents. But there are these lubricants on processing equipment, all kinds of other PFASs or products that are used that have PFAS in them that I think need to be considered.

DR. BALAN: And to clarify, would those qualify as food packaging?

MS. JACKSON: Since they are ending up in the product. So for example we did some testing in products and we were surprised by some of the results, because the folks that were manufacturing them said, "We don't have any chemistry that has fluorinated chemicals in the product itself intentionally added."

And then we found that it was actually the mold release agents and the lubricants used in the equipment to manufacture those products that were causing these high hits of fluorinated chemicals in the product itself. So that product is going to go into compost and potentially contaminate that compost. So we need to look at the whole way the product is produced, not just the product itself and the intentional ingredients in the product.

MR. YEPSEN: Yeah, so I would concur with that. And that's one of the reasons we have that sort of two approaches for our restriction. So we're not just looking at intentional use in the ingredients that are used, because that wouldn't cover things like mold release agents. And we're not just looking at the total fluorine, because that could miss things as well. It's just sort of a general screening test. It's an indicator, it's not definitive.

So we agree with that and that you really kind of need multiple approaches. And that's also why we -- well we know that it was intentionally used in only really one category of product that we certified. We decided to have the rules across all products that we certified, because we didn't want to make any assumptions. So I would just agree with that.

DR. NG: If I can follow up also a couple of things. One is to go back to a question that I think that was asked of Maricel about whether high-value polymers are going to be cleaner. And I don't know for sure what exactly the industry knows about this, but my guess is that from the evidence we've seen these are very messy chemicals to produce. We saw a bunch of redacted impurities here. We know from what's happened in Cape Fear that some of the most problematic chemicals are things that the industry did not know they were producing, they're unintentional byproducts.

And so actually I want to come back to something that Brian mentioned earlier about how there are about three dozen chemicals that are approved for use in food contact materials and whether it should be right that we focus on those. I think we need to focus on those materials and the unintended products that happen when you produce those materials.

And so in thinking about testing for what comes from these materials, I think something we haven't mentioned yet, we talked a little bit about total fluorine, but in general the use of non-target analysis and what people are thinking about this. It's kind of expensive and complicated but it seems like an important thing to try and evaluate what's actually ending up in the materials that are used in food contact.

MS. MOLIN: I just have a couple of little perspectives to add. I agree a lot with what the panelists are saying here. And I think the question of necessity gets really complicated pretty quick, because it depends on your perspective, and necessary to whom and thinking about even like with alternatives. For example, right now there's a lot of conversation in CalRecycle about the clamshell, the to-go container where you get your sandwich. And there's many different ways you can transport that sandwich, and the molded fiber has a lot of great values for it in if it could

be compostable in a really safe way without the PFASs.

And I think that's a really tricky area to navigate knowing that there's many sources to PFASs in the product manufacturing's supply chain. So when I think that we have to think about these questions in kind of a multidirectional sense, necessity, thinking about CalRecycle going to two site visits so far and there is so much plastic out there, there's so much waste out there. And I know that Safer Consumer Products has a particular lens by which they think about alternatives, but I think also encouraging conversations to get away from the disposable society so that you don't have so much. And pushing or encouraging more for the re-usables and not just by de facto everything has a to-go container. I think that's one important element.

And it's a bit of a low-hanging fruit. There's so much traction nationally to get PFASs out of food service packaging. And there's several organization setting proposed levels for what "intentionally added" looks like. And it seems like if that's the direction that things are going, then kind of a collaborative approach in that sense could be one way that makes sense. There's a mention of kind of having a consistent supply chain and kind of evening out the market. So I think that could be a consideration.

DR. BALAN: Basically sounds like we need to

consider not only the intentionally added PFASs to food packaging, but also the manufacturing impurities from the production process from the mold release agents, the lubricants and any other sources that may end up in the final product.

And I wanted to follow up also on Carla's last comments regarding the number of PFASs that are found in these products. I believe Maricel mentioned there were 19 different food contact notifications that were approved for use by FDA for any kind of food contact, whether it's in packaging or in these industrial processes. And as we have heard those 19 substances that are approved contain a lot of impurities or they have degradation products. So the actual number of PFASs that we expect to find in the food packaging will definitely be larger than that, right?

So I have a couple of questions about that, I am trying to understand. So one, out of these 19 FCNs that are approved, these 19 substances that are approved, do we know if all of them are being used?

My understanding is that once something is submitted to FDA it's usually not withdrawn even if the substance is not used. I think Chemours is now doing something kind of unique where they are withdrawing their food contact notifications. But I wonder if anybody is aware if all of those remaining, what 16 or 17, if all of

1 those are currently being used in food packaging for food
2 processing equipment?
3 If anybody in the audience knows, please, or
4 Baoku, if we get any comments from online please let us
5 know. All right, so that is something that we are -- oh,
6 yes?
7 DR. BRUTON: I don't know the answer to your
8 question, but I have a question about your question.
9 Do we know how much of that world of chemicals
10 used in the equipment in food processing is captured by
11 those FDA FCNs, or the lubricant on a machine, is that
12 approved?
13 MS. BRANYAN: When you go in to their -- oh, I'm
14 sorry -- they're each specified for an intended use. So
15 every time that you have its own complex (indiscernible),
16 it's for its own specific use. So even if you go in there
17 and you look at one that's specifically for coated paper or
18 paperboard or something like that you might find that same
19 distinction of the chemical, but for, it'll say "lubricant
20 for machinery," or it will say something else.
21 So the ones that we pulled here, like the 30 that
22 are approved of the FCNs or the 19 distinct formulations,
23 are specifically for food packaging.
24 DR. BALAN: If anybody knows an answer to Tom's
25 question? Yeah, please.

MR. MAYHOOD: I'm Clay Mayhood. We do review the lubricants at a certain point in the packaging preparation. So we are at the end point where we're making paper that's going to be printed and made blanks and made into packaging. Our lubricants and our oils are FDA approved. I've made a note to see if we got PFAS in them or not, but right now they are FDA approved.

DR. BALAN: So I think, in general, everything that's in contact with food would have to be approved by FDA through the FCN process unless it is generally recognized as safe.

And that's also something I would like to come back to because I've been really struggling to figure out if there are any PFASs approved as GRAS or basically recognized as safe through the GRAS designation? And there are none listed in the inventory of GRAS substances on the FDA website, but that doesn't mean that there aren't any. Because if I understand correctly from what Maricel said earlier manufacturers can make the GRAS designation and they don't actually have to inform FDA.

At a workshop that Washington state held last year I asked this question. And a representative from Daikin said that there are no PFASs that are GRAS that are generally recognized as safe. And so what I am wondering is, I understand that there are no GRAS PFASs from Daikin,

but since a lot of this is confidential business information Daikin probably doesn't know if any of their competitors have any PFAS that are approved as GRAS. So I'm just curious if anybody has any more information or concrete information as to whether there are any PFASs that are being used and have these GRAS designations from other manufacturers as well?

Black box, we're trying to crack it. (Laughter.) Yeah, we have a comment there in the audience.

MR. WAGGONER: Yes. I'm Mike, I'm with Corumat and we make packaging. And it's tough, because like the machine uses lubricants. And even determining what's food-contact okay or incidental food contact okay usually just means going to a website. And so like it would almost be nice if there was a list of safe lubricants published by California or something just so we would have like a second place to look. Because right now I just have to go to the website that sells lubricants and then search for "food-safe," and then that's my validation. So if they say it is, it is, but there's not like an extra level past that.

MS. ROBIN: Hi, I just would reiterate that. The manufacturing facility that we have, and that we're building, all of that has to be audited for food safety. And all of the equipment and so on, we make sure everything has FDA approval. And then we go to another level in terms

of hygiene and food safety. That's not to say that as we've discussed some of those things that are currently FDA approved may contain some PFAS such as tubing and some other things.

And as far as the other question about GRAS I'm not aware of that there are any PFAS GRAS approvals.

MS. SETTY: Would you mind stating your name for the record?

MS. ROBIN: Renee Robin.

MS. SETTY: Thank you.

MS. ROBIN: Thanks.

MR. COFFIN: Scott Coffin, Division of Drinking Water. Just a super-quick Google search like literally from two minutes ago, there I found one PFAS in the GRAS list, 1,1,1,2-Tetrafluoroethane. It's probably really volatile and it's a two-carbon hydrofluorocarbon, but it's not comprehensive.

DR. BALAN: And what is it used for?

MR. COFFIN: It is approved in food packaging as a flavor and extraction solvent for food flavors.

MR. WAGGONER: I just had another thought. So one of the -- there are standards set forth by the government and they're actually really quite low for safety. But the fast-food chains quite often care more. And so there is like GFSI and SQF. And those are both manufacturing

standards that we have to hit. And manufacturers tend to get really pissed off when it's the government that's coming in there. But if it's their customers saying, "We want you to hit this."

And so right now there is a certain fast-food chain using molded fiber that has a lot of egg on their face, and other ones don't want that. And so if other fast-food chains were to adopt this issue then like I know it would be much easier to get my manufacturing partners to adopt it, rather than just trying to push it forth in legislation. Oh, this is Mike Waggoner.

MS. RUDISILL: Hi, this is Cathy Rudisill from SRC. We're working with the Washington State Department of Ecology on a PFAS and Food Packaging Alternatives Assessment. And we have been engaging with some stakeholders about the issue of what PFAS are actually being used as far as what's been approved by FDA and what is actually being used. I don't have a concrete conclusion on this, because we are relying very much on what FluoroCouncil has been telling us. But they did indicate that there is a subset of what is actually on the FCN list that is actually commercially relevant with regards to the sidechain fluoropolymers.

How that is relevant to the polyfluoroethers I'm not sure, and again this is just going off of what they're

telling us. There's really no additional information to support that as far as capacities or use levels, that sort of thing.

DR. BRUTON: In that same vein I can say that it is written in the scientific literature that the 2 main types of PFAS used right now to impart grease and oil repellency to paper products are the C6 side-chain fluoropolymers and perfluoropolyethers. And I've heard that from folks in industry as well, but again no specifics.

DR. BALAN: Some of the compounds in the EDF FOIA package though had PFOA listed as an impurity, so that's a C8. I don't know if anybody knows whether those particular compounds are still being used, the ones that have PFOA impurities.

MS. RUDISILL: Well, I still have the mic, so I'll just mention it again, I asked the same question. And when we had interacted with FluoroCouncil they were emphatic in saying that that they're -- the C8 and C10s are no longer in use. Furthermore, the diPAPs that had been initially approved earlier on some years ago are not in use anymore within the United States, "emphasis added." Yeah.

DR. BALAN: All right, thank you.

MS. JACKSON: I just wanted to add I'm going to channel Jennifer Field. So I attended a conference where she talked about the manufacture of fluorocarbons. And she

likened it to hydrocarbon manufacturing where you're looking for say a C6, that's what you're aiming for, but you get all this other stuff. And so -- and probably Carla, you could speak to that from a chemical engineer's perspective -- but you would get a C10 residual or impurity and maybe C4s and C3s. So it is very common and very likely that you would have a C10 impurity PFOA.

DR. NG: Let me turn on my mic, can I ask a question? About sort of the food packaging landscape in terms of regulation, we're talking about what should be allowed by the FDA for example here. A lot of Americans get a ton of their food from internationally-traded foods. What is the landscape in terms of regulating food contact materials coming from outside the U.S.?

DR. BALAN: Do you want to take that question? That was going to be my follow-up question, so thank you.

DR. BRUTON: Maybe to make it more concrete we could ask if a manufacturer is manufacturing something like a molded fiber product in China say, is there follow-through on that supply chain to make sure that that factory is not using a long-chain PFAS?

MR. MAYHOOD: If I may, I was just saying about fiber solutions, I won't give you the molded fiber. But on a package, a bleach package, a bleach board package there are a lot of materials -- and we talked last night -- there

are a lot of materials that actually board from the United States, it will go to China. It will get printed. It will be converted into blanks. It will get shipped back to the fulfillment centers where the food is being packaged and go through that. And yes, they are subject to the rules and regulations of the FDA to do that.

Having said that, you can also know that properties or paper coming from China and other Southeast Asia countries are also supposed to adhere to sustainable forestry practices. And you may have heard about several times when companies go in and do an audit they're finding original-growth forest fiber being present, having to go through that.

So there's a diligence that's required on the part of the brand owner and the distribution centers to make sure that it's actually done. So I think the bottom line there is you have to question how well are you auditing that whole process in making sure that compliance is indeed maintained.

MS. VENTURA: Hi, my name is Andria Ventura with Clean Water Action. And I'm sorry, I came in late. So if this has been covered just tell me that and I'll catch up. But one of the things I am concerned with is as we're trying to do many things, and I know San Francisco is doing this, trying to deal with waste streams as well as toxic chemicals. What concern do manufacturers have with recycled

material coming back through? And if you've covered that just tell me.

DR. BALAN: No, actually, that was going to be our next topic. So that's a perfect segue.

MS. VENTURA: Okay, never mind. We'll go into that.

DR. BALAN: No, that is a great segue. So yeah, let's talk a little bit about where do we have exposure sources along the lifecycle of this food packaging. So there is this black box of, this lack of knowledge about what PFASs are actually being used right now. But maybe we can tackle a little bit of this issue of where we have exposures throughout the lifecycle.

And Brian, earlier you mentioned the importance of understanding the supply chain. I think that's something that we definitely struggle with like understanding where the PFASs are being introduced and where there may be exposures during manufacturing. But also at the end of life during recycling, composting, landfilling or perhaps incineration what are the exposures there?

So I don't know if you want us to start this discussion, but please tell me.

MS. JACKSON: I could chime in really quickly. So from San Francisco's perspective we are concerned perhaps more than just the use phase, we're more concerned about the

beginning of production or the production phase, and then the end of life. If we are to agree that FDA's exposure assessments are accurate then we would say, "Okay, that piece," is not a lot of exposure perhaps. But for people who are manufacturing these products they are going to have far more exposure than my 15 seconds of a burrito on a plate.

And then at the end of the use phase when it's going to a compost facility if those materials are not breaking down, so if PFASs are not breaking down, I have said this before, it's kind of like a bathtub with no drain. We're just continuing to fill up this bathtub and cannot break down PFAS chemicals at that end of life.

So for us, we are trying to change the demand the city of San Francisco has so that we can really address those two other use phases, but also of course to protect our citizens in the compost that we generate.

MR. SERNULKA: I'll just say I think that if you're looking at recycled paper, it would be very difficult to say when a bale comes into a recycled paper facility, if somebody threw an antique magazine or something that may have long-chain PFAS in it from 30 years ago. And that shows up as a part of that bale, you wouldn't be able to catch something like that. And I don't know if that would actually impact the end product at the end of the day, just

one thing.

The other part of this is that foodservice packaging is less than 2 percent of your waste stream. So in those bales that are going into recycled paperboard, like if it's a paper cup or something like that it's a very small percentage. And so it's not going to show up in large scale when you're looking at the bales. I mean, mostly what you're seeing is cardboard boxes or newspaper or however you layer. Whatever that end product that's going to come out of the recycled paperboard mill is, it's whatever that mix is that's going in. And for recycled food packaging items it's going to be very small, a very small percentage of that.

DR. BALAN: Well, approximately what percentage of food packaging is recycled?

MR. SERNULKA: I don't have any of those numbers with me here. I couldn't give anything like that. But I mean if you're just looking at the entire waste stream and then you work your way down to that number that ends up at that specific recycled paper mill, it's the bale, it would just be very difficult to ascertain like is it cups or whatever is coming in that specific bale.

MS. MOLIN: So I think waste can kind of go in maybe three different directions: landfill, compost and recycling. I think there is potential for PFASs to get in

through any of those mechanisms. So I think just kind of going back on the recycling piece, I mean it's my understanding these PFASs don't degrade, right? So if you're going through the recycling processes the paper products that go through kind of like a slurry, and the intent is to get the fibers and then use that for a new product. Maybe PFASs go along with the new product. Maybe they're in that residual water that's used for the recycling process. And then what happens to that really depends on the regional water quality requirements for that, which can be kind of a patchwork legislation or regulation. So I think that that would be one area to think about.

You know, kind of going back to my earlier question about the accumulative exposure. It's true that the food service packaging is not a huge component of these bales. But when these recycling facilities are processing so much of it, and the PFASs aren't breaking down, they go to the water and then what?

And then I think Jen covered the compostability piece pretty well. We really want compost to be a commodity that can be sold. And if there's going to be enough PFASs in there that that's going to get in the way of that and kind of mess up that whole batch.

MR. SERNULKA: Not speaking on the compost side, but just the recycled paperboard then you would have to take

that. And it would become like food service packaging, again which it isn't. So that process, again it wouldn't be an issue.

DR. BALAN: What does it usually become?

MR. SERNULKA: Oh it's going -- I mean, whatever the company is selling. I don't want to speak for those specific companies, but they're not going to manufacture -- whatever it is, it's not going to -- the percentage would be very low.

DR. NG: Can I just -- oh, sorry. I just wanted to ask a clarifying question. So is paper intended for food packaging not supposed to be recycled paper? Is that right?

MR. SERNULKA: Is what?

DR. NG: You're not allowed to use recycled fibers in making food packaging?

MR. SERNULKA: Companies would need to speak on that individually over what they do with their customers and how that's worked out on that issue.

MS. ROBIN: I'll just offer a few comments. My name is Renee Robin. I'm with a company called Zume, Z-u-m-e. We are a new company. We manufacture multi-fiber packaging from waste fiber, primarily wheat straw, bagasse, things like that. And there's no question but that every word I use I'm thinking about what the implications of that are. So if I say it's compostable in an industrial facility

or compostable period, I know that I need to look at that entire supply chain to make sure that there aren't externalities, impurities, byproducts and so on.

All that being said, so for the molded fiber industry it's been interesting for me to hear you talking about the potential exposures of PFAS from other things than the additives that might go into a recipe for a slurry of molded fiber. That's a whole other set of discussion, which I think is really important.

But I also think that for the purposes of what DTSC is doing right now I'm interested to think about how many layers of that onion you're going to take on. Because I think that this is a potential industry that has a lot of great environmental potential, especially for compost. But it has to be done right. And those companies that are delving into this are trying to figure it out at the same time.

So I'm going beyond PFAS for sure, because we're certainly not interested in that being in our product going forward. But that's not where we started. So the alternatives discussion today is going to be really important to us and we can share what we're doing as well.

But I guess my comment was really for CalRecycle, because the compostability aspect of this is so important to us. And when we source that waste fiber that would have

otherwise been incinerated in a power plant, and we use it to make a compostable product, it may not have come from an organic farm. So it's going to have something going on in that waste fiber that may have environmental, residual concern. So that's something that I would invite people who want to talk about that, that we can pursue it. But I kind of want to focus on the packaging itself.

Yeah, that's all I have to say.

MR. MAYHOOD: Clay Mayhood with Sustainable Fiber Solutions. You can use recycled sometimes. It has to go through a long process to get FDA approval and it makes it very expensive. It's more often used as indirect, so you can get recycled in an indirect food contact where it's not directly touching the food. In that case it's approved. Some of the food service packaging materials will go into a multilayer minor board (phonetic) and it'll go on the inside layers and get absorbed there. And then it's typically used for corrugated packaging.

DR. BALAN: Maricel could not be here for the panel discussion. But she also wanted to bring up during this discussion the issue of paper mills, and how paper mills are a source of PFAS contamination. She recently coauthored a blog about that. So I wanted to see if anybody here on the panel or in the room wants to comment about paper mills and the associated exposures from that. And

what could be done to reduce them.

MR. SERNULKA: Can you clarify what, are they saying like from emissions or like how the paper mill does?

DR. BALAN: Yeah. So I believe they found emissions, PFAS emissions from paper mills in adjacent waters from the manufacturing process. It's unfortunate that she's not here, so I'm sorry I don't know a lot about that. But that seems to be one concern at least along the life cycle of the packaging.

MR. LEIMKUEHLER: Zack Leimkuehler, I'm with Ahlstrom-Munksjo. So we are a paper company that does use PFAS and does it from a legal standpoint with what the FDA requires.

So I think we are acutely aware of the downside of all the uses of PFAS, whether it be in the package itself or in those other side streams where there would be waste generated or other things. And I think it's something that obviously the industry has to be extremely sensitive to and watch. And it would be no different than the actual PFAS chemical manufacturing sites that have to do the same thing. So I think that dovetails into a conversation we have to have, and the industry has from a paper side of things, which is you have a packaging requirement and you have an effluent requirement, a water requirement, so those are two different things.

And one of the things I would always caution, and I have cautioned in any discussion I get into, is you are talking about order of magnitude differences specifically on the types of materials you are looking at and the levels that are present. So when you're talking about water treatment, water quality standpoints, you're in parts per trillion. When we're talking about a BPI regulation on packaging, we're talking about parts per million. So very, very different and again, not the same testing or the protocols with that testing.

So there is a watch out there to make sure that that is controlled and that there are controls in place to do that. Again, no different than any industry, especially if you look back at the fluorochemical producers (Audio cuts out.)

UNIDENTIFIED MALE: You're cutting out.

MR. LEIMKUEHLER: Sorry. All right, sure.

So I don't know if that answered the question. But I would say as anything there is always a waste stream concern you have to manage.

DR. BALAN: Uh-huh. It makes sense.

We have a comment from the online audience as well.

MS. BRANYAN: Yeah, I have a question from Melody Labella. And she is from the Central Contra Costa Sanitary

District. And she's kind of concerned over fate and transport of PFASs in food packaging exposure routes. She said she didn't see anything about wastewater. Does DTSC staff or any of the experts have a sense of how significant the amount of PFAS transfer into human waste would be due to transfer of PFAS in human from food packaging? So wastewater, but through a sanitary route.

DR. BALAN: Interesting.

DR. BRUTON: Could I jump back really quickly to piggyback on something that Zack said while we all chew on that question?

DR. BALAN: Sure.

DR. BRUTON: My question would be I mean you mentioned that it's no different than any other industry. But it's my understanding that effluent limitations for PFAS are not something that have been in place in almost anywhere until maybe now in some jurisdictions. So I would like to see those be in place to make sure that companies who are perhaps not as proactive as yours are paying attention to this.

DR. BALAN: We have a question over here. In the meantime, do you want to go first? Just a second.

MR. LEIMKUEHLER: Yeah, sorry. And to that point, there is a lot of active legislation right now in the United States pending on water treatment and water quality

standards, specific to PFAS. It's actually probably a more current issue in the water side of things than it is in the packaging side of things, by all means. So I think that that is coming and that's a challenge.

I think the biggest challenge that we have as an industry in the United States is we are not seeing the federal government do it. We're seeing states do it, which becomes really a big concern from a competitiveness standpoint. When you look at the industry across the United States and then globally as that trickles out to the rest of the industry it's weird where those levels set. And is the state going to take a very aggressive route, which will potentially cause more issues in an industry than a national level or an adjacent state, for example.

So I think you have evidence of Michigan looking at that. Our state, Wisconsin, is trying to lead the charge in setting extremely low levels, which that's a discussion for a different day than this panel probably is. But both of those things are I think going on, and actually could change the industry faster than anything on the packaging side quite honestly.

MR. SERNULKA: And I would just add to this, there are very few paper mills in California. So this would be a very small piece of the pie that you would be looking at in terms of (indiscernible) so.

DR. BALAN: Do you know how many?

UNIDENTIFIED SPEAKER: Angle your mic more.

MR. SERNULKA: Sorry. I believe there was like five when I was back on the paper side, but I'm not sure exactly what's left here in California.

MS. MOLIN: And maybe just to add a consideration for SCP as they think about this, is it's a global economy. And you were kind of alluding to things going to different states. And that is true, there's not a lot of paper recycling in California, if much at all. And also exports out of the United States. And so as you think about your considerations it would be worth noting that not all of the potential for adverse impacts may necessarily be happening here and could be happening in other countries as well.

MR. WEINER: Just on the water side I found out the other --

UNIDENTIFIED SPEAKER: You are?

MR. WEINER: I'm sorry, Peter Weiner, W-e-i-n-e-r. I found out the other day from a consultant who's doing water treatment basically to remove perchlorate and TCE that they were specified to use plumbers tape. And the plumbers tape contains PFAS. And so they had to get an alternative so that the water treatment at the wellhead would be pure water. So it's all over. I mean, plumbers tape is a consumer's product, consumer product that can affect our

water supply.

MS. VENTURA: Yeah, I'd like to add a little clarity to the water issue, because that's something that I'm delving into. And I don't know how much paper mills -- and even if it's five that can be very significant to a local community. But I don't know how much they are doing for wastewater to Ms. LaBella's question. But we're finding, but we're in the process of trying to find that out In California, because California probably has the most detections of PFAS.

And Dr. Bruton is right. I mean there have not been effluent out of industry standards. And the problem is yes, people are starting to think about that at the state level. We're not there yet in California. But in most cases the states are looking at specific PFAS.

So if a manufacturer, whether it's the chemical industry or whether it's a product manufacturer -- and it doesn't just have to be this realm of products -- decides they are going to use some new C4 or C6 chemical which is probably going to be harder to get out of water in the end, they may not have to worry about that. So the issue of not having effluent standards is going to continue for a while if we continue this approach of looking at PFAS as individual chemicals, because that's traditionally what has been happening elsewhere in the country on the water issue.

What you're doing right is you're looking at the class. And I think that that's really important. But, and I'm sure Simona you know this, that the State Water Board is doing a site investigation. They're going to look at water wells around all sorts of potential sites whether it be paper mills or military sites. And they are looking at what's going on around the wastewater. Of course, the wastewater facilities didn't put it there. But they are looking to find at what those sources are. And I think we're going to get a lot more data.

What we're getting in so far is that the problem is not just the traditional PFOA or PFOS that are historically going to be there, but that we are seeing the newer generations of chemicals coming up.

So yeah, there's a lot of discussion in the country around what to do about whether it's surface water or drinking water or groundwater or whatever, but nobody has figured that out yet. So I don't think we can rely on that's going to get fixed. I think we need to be talking to the water agencies in seeing how we're going to deal with this, because in the end they're going to have to deal with what's already out there.

DTSC and this program has the capacity to help stop the further bleeding, so that we don't keep filling the tub. And you can't do it on everything like the gentleman

said these chemicals are used in so many different kinds of products. But this is one step toward that.

MR. SERNULKA: I just would to be clear, I was trying to bring it back to food service packaging too. And I don't believe there are any paper mills here in California that produce paperboard that goes into food service packaging. It would be a tissue mill or something like that that's here. So I was just trying to --

MR. YEPSEN: And then yeah, I would say I think connected to this issue and related to end of life for compostability, the issue of what you do when it's detected in effluent. So like at a composting facility it is a state-by-state approach right now. And states are looking at the contact water at a composting facility. And if it has elevated levels of fluorinated chemicals they're instructed that they can't land-apply it because of groundwater issues.

But then it's sent to a wastewater treatment plant. And in most states there aren't rules around removing that completely before it's discharged. So you're not really solving the problem, you're penalizing a composter who was not a generator of that material. And then at extra expense, sending it to a wastewater treatment plant.

And then we have this whole issue that was

mentioned with the Maine farmer right, with the biosolids compost. And the biosolids composting industry has been really proactive around this and is in a tight spot arguing both sides saying, "Look we don't know what's happening to the composted biosolids and if they're actually leaching in the groundwater from there."

And then at the same time saying, again, looking at the big picture of beneficial use again what do you do with those contaminated biosolids? There are a lot of environmental benefits to using those biosolids beneficially on farm fields. And now what are we going to do with them? Put them back in a landfill where the leachate will go back to a wastewater treatment plant? Or burn them? And we know that even if you're burning them the incinerators are not hitting temperatures high enough to actually break those fluorinated chemicals down.

So I would just say that it's difficult not to be reactionary on some of these topics. But there are so many other implications downstream when we start looking at what do you do with the contaminated water? And I think that we need to be really cautious about that. And make sure that we don't derail all of these other side industries that are really beneficial, the composting industries.

MS. JACKSON: Can I just jump in? So what all this says to me is that prevention is so important. So to

Melody's question around how much comes through our bodies versus how much may be coming from a factory or a facility that is discharging, it all comes back to circularity. So whatever we are creating in terms of PFAS we are going to end up with it, whether it's back into biosolids or back into our drinking water there's so many facilities that discharge are in a separate jurisdiction. They discharge effluent and then it goes downstream into a river where a water facility is then going to have to treat it. They're going to have to spend millions and millions of dollars to treat PFAS out of the water that came downstream from a wastewater treatment plant.

So to me, it's we have to work upstream. And so I'm glad that the Safer Consumer Products Program is looking at this particular product category. And we need to get it out of the products to begin with. And then we're also going to have to figure out how to deal with all of the contamination that we already have too.

DR. BALAN: So that kind of leads me nicely into my next question. So like Andre mentioned earlier for our program to designate something, to propose something as a Priority Product we need to demonstrate that there is potential for exposures and potential for significant or widespread adverse impacts.

And so from my discussion so far, it seems pretty

clear that there are exposures to PFASs from food packaging whether it's during manufacturing use or at the end of life of the product. And so my question for the panel and the audience: what are the potentials for adverse impacts from the use of PFASs in food packaging? What do you see as the most significant or most widespread adverse impact, if there are any, associated with the use of PFASs in food packaging?

DR. NG: Can I jump in? So I'm not exactly going to answer the question you asked of course, but I'm going to talk about why that's maybe not the right question.

So one is that we don't have a lot of data about the specific PFAS that may be found in food packaging. Also it's evolving, so most of the toxicological data we have and epidemiological data we have are for PFAAs and for especially the long-chain PFAAs. And we know that there are significant effects on lipid metabolism, on liver health, kidney health. It has been linked to many adverse effects, developmental effects.

We're also going to arguing about is this is significantly adverse, because we're not -- we've moved away from acute toxicology, right? We're not at the point where we eat something, and we have to go to the hospital. And so we're talking about chronic especially for something that's basically totally persistent, ongoing, lifetime, since-before-you-were-born exposure to chemicals.

And one of the issues we have is this idea that we have to prove something is going to have a negative impact before we can do something about it when that substance is basically indefinitely persistent. Such that when we discover that there is a problem, oh well how are we going to now reverse that problem when this stuff is out there and we have a really hard time taking it out of our drinking water and our products?

So I think something Tom pointed out at the beginning is that the biggest hazard of these chemicals is their persistence. Humans are really bad at risk assessment and we are also really bad at anticipating the unintended consequences of stuff.

And let me point out an earlier fluorinated substance for which this is sort of really famous, and that is fluorocarbons. "Look, we have these totally inert, absolutely safe chemicals that are never going to do anything bad." And suddenly we have a hole in the ozone layer that nobody foresaw. And so the issue with a persistent substance is that there will be an unintended consequence in the future that we cannot foresee. And if we allow it to be released then we're stuck with the problem.

DR. BALAN: Well, we can come back to that if anybody else has comments from the online audience or from the room. But meanwhile something else to think about, so

Rhodes you kind of alluded to that, but when we have this food packaging with PFASs there are exposures to the environment whether we compost it or landfill it or whatever we do with it.

So what would you say is the best thing to do with PFAS containing food packaging? What is the responsible end of life fate of these products, the most responsible according to our current technology and abilities to deal with them?

MS. JACKSON: I think the silence is indicative of it's a big problem. And we shouldn't have them there in the first place. So I mean there are a lot of different folks who are working on disposal technologies, but shouldn't we be investing in the greener chemistries and the alternatives rather than these downstream solutions?

DR. NG: I'll jump in. I do think we do need an all the above strategy, right? So absolutely we need to turn off the tap, but we have the problem now. And there are a lot of communities that are stuck. And it's going to be really expensive, but I think if I had to say what should we do, I think we need to work on getting our incineration technology to be good enough. Because as long as we get it to be good enough such that we're not just moving everything to the air where it will come back down on us that's the only proven technology we have to absolutely destroy these

substances. Because I think just sticking them in a container somewhere it's just putting off the problem till later.

DR. BRUTON: I also think that we should be taking steps to monitor PFAS in some of these places that they end up once food service materials are disposed of. We should be looking early at landfill leachate. And I know California is going down that path, but it's taking a while to get there. We should be looking at compost probably to make sure that we're not adding compost with unacceptable, whatever that might be, levels of PFAS back to our agricultural lands. So those are not ways to solve the problem but those are ways to stop it from getting worse in specific ways.

MR. WEINER: Peter Weiner again. I think from the perspective of CalRecycle for example on diversion of organics and so on that this is a real issue, with 1383 I think it is.

And I know of one company at least, and Mr. Yepsen I'd be interested be interested in your data. But I think one company is testing incineration and believes that they're destroying them, but I don't know test methods. I don't actually have figures yet. And if that's possible then at least in terms of an existing problem that may be not a solution but at least better than landfilling. So I

don't know. The people are testing to look.

MR. YEPSEN: Yeah. And that may be true. But I think getting back to the sort of the whole intent of a compostable product or package, if we're putting it into a landfill or an incinerator and you can actually hit it sort of gets away from the whole point. And so I think that's where in the interim, and this is my personal belief, is that in the interim while we're working on upstream reduction that we also still have to weigh the risks of what's in our environment today.

And that I think one of the big concerns that I see is this risk to organics diversion programs that have been very hard fought to get so successful whether that's food wasting, yard trimmings, composting or biosolids composting. And that again we don't want to penalize with those programs, so I agree we should be testing. But not if that means that we're going to then tell composters, "You can't sell that compost," unless there is some crazy risk.

So like the Maine farmer, that compost maybe should have not been sent to that farm. But I think if there are relatively low levels, I think we need to figure out maybe alternative uses for that compost, maybe it goes to non-food uses. But I think being careful to not jeopardize those composting programs while we weigh the risks and balances. And penalizing the right parts of the

value chain not the people who are receiving it, because then I mean -- yeah. So I think about like high temperature of incinerators, I mean sure. But like isn't that kind of -- it just seems like the wrong place to be focusing, in my opinion.

DR. BRUTON: I agree with you that it's not good to be penalizing those systems, those waste diversion systems that are there, but I do think that getting the data to have those kinds of conversations where you figure it out amongst stakeholders is important. And that testing is how you get that data.

MR. YEPSEN: Yeah, I agree.

MR. ALGAZI: May I chime in? Tom, you talked about measuring total fluorine as a surrogate for PFAS, especially if you can't like quantify and speciate what PFAS is there. And you had talked about the importance of maybe doing some studies on what's in wastewater, what's in compost and things like that. Can you talk a little bit about that technique? And are there concentrations of total fluorine that are indicative of PFAS versus inorganic fluorine or something like that?

DR. BRUTON: I think the answer to that last question of what is a concentration threshold that indicates intentional addition of fluorine is dependent on both the application that you're talking about whether it's packaging

say, or carpet.

And also on the technique that you're using, so the technique that I was referring to has been dubbed PIGE, particle-induced gamma ray emission spectroscopy. And Graham Peaslee at Notre Dame who's pioneered using that for this type of analysis has taken paper that he got from paper manufacturers that he knows contains intentionally-added PFAS to make it oil-resistant, measured those and seen what kind of reading he gets back. And he's also taken paper that he knows is not intentionally treated. And so he's come up empirically with a threshold. And that's what we were using in those types of studies.

It's not something that necessarily you could take and start applying in other places. There's a lot of groundwork that has to go into it.

MR. ALGAZI: For the paper he had done that correlation or those tests, but we might not be able to use it on compost say, or something?

DR. BRUTON: That's right.

MR. YEPSEN: And yeah, we worked with Graham on that to sort of do a back-of-the-napkin comparison to the types of results that we get from the labs for total fluorine, because they don't totally match. And the 100 parts per million that we used is relatively comparative to the threshold he had come up with for intentional use. But

I think that again it's a good, quick screening method, but it's not enough on its own.

And so we see, for instance, in compostable products there can be sources of inorganic fluorine in a product from materials that are mined that are naturally occurring. Or it could be from a contaminated water source, things like that. And so one of the ways that we do that with that dual approach, of both looking at intentional use in a formula versus it coming from an inorganic source or a contaminated water source, is that you can start to break that apart.

So if you just look at something like an inorganic fluorine coming from talc or calcium carbonate you can test the finished product and you can test that talc separately. And to do simple math and if they add up then you know where it came from, similar to the water. So if talc wasn't the source and it's still higher then you could say, "Okay, well we need to test the water source." And I think that that's been one helpful way.

But for sure we need a lot of help I think continuing to develop the test methods for total fluorine, because the PIGE method is giving different types of results than a lot of the labs that we use with standardized test methods. And part of that is because this is still so emerging. And a lot of the standardized test methods for

total fluorine were not set up for packaging. They were set up for things like fuel.

And so there's a lot of work being done on that right now. There's an ASTM, part of the ASTM D2096, which is the sub-group working on compostable standards where our ASTM D6400 and D6868 live. There's a sub-group in there that is looking at total fluorine testing and things like standardizing the way that samples are prepared before tests.

We have at BPI we some general rules around sample preparation before you do a total fluorine test. We in general do not allow extraction but do allow digestion to prepare the sample before the samples are analyzed. But within that there is sort a whole other range of what is actually done. And so ASTM is looking at that in minimum sample sizing and things like that.

ACTING DEPUTY DIRECTOR PALMER: Hi, this is Karl. I want to change a perspective a little bit. As Andre laid out in our framework it's our responsibility at DTSC to pick a specific product or products containing a specific chemical or chemicals from our Candidate Chemical List. And our approach in this sector is that we're looking at the whole class of PFAS.

And I think we all per our research and discussion we're pretty comfortable looking at the class and think that

we can document that there's potential for adverse impact from this class of chemicals. But what I want to ask the panel about is really more of a question somewhat strategic practical question, which is one of our challenges in DTSC is looking at in the space and in others is that there are such a wide variety of products. And yet we have to actually be specific about what type of product we're looking at within that class of food packaging, for example.

So my practical question is, and maybe Jen and maybe Daphne could speak to this based on their experiences, we are well aware that if you look at one type of packaging it might push people to a different type of packaging. And you may be aware that the Department is also looking at ortho-phthalates and BPA and polystyrene for the same types of concerns.

So I'm wondering if there's sort of a practical filter from your experience, which would suggest where we might look? And are there certain types of packaging that we should look at that would be less likely to push to a different type of packaging that might raise additional or similar concerns? Not PFAS, but maybe it's BPA or something else. So it's a little different perspective and I'm just curious if you've got thoughts on that.

MS. JACKSON: In San Francisco most of our work has been related to takeout food serviceware. We had done

some studies in the early 2000s to look at what was going into our landfill-bound bins. And we had a fairly robust recycling program and we had a yard waste program, but what we saw in the landfill-bound bin was a lot of take-out foodware. We're a very urban city so lots of restaurants, etcetera. So that was a waste stream to us that felt like we could potentially address to try to minimize what's going to landfill and divert it for climate change purposes.

So at that time it was a lot of polystyrene foam products. And so we passed an ordinance that then eventually led to a lot of these molded fiber products coming into the market. So we banned polystyrene and the regrettable substitute in some ways was these molded fiber products with PFAS chemicals.

Heartening news though, because of our next ordinance what we learned what we didn't know, was that a lot of the molded fiber sector is trying to move out of using fluorinated chemicals. But I think that that particular product type is here to stay.

So what we're already seeing is there is a shift in the marketplace for the products that already exist. But the areas that I am concerned about are those that don't really fit into the takeout food serviceware like the popcorn bags, maybe the carton that contains your cereal. Those products are still potentially going into compost or

recycling and could contaminate those waste streams.

So from what we're doing at least in San Francisco we feel like we are starting to handle the takeout food serviceware space. But these other food packaging materials outside of that, we haven't addressed.

MS. MOLIN: I think there's a couple ways we can probably think about it. One thing that comes to my mind is kind of not thinking about them necessarily as products, but as materials and trying to go towards the common buckets that those fall into. Because things get sliced and diced in different ways and you can transport a sandwich in many different ways, for example. So that might be one way to think about it.

And then also knowing that in the end where are those products most likely to end up? So for example, there's oh so much effort on the kind of the clamshell type of thing to make it either into recycling for plastics or for compostability.

But then what happens with all the other stuff, right? The things that could be replaced with a plastic film and those are not very recyclable, if at all. So that would be another tradeoff to think about.

The other element that kind of comes to my mind is again the clamshell. They're just so widespread and everybody uses them. They're so prevalent. And from my

understanding PFASs are consistently found in those products. So that type of product is perfect from a CalRecycle perspective for it should go into the compost bin when it's done, right? That's what we want to happen, but not if they're filled with PFAS. So that seems to be kind of like maybe a lower hanging fruit from our perspective, because it's so tied in directly to getting those products to compost.

MR. YEPSEN: I would just reiterate that and say I think when we looked at essentiality from BPI's perspective, we were looking at generally the range of compostable food service or food contact items. And saying that when we first were getting into this in 2016, 2017, we weren't looking at is there a direct replacement for PFAS, because PFAS is not essential to compostability? And so we were looking at really are there other methods of having a compostable takeout container, and as that interim, right? So not just saying it has to be a direct replacement for that chemical.

And so it could be a replacement for that chemical, which there's a lot of movement on that and it's great. But it could also be alternative things like a coating on that molded fiber item, a foamed biopolymer. It could be a clear PLA takeout container. There are a lot of other ways of doing that even within just the compostability

world, not even considering switching to a recyclable container like aluminum or something like that.

So I would agree with that. And I think that that gets into that essentiality thing. It gets really tricky, essential in what regard?

MS. VENTURA: I want to just add something anecdotal to Karl's question and to Jen's comments, because I can't say this scientifically. But I happen to live in San Jose, which is not as good at managing waste and figuring out what to do about these things as San Francisco is.

So I live in a residential neighborhood, very nice neighborhood, but I live across the street from the main post office. Consequently it's a trash collection area, because the federal government doesn't go and pick it up. Okay, o what I see every morning when I'm walking my dog is primarily food packaging on the ground that people just, they've got their kids in the van and they just leave it on the sidewalk. But in the Bay Area, because of the cost of living even the nicest neighborhoods have of course homeless communities, people living in their vans, who are also bringing in not just takeout food packaging, they will also have supermarket packaging.

And so one of the things that a national campaign called the Mind the Store Campaign has done, is go into

supermarkets and try to look at what's in certain kinds of packaging. They've actually done some testing and I think they'll be sharing some of that information with you, Karl and Simona.

Because you're right, Jen. That we know that in pastry bags or pizza boxes or the clamshells that has been a traditional problem, but what about the butter boxes? Popcorn yes, but people in vans are probably not popping popcorn, but that's an obvious one. And what's in the other things that people are buying and then without trash receptacles on the street are just leaving outside their vehicles, because that's where they're living. But I have to tell you that it's terrible, I mean the amount of waste that collects from this stuff.

And what happens is because in our case it's federal property, and they are not like my apartment that goes out and cleans up the sidewalk, it sits there for months. And whatever is in that packaging I can see the dyes running into the soil. So whatever's in that packaging is leaching into soil.

MR. ALGAZI: Yeah, I had a kind of a follow-up. I think I heard either Rhodes or Jen talk about the discussion of clamshells and essentiality. Is it essential to use PFAS for the mold release agents for molded fiber clamshells or are there alternatives already available for that? Do you

know?

MR. YEPSEN: I don't believe it's essential.

MS. ROBIN: I was just going to say, oh sorry, steam works really well.

MR. YEPSEN: Yeah, and to be clear it's not just molded fiber items that have mold release agents. There are other items that pop out of a mold. But no, it's my understanding that they are not -- there are alternatives that are not fluorinated, even if fluorinated chemicals work very well for that.

DR. BALAN: Are there any other questions from the audience? Is there any comment or question from online? No?

Okay. You can go first.

MS. RUDISILL: Okay. Hi, Cathy Rudisill again. I had a question for the panel. I notice that some of the panelists are participating and actively engaged in the transition to alternatives. And I was curious as to what their challenges have been with that transition and any kind of methods or approaches they've used to manage those challenges?

DR. BALAN: So we're going to discuss that in a lot more detail in the afternoon. Do you mind if we leave that for the afternoon? Okay, thank you. Unless somebody wants to make a quick comment, so we'll get back to that.

MS. JACKSON: Very quickly, from the perspective of working directly with food service operators the first big challenge has been to have a list of products that don't have fluorinated chemicals. So here's comes BPI's list, registration, product registration, which is very useful. But then also making sure that people know that for us in San Francisco, it's a requirement now to use products that are Biodegradable Product Institute certified. So just that outreach and education of thousands and thousands of different food service operators, whether it's grocery stores, delis, taquerias, mobile food trucks, it's a huge education push.

MS. BRANYAN: And I do have an online question from Juan Villa-Romero. And he comments that, "The European Commission Food Safety Authority suggests daily food intakes for both PFOS and PFOA. How can we take advantage of this information to avoid duplicative efforts during regulation?"

DR. BALAN: Would anybody like to comment on that?

DR. BRUTON: Just to say that I thought about this when Maricel was presenting and she showed that slide where one of the companies had reported that PFOA was an impurity. At some certain level it was actually reported in that FDA certification. And I would be really curious to see how that compares with those European TDIs, because they're quite low.

MR. ALGAZI: This is Andre Algazi following up. Earlier I had said -- I talked about the way our standard is a narrative standard and not a risk-based standard. So from our perspective we're asking the question whatever that level is given there, given that there is potential for exposure, is it necessary to use any PFAS? So we're sort of sidestepping how to use that, because it's not part of our framework per se.

DR. BALAN: Okay, so that was a lot of information and also still a lot of unknowns it sounds like. As Andre mentioned earlier, and as Karl basically re-emphasized, we are trying to figure out what makes sense for our program to pursue.

Also, in terms of what product out of this universe of food packaging it would make sense for us to propose to list as a Priority Product. And so when we make such a determination we think about the potential for exposures. We think about potential for adverse impacts, which to us may not be just toxicological hazard traits but also persistence, bioaccumulation, transfer to the fetus and the baby. And as well as adverse waste of life impacts, so any adverse impacts to a wastewater treatment plants or to composters would also be highly relevant to us.

So I'd like the panel to maybe take a moment and think about what you would recommend that we do? How should

we move forward from today? What do you think we should do? Should we pursue a Priority Product? And if so, what should be the scope of that product definition?

So I would hope to hear from everybody if you're willing to share your thoughts and if you have any other closing thoughts to share. And yeah, feel free to take a moment and whoever wants to start.

MS. MOLIN: Yeah, I've already put forward my recommendation for molded fiber. And I don't think I've really laid out all the pieces completely, but you know the end-of-life pathways are more and more complicated. We previously historically had exported a lot of our waste. A lot of that is a little bit upside down right now and markets are beginning to develop more domestically to handle that.

At the same time CalRecycle is working on various significant regulations for organics diversions, that 1383 that somebody had mentioned earlier. And it's going to require all the jurisdictions to start moving the organics out from landfills and into other places, which hopefully a lot of that will be composters. So with that in mind, thinking about the pathways for the different products like let's say there is, so options like molded fiber, coated paper, and was there one other one that (indiscernible)?

DR. BALAN: Well we listed paper, paperboard and

molded fiber. But I mean the options could be any subset of that. Or maybe there's something else we're missing.

MS. MOLIN: So just thinking about the paper, paperboard, lined paper, ideally that's -- or I guess that stuff could be composted. I think a lot of times it's more likely put in a recycle bin. Would it actually find a market? Would it actually make it to a recycler? It depends on the market of the day from my understanding, which may not be completely correct.

So I think between the reasons for the amount of PFASs and the molded fiber and the likelihood for those to get to a compost facility, once these more infrastructure starts changing from 1383 I think it will be well lined up.

MR. YEPSEN: Yeah. I guess I would say I think with that in mind that it's hard to focus on a product category, right? And so if it's really food-contact related, and as Jen mentioned food service products are one, but there are other food contact packaging materials out there.

And so if we're looking at food contact packaging traditionally not being recycled, and potentially being composted in the future as the infrastructure develops under 1383 and if SB 54 passes and pushes all packaging into one stream or another: reduce, reuse, recycle or compost, I think that it would be better not to focus on just a

product. But look at materials that are going into a particular waste stream even if that's more challenging.

So maybe that's multiple products to make up that, and making the categories broad enough to make sure that you're catching a majority of them even if you maybe miss one.

MS. MOLIN: And just to clarify that I was operating under the assumption that you're looking to narrow things down.

MR. YEPSEN: I was saying in (indiscernible).

MS. MOLIN: Because of course if we can go broader and get everything of course that would be the best way to go forward. Yeah.

MR. ALGAZI: I just wanted to point that we're constrained by our work plan, which the product category we have in the work plan is the one that I showed on the slide. So that's kind of the boundaries that we're looking at currently. So I don't want to -- I don't know if this is okay Simona, I'd maybe reframe the question if you had to prioritize, what we would do first. Assuming we can't do everything all at once what would you prioritize?"

MR. YEPSEN: Could we still do those three? (Laughter.) Because again I think that would capture the bulk right, if you could do molded fiber, paperboard and paper. I mean, paper was one of the categories. I mean all

paper, so would that cover the microwave popcorn bag, which is not paperboard? You know, I think if you have to prioritize one of those three you'd look at what the highest concentration is across those three, right?

So using the product sampling in reduction as the first priority, if you could only choose one you want to look at which has the most in it and then work down.

DR. BRUTON: I'm going to put in another plug for going after molded fiber. And I shouldn't use the word going after, because I don't it to be like picking on molded fiber. But I do think that of these three that we've talked about it's the one that we have the best understanding of. And that makes it more actionable for you at the moment.

I do think that we need to do more to understand what other types of paper, paper paperboard, food service packaging might contain PFAS. But we know that a lot of the molded fiber does and that it's going to compost. And that exposure pathway is pretty clear. And so I think that's something that you could begin to act on.

MR. SERNULKA: I'll jump in and just say a couple of general things that come to my mind. And I think the first one is just reiterating what we heard at the very beginning of the day, how important continued collaboration is as this process goes forward. And I think that's important for two different aspects of it is that you

continue to collaborate at a national level whether it is with FDA, the national trade associations like the one I work for and the other ones that are out there. Because a patchwork regulatory system in the United States is what's going to drive costs and other considerations. It's difficult for operators when you start seeing regulations in a patchwork framework.

And I think definitely a next step is certainly to talk with your food service operators in the state to get a feel for what they're using, what's available to them. You know they have catalogs that they order out of. Whether it's a Chinese restaurant down the street to a large branded restaurant they're going to be picking through a catalog or selecting their items. So really try to get a feel for what's available to them, what they need from a performance standpoint, what do their customers demand. And then certainly you'll get a better feel for the reality of costs associated with any regulatory change.

So I think that's going to be an important next step is certainly with the operator sides. And I'll just say from our perspective we look forward to being a part of the process and continuing the dialogue with you all.

MS. BRASCH: Hi, my name is Joanne Brasch. I'm with the California Product Stewardship Council. We strongly support adding foodware, food packaging treated

with PFAS as a Priority Product. We do prefer a definition that incorporates all materials in direct contact with food. But what's most concerning to us is that the public has no way of knowing that these toxic chemicals are in their food packaging and the food that they consume. Nor do they have a way to protect themselves. Even if there was a labeling requirement it merely informing the consumer is not sufficient enough to protect human health.

So therefore we're asking DTSC to take swift, decisive action to ban these known cancer-causing chemicals from all food contact. And I know that's in the regulatory process therefore they are listed as a Priority Product. But we just want to let our intentions be known in the beginning. Thank you.

DR. BALAN: We have just a few minutes. Would our last two panelists like to say something?

MS. JACKSON: I just had a thought. I don't know how actionable it is, but I was thinking about where PFASs are used or why they are used and it's for the function to confer water, oil, or grease repellency. And so I just wonder if the product category could be any food contact materials that are meant to be water, oil, or grease resistant? And then in combination with PFASs that casts a broader net. But it could address the places where it's most likely to be used.

MS. CHIANG: Hi, my name is Sue Chiang with the Center for Environmental Health. I know you're talking about alternatives later this afternoon, but I did have a question for Rhodes I wanted to ask now since you're up here. I was kind of curious as far as the applications you're getting for products to be certified under the new requirements. What kind of -- like how many? I don't know if you're able to say that but like how many are you getting and how long is the process taking? I was wondering if you could just say more about sort of what the outlook is for some of these alternatives.

MR. YEPSEN: Sure, I can share some, I can't share a lot. Unfortunately as soon as somebody signs a confidentiality agreement with us even the intent to certify is covered under that. So what I can say is there is a lot of interest in in this, whether that's alternatives in a molded fiber category. So different wet-end additives or coatings as well as alternatives to molded fiber like we talked about before, so foam with biopolymers or more types of rigid takeout containers. So there's a lot of interest.

And I would say that the -- yeah, as of January 1 so on the holiday break we delisted thousands of products. And so that is not a good thing for us to do. We're a membership-driven organization. It was very challenging for a lot of our members. And so I think what we're seeing is

members taking that challenge and turning it into an opportunity, which is good. And so whether that's the existing members or a lot of new companies coming in as well. So it's a little vague answer, but just there is a lot of interest.

And in terms of timelines there is a lot of interest in compostability in general, so we are completely bombarded with requests. And the labs, testing labs are completely bombarded, so there are waiting lists to do any type of test at our approved labs. We just added a third one in the U.S. recently which is great, so that will help. And we welcome other labs to join. The latest one is at a university, so anyone can qualify. You just have to be ISO compliant, or audited, and the process to get approved is free.

And so there is that delay and then there is the staffing delay. We just hired three new people last week so we're trying to keep up with requests in general.

And then I think there's also just a challenge around reengineering products, so not the new products coming in the reengineering a category is really tricky. Both for the manufacturer of course to figure out, but also for certifiers to figure out exactly what changes have been made especially when you're talking about ingredients are used in really small amounts. So we've had to add extra

layers of scrutiny around things like molded fiber products with letters from factory locations detailing things like do they have separate liners in place, which we haven't had to do before. So that's also slowing things down

And the last thing I would say about that that's slowing things down is the safety data sheets are not uniform, right? And so we've been learning a lot about that and updating our requirements around carcinogens, reproductive toxins, etcetera, but for fluorinated chemicals as well it's not always apparent in a safety data sheet. And we have to sign extra confidentiality agreements with those suppliers who are oftentimes understandably very resistant to signing a confidentiality agreement with us. So that adds another layer of really slowing down the process.

DR. BALAN: So I'd like to give Carla a minute if you have any final remarks?

DR. NG: No final thoughts. I think I was pretty clear where I stand in terms of persistent chemicals in general. So for me, of course if you're trying to prioritize, we need information about levels. I think as Rhodes said you would go after the thing that's there in highest concentrations.

And so there in terms of talking also about collaboration I often hear from industry saying that they

would like to kind of have an even playing field. And this is an issue with states having different levels.

And I think as scientists we feel the same way when we are kind of swimming in the sea of unknowns which products are used where and in what quantity. That would also help really clarify things if that information was available. I mean I understand confidential business information in the sense of formulations maybe giving someone a competitive advantage, but this is critical information for about whether something should be allowed in a product or not. And so I think there definitely needs to be more movement in that area to make these things more transparent. Because if everybody is looking for clarity and an even playing field I think that would really help.

DR. BALAN: Yes, so that was very well said. Thank you so much to everybody for participating today on this panel. I can't reiterate enough how important it is that we hear from all these different perspectives, because yeah it is a patchwork of information. And there are a lot of black boxes. And if we are to move forward in a meaningful fashion we need to take everything into consideration.

So I really appreciate your time and your knowledge and wisdom that you shared with us today. And please come back for the afternoon. We're going to have a

very interesting discussion on alternatives. So in the afternoon that's a very critical part as well as we think about proposing anything as a Priority Product, one of the questions is what are the alternatives, because we do not want to incentivize any regrettable substitutions.

So please go have your lunch and come back for more interesting discussion on alternatives to PFAS. Thank you everyone so much.

MS. SETTY: We'll be reconvening at 1:30 p.m. All right.

(Off the record at 12:28 p.m.)

(On the record at 1:31 p.m.)

MS. SETTY: Hope everyone had a good lunch. Let's go ahead and get started with our first afternoon speaker who will be presenting remotely from Denmark. I'd like to introduce you to Malene Teller Blume, who manages Coop Danmark's quality for all food and safety programs for non-food consumer products. She's also responsible for Coop's chemical strategy and develops chemical safety requirements that often go beyond legislation. We'll leave some time for discussion with Ms. Blume after the presentation since she won't be on the panel discussion this afternoon.

Please welcome Ms. Blume. (Applause.)

MS. TELLER BLUME: Thank you very much everyone, so should I share my screen now?

MS. SETTY: Yes, we can see your screen and we can hear you great.

(Pause to set up screen.)

MS. TELLER BLUME: Sorry, so is this better now?

MS. SETTY: Yes. Thank you.

MS. TELLER BLUME: Okay. Hello everyone and warm greetings from Denmark. This is quite late here in Denmark so it's almost is totally dark outside. And thank you for the invitation to speak today. And we would like to inform you what we're doing here in Denmark, trying to stay ahead and implement a very ambitious strategy to phase out harmful chemicals in our products.

First a little bit about -- sorry. Can you see the screen now?

MS. SETTY: Yes, we can.

MS. TELLER BLUME: Okay. Sorry.

And then a little bit about Coop Danmark. We are the largest retailer in Denmark and it's owned by members in Denmark with 1.7 million. We have the chains that you see in the bottom. This is supermarkets, discount markets and also hypermarkets and we also have online sales for both non-food and food.

We are a special organization, because we are a corporation. So we have to, of course, to (indiscernible) and have a good business. But we also work and have worked

for many, many years with a high focus on responsibility in social compliance and we work together with our suppliers to meet the high requirements. And how do we work, we have more than 4,000 products in private labels and that makes us able to set up strict requirements in our own brands. And then be a front runner for good products that we sell under Coop's brands.

We have many years -- now Denmark is a small country, but you can see that we have 1,100 shops altogether in Denmark. And what makes us also different from the competitors Denmark is that we also have many small shops in the small circles in Denmark. So we are also in the small villages, represented, so we do keep the small villages alive all over Denmark. And besides we have the big supermarkets as well.

We have always been working with the sustainability, because we are owned by our members. So when we discovered and realized that there is a problem with health, with the environment, with animal welfare, with many different issues, then we can set up requirements. So we started from many years ago, setting up requirements for our own products.

We do investigate and we do discuss with authorities, with the experts, with universities, with NGOs and always been in touch with what are the concerns out in

the society? And then of course we need to have solid scientific evidence that we need to do something about it. So then we discuss and we make business cases and then we implement requirements for all our own brands.

We are using the precautionary principal. And I'm proud to say I think that many of the actions and the bans that we have implemented during the last decades actually seem to be the very right decision. Because the evidence for the harmful things that chemicals do has been even stronger for every year that has been gone through since then.

So here you see that we have been working with many kinds of areas. We started quite early, 2004, with banning all the chemicals, which were under suspicion for being endocrine disrupting chemicals. It was very early in Danmark, but we do have a lot folks, we do have a lot of educated people and universities are in quite close dialogue with the media, with the press. So over time you see a risk or a concern then there will be an article in Denmark. And then the consumers start to worry about this. And then we have to meet the consumers and meet their concerns and also make them safe to go to into our shops.

So we have been working for quite some years with EDCs, which were the new how you say, danger or risk in the beginning of the new century. And then we started to work

also with food contact materials in 2014, '13. And these have been the biggest actions from Danmark, from Coop Danmark, in the last few years.

Here you see just quickly, a quick look into our Chemical Strategy. It's called the Dirty Dozen and it's 12 groups of chemicals where we have banned them in all our private labels products. This is both for food and non-food. We are in full compliance with this strategy. We haven't invented a new strategy, but we do still fight very hard to comply with these requirements which we have already implemented during the last years.

And here you see there are bisphenols. There are fluorinated compounds. There are phthalates. There are also triclosan and allergenic chemicals and also pesticides. So we have decided to phase it out for all our private labels and succeeded two years ago.

When we first started to work with packaging, I think starting around 2013, until then I actually thought that the regulation was quite good and covered the risk. But then we looked into it. The scientists started to discover things. We started to work on workshops and discussion with the NGOs and we realized that something has to be done about the food packaging.

So we set up requirements for the PFAS and also for the bisphenols, because there was more and more evidence

showing that the risk is not covered for the consumers. And the legislation is very, very slow in covering the risk.

So we started to look into the PFAS and in fact it started with world leading scientists. In 2014, they made a public statement showing that there were 10 very, very strong arguments to ban all nonessential use of PFAS. And there was a lot of evidence showing that it would link to harmful diseases, human health and also the environment. And these chemicals, they are very persistent and will be out there almost forever.

So we started to read this statement. We started a dialogue with the experts and we realized that we had to do something about it. So in 2014, we banned the PFAS in all our private labels products. And at that time we didn't know how big the mountain should be to climb and to succeed. But we realized that the risk and the discussion and the evidence was so strong and so scary. And because we are a consumer-owned organization we need to be a frontrunner and be very clear in our statements and our approach to these harmful chemicals.

So we started to look into it and we started with the food contacting materials, the food packaging. We started to map all our products. Then we looked into the textiles and footwear, cosmetics and also home textiles in a continuous dialogue with our suppliers to find alternatives.

And to secure and set up a test program, which could test for these chemicals.

We were quite under high pressure, because in that time there was no standard for testing. We didn't know how exactly we could test also the alternatives, but after a short time we tried different standards. And then the authorities and also a lab in Denmark were starting to test for TWFs (phonetic) in the products. So that made us capable to also to test the products and set up quite clear requirements in that time.

Then we had work with phasing out all our food packaging for, I think it was around six to eight months. And then we ended up with one product left which was the microwave popcorn. And the supplier was continuously saying that they couldn't find any solution. They didn't have any other packaging to use without PFAS. And then there was very, very scary evidence from a Danish university showing that if you have a high content of PFAS in your blood and you are pregnant then you will have a 16 times higher risk for early abortion. [sic: miscarriage]

There was very high attention in the media in May 2015. And on that background we decided to take away all the microwave popcorn from our shelves immediately, because we had a very bad feeling about this product. And we wanted to put very, very high pressure for the supplier to start

innovating even more and find the right solution.

This picture you see here is not what we published, but we were close to doing it, but we thought that this picture was too scary. We used another picture, but it was a statement to our consumers telling why we had to remove the microwave popcorn from our shelves. So we didn't want them to be angry and go to buy the microwave popcorn in other shelf because there was no solution in the world in that time. We had searched every corner to find a solution.

But after six months the suppliers found a solution and in October of 2015 we launched a new version of the microwave popcorn without any PFAS in the packaging. And as far as we know, and still believe, this was the first PFAS-free microwave popcorn packaging in the world actually. So we were quite proud and it gave us very, very good attention and media exposure.

So during the last five or six years we are working with setting up standards requirements. And also the Danish authorities have been looking into this and also recommended all suppliers and all retailers to phase out the PFAS from food packaging.

So they set up some requirements. It was very low. As you see in 2015, 0.35 in this value. But in that time it was in a perfect world without using any PFAS,

because the background contamination is so high now. So it wasn't easy to meet this requirement. So now they made a new indication limit in 2018, which is 10 µg/dm2 paper and this is what we are following today. We're using the TOF methods when we do test the packaging.

I've just been to a workshop in Brussels (indiscernible) actually and see there are many, many different kinds of standards and the discussion by the experts and the scientists, which standard is the most useful to use. And it's of course very important to find a shared standard to use all over the world.

What is one of the very important tools that we use in Denmark is the Green Swan you see on the right side on the top. This is a third party. It is a controlled ecolabel from the authorities covering the Nordic countries: Denmark, Sweden, Norway and Finland. And in that criteria PFAS is totally banned. And so when we implemented the ban in 2014, they were already banned in those criteria, so the manufacturer and the suppliers could start looking to those criteria and seek for approval. And then we could label actually our product with this label showing our members and consumers that these products are without any PFAS.

And if you want to see to find the list of products and manufacturers, you can see on the link in the bottom.

Then we are still waiting for the legislation. In 2014 when there was a very high media focus in Denmark for the PFAS, and we implemented our ban, the Minister of Food Safety said now he wanted to ban those harmful and poisoning PFAS. But he didn't succeed. But last year, in October of 2019, the Danish authorities came back with a national ban. And it will be implemented this summer actually, but only in Denmark. So Denmark will be the first country in the world banning PFAS. And also note that some states and also in California the PFAS is already well-regulated for the food packaging.

And so this is better late than never, but I think it's quite -- I can't understand why it has taken so long to regulate those very harmful chemicals. The evidence has been so strong for so many years now.

And what was always shocking about this is that the European Safety Commission for Food Safety they made a new evaluation of the PFAS and found that the total label daily intake, they have made a mistake. Now, they have to still lower the limit 2,000 times, so all the risk assessment has been totally wrong. So they need to start all over again, so those chemicals are even more dangerous than they first predicted.

There also the case about the bisphenols. This is also when a journey almost 10 years in phasing out. We

started back in 2010 for the baby bottles, the polycarbonate plastic bottles, we phased out the bisphenols. And then in 2015 we also changed the cashier rolls for the receipts. And in 2016, we have worked some years to substitute all our cans in the lining with bisphenols, but today these are bisphenols-free. And it was more than 100 products, which we have substituted in that time. And today we're working also to use only paper board. You know, the brick you see there with the red one instead of using the metallic cans.

So now I also want to tell you that we have been working with sustainability (phonetic) for many, many years, starting back in the 1970s. But we have not been as good communicating this to our consumers, so we have been working more closely with this the past few years and we have been better. But we still have a lot of potential involving our consumers in all our actions and they can feel safe. And maybe they could be more loyal if they read about something in the newspaper and they have some concerns then they know that Coop is probably taking some actions about this.

So we made a very, very strict very untraditional campaign trying to involve consumers and trying to make the political system adopt a very strict chemical regulation for PFAS and for bisphenols. And it had a very, very high success and we have won very big awards for social media for responsibility in communication.

And now I will show you the video. It will take about two minutes.

(Video playback begins)

NARRATOR: In Denmark men's sperm count have decreased by more than half in 40 years. Almost every 10th child is conceived by artificial insemination. Girls enter puberty one year earlier than one generation ago.

Scientists believe that a lot of the blame lies in the problematic chemistry we've found ourselves with. Coop, the Danish retailer, wanted to change this, but they couldn't do it alone. New legislation was needed. But in Denmark the only ones who could change the law are the 179 members of Parliament, so how could we get one of them to (audio drops - indiscernible)?

The solution was NyKemiLov.nu, a direct campaign to the members of Parliament backed by the Danish people. On social media we sparked a debate on the problem of hazardous chemicals. And on the campaign side, we encouraged the Danes to share their concerns with the politicians. When signing the petition, personalized emails were sent directly to the 179 members of Parliament with a clear message that the law needed to be changed.

To ensure that the politicians did not miss this important message we also developed personal films for Twitter. (Audio drops out) -- action together with experts

we (indiscernible) against half of these chemicals, which could immediately be submitted to Parliament. The campaign quickly gained the politicians' attention. But to ensure that no one missed this important message, we also surrounded Christiansborg, the Parliament building with our (indiscernible). After an intense month Coop handed over the (indiscernible) at Christiansborg and soon after this happened.

(Multiple announcements in Danish)

NARRATOR: The campaign generated more than 2.7 million viewers and had a 450 percent higher engagement rate than average on Facebook. Coop received a letter from the Danish Minister for Environment and Food thanking us for drawing attention to the reported problem, proving that sometimes it pays off to target the few with many to make a difference for every one of us.

(Video playback ends.)

MS. TELLER BLUME: Yes, and this is as you can see, a quite untraditional campaign. But we were very proud, because we had very high support from everyone and I think we put the focus about regulating those harmful chemicals. And as they also said in the video, we received a letter from the Danish Prime Minister, because we helped them to adopt a quite ambitious chemical strategy in the Danish Parliament.

And I know the time is running, so I will go very fast through the last one. The last things that we missed (phonetic) this year was the cosmetics. So in March of last year we got out the last products from a very famous brand in our shops, because they didn't want to remove the PFAS from the foundation, night cream, day cream, mascara, and so on. So we promised our consumers that by September the 1st last year there would be no PFAS in the cosmetics in our shops, so we had to remove quite a lot the 1st of September last year. But we think that there are also many alternatives to PFAS in cosmetics, so we just use other brands instead of those famous brands, which were not willing to cooperate.

And here you see how we work. This is my last slide. We do it because we realized there is a need to move, because the scientists and the scientific proofs are much in a higher speed and the legislation is behind. So we need to do something before and we can do this, because we have a direct communication with academics, with researchers, with authorities, scientists, NGOs. And then we can move and we can implement requirements and then we save maybe 10 to 15 years compared to how long it takes to implement a regulation in the European Union.

So we do it because we want to maintain a high consumer loyalty from our members and consumers. And

consumers are quite demanding in Denmark. And in that way we also are protecting the brand Coop and you know that we are taking care of about these things when you go into our shops.

Yes. Thank you very much for your attention. (Applause.)

MS. SETTY: Thank you for the presentation, Ms. Blume. We don't have a lot of time for questions, but we can take a couple. Do we have any from the audience? One over here?

MS. CHIANG: Hi. My name is Sue Chiang with the Center for Environmental Health. You had mentioned the Nordic Swan label. I was just curious when that went into effect with the restriction of fluorinated compounds?

MS. TELLER BLUME: I think they made it may be back in 2013. In 2014, the criteria were already adopted. And we did have already product in our shop with this label, but we weren't that aware about this risk and these high requirements. So, now, it was easy for our suppliers to start looking into which solutions, these suppliers, which had the Nordic Swan, already had found. So that made the substitution quite easy for us.

MS. SETTY: Do we have any questions from the webcast? Any last questions from the audience before we move on to our next speaker?

(No audible response.)

MS. SETTY: Okay, great. Thanks again, Ms. Blume, for your presentation.

MS. TELLER BLUME: You're welcome and have a nice day. Bye. (Applause.)

MS. SETTY: Okay. We're going to move on to our next speaker. I'd like to introduce you to Cathy Rudisill, who's an Environmental Chemist at SRC. She works on environmental health, public health and green chemistry projects within both the government and private sectors. Her recent work focuses on green chemistry and Alternatives Assessment for the EPA's Safer Choice Program. Please welcome Ms. Rudisill. (Applause.)

MS. RUDISILL: Hi, thank you for giving me the opportunity to speak at this forum. I'm really excited to be here and to share with you what we've been working on with the Washington State Department of Ecology for their PFAS and Food Packaging Alternatives Assessment. So we are the contractor hired by Ecology to do this work.

This is a quick outline. I'm just going to do some interim background as to why we're doing the Alternatives Assessment and what the basis is for that. We'll talk about what's been done so far and where we're going in the future and then with some conclusions since I need to be moving along very quickly.

So the Washington State Law RCW 70.95G bans perfluorinated and polyfluorinated substances for food packaging materials. So if Ecology determines that there are alternatives that meet the requirements of the law then the ban will take effect. Otherwise the assessment must continue on a yearly basis.

The Department of Ecology is going to conduct an Alternatives Assessment that considers chemical hazards, exposure, performance and cost and availability.

Definitions, so what is an Alternatives Assessment? So according to the National Academy of Sciences in their work published in 2014, it's a process for identifying, comparing and selecting safer alternatives to Chemicals of Concern on the basis of their hazard, comparatives exposure, performance and economic viability. The main goals of an Alternatives Assessment are to perform informed substitution and avoid regrettable substitutes. And really they kind of go hand-in-hand, because if you are truly performing informed substitution then you're likely avoiding regrettable substitutes.

I think it's really important in the context of regulatory assessments to emphasize what Alternatives Assessment is not. And AA is not a safety assessment where exposure is below a prescribed level, not a risk assessment where risk is calculated as a probability, considering

exposure and hazard. And it's also not a sustainability assessment that considers all aspects of the product life cycle. It contains elements of all of these things but it's sort of reorganized and repackaged into its own approach.

So for this assessment we're following the IC2 guidelines on Chemical Alternatives Assessment. We're going to be forming a Level 2 Hazard Assessment module and then a Level 1 Exposure Assessment, Performance Assessment and a Cost and Availability Assessment. So if you're interested in those resources I provide links on the slide.

The take-home of this is that IC2 is a guideline. It's not a handbook that takes you step-by-step through the process. So part of this project is also trying to develop a framework that's specific for this project that is in line with the IC2 guidelines.

I think it's important to also clarify what our role is in this assessment. So as I said before we're the contractor hired by Ecology to perform this work. Our job is to develop a methodology to assess hazard, exposure and performance and cost availability. The mantra is happening through this assessment. Ecology's role is to finalize and approve those methodologies.

We recommend products and product types for evaluation. Ecology is the one that approves the selection part of those products and product types.

And then we evaluate those products against the assessment methodologies that we helped to create. And then what Ecology needs to do is decide if those safer alternatives exist that meet the letter of the law. And then they will prepare a final report to the Legislature in Washington.

So what's been done so far? Stakeholder engagement, I say it's not done because it's not finished. It's an ongoing process in this Alternatives Assessment. But at the moment we have about 60 or so active stakeholders. And by active I mean we're engaging in email, we're getting on phone calls, they're part of our email list and so on and so forth. They have provided us information very kindly.

We also had a listserv based on the Chemical Action Plan Membership. It's about 250 people, so our stakeholder group now encompasses a wide variety of folks within the value chain and the supply chain as well including government, various manufacturers, suppliers, so on and so forth.

I can't emphasize enough how important stakeholder engagement is for this assessment, because the information that we're going to need in order to do a defensible assessment doesn't always lie in the public domain. So we can't go to literature to get the information to help answer

some of the questions that we're asking here. So we're really going to depend on the stakeholders who are in this business particularly, who have information that would be really helpful to this assessment.

So really how we see this feedback loop happening is that SRC does their internal research. We supplement that with stakeholder input. And that hopefully helps to clarify and fill some of the data gaps that we're seeing from the available information in the public domain.

What's been done is we have identified what we call a PFAS Base-Case. So PFAS as a group has been banned in Washington State, but for the purposes for this assessment we have selected a PFAS material that we're using as a comparator to help us through this assessment as a means to compare exposure or compare hazards, so on and so forth. This one is FCN 604. This is the CAS number and this structure was developed by us by one of our highly experienced PhD chemists who has spent probably the last 15 years evaluating industrial chemicals or structures.

This is a C6 side-chain polymer, as you can see the fluorinated side-chain is on the side there. So again this is a comparator. It's not meant to be wholly representative of what is being used right now, but we were told by working with our PFAS manufacturer stakeholders that this is a commercially-relevant substance.

What's been done is that we have developed a hazard and exposure methodology. We released a draft of a hazard assessment methodology in the fall. We've been working to address comments and concerns from the stakeholders since then. We are also in the process of finalizing a draft exposure assessment methodology. And we'll actually be discussing these with the stakeholders on a call scheduled for January 29th, so please mark your calendars if you'd like to be part of that discussion.

If you're not already in our stakeholder group, please let me know and we can add you and get you invited to the call.

What's been done: Product Scoping. This has been a bit of a challenge for us. I think it sounds like it's been a challenge for California as well. It's a similar issue. We need to figure out how to scope this in a way, because we can't look at everything, because it's a very big sector, a very big product sector. But we have to scope it in a way that can help Ecology to form their questions and hopefully help to make them to make some decisions.

So initially we thought we would only be able to look at wraps and liners and possibly bags. But the initial stakeholder concern was that our scope was too narrow. It was too narrow of a market for what was actually being used as far as the PFAS materials. So in the fall we've been

spending a lot of time trying to figure out how we can broaden that scope and so we've had some negotiations with Ecology and also clarifying some of the concerns with the stakeholders about what we can do.

So that's where we kind of lost some time in the fall. But the good news is that we're really close to getting a product scope at least for the purposes of this assessment. We've been reaching out to some of our manufacturers, alternative producers, so now get some additional insights to identify where there's overlap between the different product types in the sorts of alternatives that are being used.

So where are we going? The next step is cost and availability. So I initially thought that we would have to dive into performance first, but due to some of the staffing availability that Ecology has regarding their economists and regulatory analyst we'll probably be looking at cost availability first before we start looking into performance.

So what's interesting here is that we need to address three simple questions. They're viewed as two questions, but the second one is a two-parter. We need to answer is the alternative currently used in the application of interest? And is the alternative currently offered for sale of the application of interest? Is the price of the alternative close to current? So I emphasize close to

current, because this is where things get tricky in a regulatory assessment.

We have to define what is close to current. That's really important I think for the purpose of this assessment and under the law says sufficient quantity and comparable cost. So we'll be working with Ecology staff and engaging the stakeholders to determine how we can define some of those terms and apply that to this assessment and develop a methodology.

Next is the heavy hitter, performance. So we'll be doing a Level 1 Basic Performance Evaluation. We have a set of about 5 questions to ask based on the IC2 guidelines. It's generally based on marketing information and public reports, existing use, that sort of thing. So it's not going to be a deep dive into comparing the different test methods and standards, that sort of thing. But we do need to figure out some way to assess and support the conclusions that we will be formulating. So we'll be talking about those in the future, again likely after the cost and availability discussion.

I did want to emphasize this is where the stakeholder input is going to be really critical, because this is where the information lies a lot with the producers of these products. So it's really important to us that we have that engagement. I think we do have that, but I would

like to emphasize that getting this information and getting insights on how these products perform is going to be really critical to this portion of the assessment.

So I would like just to kind of conclude with highlighting some challenges and some of the opportunities that we've had so far in this process. And I would like to address the issue of timeline. So we started with a much shorter timeline about a year ago. We initially thought that that we would be over and done with this in August and that has not happened. Now, we're looking at probably this summer for our draft report to be due to Ecology based on some of the issues that we've had.

I would say one of the aspects to that is underestimating how much level of effort is needed to engage with stakeholders. And I don't think that's as a negative. I think that's a very important part of the process. But when you go into a research project you never really understand. You don't really know how much time it's going to take until you're in it really. So that's just part of it.

It takes time to recruit. It takes time to communicate the value of the project. It takes time to go over reports with folks and get them to the point where they would be willing to share possibly some very critical information with us.

Another issue that I have and I continue to have is access to information. So I'm a chemical hazard assessor. I'm a researcher. Of course, I want all of the data, but it's probably not going to happen. Supply chain communication is obviously a known issue. But Ecology has developed a CBI protocol. That would hopefully make some of our stakeholders a little more comfortable sharing some of that critical information that we really need for this assessment.

And ensuring transparency in the process and again that kind of goes into this idea of engaging with stakeholders. In the context of a regulatory assessment, transparency often relates to lots of documentation right, lots of emails, lots of memos, lots of phone calls. Presentations like this one equates to a lot of effort. Often in time it also relates to a lot of money.

So one of the ways that Ecology has helped to maybe streamline that process is building a dedicated web page where it will house updates to all the project happenings. And there will be a fact page as well as document archives. So currently it's kind of been embedded with some of the other PFAS work that Ecology has been doing, so that dedicated website is very close to being accessible to the stakeholders.

And with that, that's kind of our quick overview.

I'm happy to answer questions during the panel discussion or after this. But I would like to acknowledge California DTSC and thank you again for inviting me and organizing this workshop, also to Washington Ecology for allowing me to be here. My team at SRC, they're absolutely amazing and that number of people will be increasing very shortly I'm sure. And also to the PFAS AA stakeholders who have been really instrumental in getting us to the point where we are right now.

So thank you for your continued support. Our contact information is here. The new point of contact at Washington is Ken Zarker and his contact and information is here if you have any questions or concerns.

And just a real quick FYI if you'd like to learn more about Alternatives Assessment please go saferalternative.org. There is a free webinar hosted by the Association for the Advancement of Alternative Assessments about how to get to safer alternatives using non-animal methods. That's a free webinar and it's on January 29th. So all right, great. Thank you so much. (Applause)

MS. SETTY: Thank you so much for the presentation, Ms. Rudisill. I think we're going to have to move on to the next speaker, so we'll hear from you more at the panel discussion.

MS. RUDISILL: Thank you.

MS. SETTY: All right. We have one more speaker before the afternoon break. Dr. Bill Orts leads research at the U.S. Department of Agriculture, provides biorefinery strategies relevant to the Western U.S. His recent research interests include nanotechnology, fiber-based composites and biorefinery optimization with the goal of adding value to agriculturally derived biomass. Please welcome Dr. Orts. (Applause.)

DR. ORTS: Thank you, all right. Perfect.

I'm from USDA Research in Albany which is essentially Berkeley, right? And we get the good fortune of working with companies to try to encourage them to do the right thing. Our real mission is to add value to agricultural co-products. Anything west of the Rockies, we try to add as much value to the carbons as possible. And then we get involved in all sorts of issues including PFAS-free.

Let me introduce us, so back on the hill that's the UC Berkeley tower in the background. And four miles down the hill we are an adjunct to them where the married student residents are. There's about 400 of us just off the highway across from the Golden Gate Fields racetrack. If you are in the neighborhood, invite yourself over all right? So feel free to come join us, about 50 of us in biofuels and bioproducts, adding values to carbon.

The nine most terrifying words in the English language according to Ronald Regan are, "I'm from the government. I'm here to help." Okay. He said that actually coming near and dear to my heart, because he said it the what, at a state fair in Iowa because American farmers were being left behind. And he really was there to help the American farmers.

So that's also my message. We're here to help. We get to live vicariously through companies and try to encourage them to do the right thing. We are base funded, which means your tax dollars paid for us to exist. And we hope we can encourage you to do the right thing.

We keep trade secrets with companies. We sign agreements with them. We help them get over the hump, sometimes through the Valley of Death. Or sometimes big companies that don't necessary want to do this kind of research we might want to work with them on the medium term. These are some of the people we are working with. Corumat, Mike Waggoner is the founder right there. I'm going to talk about his work in a few minutes. Okay.

Okay, some of the things that we might be challenged with. A company will come to us about the circular plastic economy and say, "I want to do the right thing, all right?" Like a yogurt company, this may have really, really have happened, a yogurt brand that you might

recognize that's international. "We want to be PFAS-free and we want to be sustainable. So should we make a yogurt cup out of a robust polypropylene with a nice coating and then make sure it's got a big 2 on the bottom that it's recycled or should we make it compostable PFAS-free?"

And the answer is yes. You should do one of those, right? And really I don't know that we can say much more than that, so we work with this company. But basically, the challenge is first cost, oxygen, water barriers, oil barriers and FDA approval in this country, okay? And those are the issues we wrestle with. We'll get back to that.

We get to work with partners. We are somewhat noted to work with World Centric. They had an "ah-ha moment" because they were very conscientious and wanted to make PFAS-free items. And when they went to their suppliers it was found out that their molded pulp and their plates actually had PFAS in them. It was embarrassing for them. So they've been working really, really hard.

Now the secret, the take-home message there is it was not in their coatings. It was in their mold release. That's a big one for you folks to notice. We're working closely with them. If you know the EarthShell Company, the EarthShell Company evolved some of the same researches that developed EarthShell clam shells are now making the pizza

boxes with World Centric. So there's a lot of places where PFAS gets into the system including mold release agents and molds.

PFAS, one of the main reasons it exists, we're going to hear about this from a paper company. It's a sizing agent. So if you want to replace PFAS. Sizing agents are kind of like a paper coating. It basically fills in the cracks and it gives you those properties like oxygen, water barrier, oxygen permeability properties, oil permeability. So it's a really, really good sizing agent. If you ever look at a cheeseburger wrapper, think it's a small miracle. Think how thin that paper is and you can put it on your lap and the grease doesn't go through, it uses very little material. And that's because PFAS works. Forget about all the other things, but it is a very, very good sizing agent. And it's pretty cost effective, so I mean that's why the industry loves it.

To replace it, you've got to replace it with traditional sizing agents or new sizing agents that I'm going to be talking about, or coatings. Traditional sizing agents are clays, siloxanes, silicas, polyacrylamide, starches. Actually the original sizing agents were modified starch. We worked very, very closely with Penford when we're working with these other companies if there's any hints. Penford is a starch company. They make a lot of

potato starch, slightly modified cationic starches that act as sizing agents.

So later when we're going to be talking about alternatives it's going to be what property do you want? And we tend to overdesign that cheeseburger wrapper or that butter wrap is overdesigned. Money, actually you might find some PFAS in money. More and more countries are switching over from paper money to plastic money. Yeah, look closely there.

The number one replacement that you'll probably see is wherever you saw PFAS you might see silicone, siloxane, silanes. So the mold release agents, if you're not going to have a Teflon version of it, you might have a silica version or the siloxane version of it. They're a lot safer than PFAS, but it doesn't come without risk. And in fact right there, the EU is talking about -- I mean certain folks who notice these things in Europe are noticing that certain size siloxanes are also nasty. And so it's kind of like regulating anything is like squeezing a water balloon. You might put pressure in one place but it pops out somewhere else. Be careful what pops out.

The other product, if you replace say your wrapper on a butter cube, you might replace it with a metal-coated plastic, which is likely to be very, very persistent, right? So one of the things, so that yogurt company that came to us

what they actually decided to do -- I'm going to give away the punch line -- is go with a really robust polypropylene container. And then they liked oxygen permeability and they sealed the top with an aluminum-coated oriented PET wrap, glued on. That's a nightmare for recyclers. So it may have been PFAS-free and the polypropylene might be recyclable, but the lid is a metal plastic sheet that is going to stay around forever and never be recycled.

Okay, the good news. There are green sizing agents starting with starch. Eastman's got some modified SAL 06 (phonetic) that are really kind of nice. There's lots and lots of -- polychromide, we don't necessarily need to go there.

There's one company that we kind of like. HS Manufacturing Group makes PROTĒAN. It's corn zein. It's protein from corn. It's almost got the same properties as shellac and it's a really, really good grease-resistant coating. University of Maine, so there it is, there's zein. It's prolamins, it's generically called that. It's a really, really good grease resistant. You're going to have to use a little more than you would for PFAS, which is really, really remarkable.

The industry has been trying to create cellulose nanofibrils and microfibrils forever. Yes, so what they are is basically you take a piece of paper and you get rid of

anything that's not crystalline in it. And what's left is little micro rods of cellulose. They're highly hydrophobic and grease resistant. They're called cellulose nanocrystals. FMC makes them, microcrystals and nanocrystals. They're expensive, but they are a great grease resistant and water resistant agent. And then biopolymers, poly(lactide), we'll talk about that in a second.

All right, there's a class that we run with Cal Berkeley. Dr. William Hart-Cooper is in that picture. I don't know what it says about him, but the only picture I had in public was right there. I'm going to talk analogously what we learned from them. They asked us so it is Gore GOR-TEX that makes jackets from highly-fluorinated polymers and they want to get rid of PFAS in their jackets. And they asked us a class. And then we gave them lab time in our lab, so it was started as a thought exercise and it turned into actually experiments in our lab. They wanted hydrophobicity of course, because they're making rain coats. And they wanted grease resistance, because they're making rain coats and they wanted them also to be grease resistant.

Okay. The first thing we learned, and there's just some science here, is you could find a siloxane that could replace your PFAS for almost the same prices. So if you ban the fluorinateds you're probably going to go to a

siloxane, a lot safer.

You could find nano versions of those. They're out there on the market, so it's called nanosols. I don't know if you see the structure there, but they work like gangbusters. And they have not been put up for being banned in Europe, but basically you take a silica particle and you coat it with a short chain very similar to the fluorinated ones, but they're siloxane versions, a silica version of them.

They stick the same way the PFAS would to your papers or to your textiles and there's the nanosol hazard profile. If I showed you a C8 PFAS that would be all red squares, all right? So these are the different silica nanoparticles and whether they have mutagenicity organ respiratory issues. So mostly green and yellow boxes are not really, really dangerous. A lot of PFAS will be a lot of red up there, red and orange, so nanosol.

And then the final thing we did, this is just fun, is can we take a little inspiration from nature or put it counter? Sometimes we overdesign things. And sometimes we can design oil resistance by just making better structures. And Corumat is a prime example of that and I'll get to that in a second.

So what that is, is basically saying leaves can keep out oil. And they don't necessarily do it by using

PFAS. They can do by their shape as well. All right, there's a leaf. There's the nanostructure of it and you can keep water and oil from getting into that leaf just by the structure alone. Alright, and so that's it in a nutshell. If you have a flat surface, you have a certain contact angle. Water or oil might want to spread. And then by the time you get to the right you have a hierarchical, both a macro structure and a nano structure. And you can keep oils out just by having that right structure by surface properties.

That's shown. This is somebody else's work, but basically if you have your traditional polyester with the scale in the millimeter range, you have a certain grease resistance so grease can get in or water can get in, hydrophobicity. So this is water. If you basically make it fiber structures, nano structured fibers it has much better water resistance. Same material, just smaller structures surface property keep water and oil out, coming to a point here.

So that's one of the reasons the nanosol works. Okay, the little nano particles we talked about. Some of it is a size effect. But it still doesn't -- it works for water. It doesn't necessarily work for grease yet, oils. Because what it says here is it kind of keeps -- so the no nanosol, you add the nanosol, and the oil still gets in.

But PFAS still works really, really well.

Unless you make a fiber mat out of the cellulose derivative, okay? And that's what we aim for. If you can make a cellulose mat cellulose usually will take up oil, but if you make it small enough the surface properties are such you can make nano fiber cellulose you can keep oil out.

This is a crazy idea. You can make nano fibers by a thing called electrospinning. Electrospinning is hard to scale up. Basically what you do is you make a solution of a polymer and you have a voltage drop of 40,000 volts. Don't put your hand in there, all right? It'll zap you. And the solution up there in the syringe takes on a charge and you have the opposite charge at the other way and you make spider web at the nanoscale. It's really expensive to scale up.

We challenged the Post Doc in our group from Brazil to scale that up without using electricity and he did it with pressure. We called blow spinning. We got a patent on it. It's kind of well known. Basically it's $8 worth of Swagelok fittings. You take a polymer solution and you just put a high-pressure nozzle around it and you jet out some fibrils. And you can have an array of those. And then you can coat your clothes or your filaments with it or your polymers.

That's the fiber mats we're making. I'm coming to

a point. Just by changing the size, we can go for plastics that are not oil resistant to oil resistance by just making these mats, just spraying them on a polymer. And when you have (indiscernible) every looks like you can also make them antibiotic, antimicrobial. And because you're not using voltage you can make artificial skin. Now, I'm just bragging.

Let's go back to the yogurt question. All right, should you make it out of polypropylene or should you make it out of biopolymer that's compostable?

If I had this PLA cup it won't stay up in a microwave. You put it in a microwave it'll melt at about 100 Celsius. If I put liquid in here and sealed it, it would eventually -- the liquid would come out of there. In about six months, this thing would only about full. So PLA by itself does not have great water permeability. It does not have heat stability. So you can't put it in a micro wave. It doesn't even have the world's greatest gas permeability.

But (indiscernible) we live vicariously through smart people. Okay that's what we do at the USDA. We're here to help. It really helps when smart people show up. Corumat showed up and basically said we can take that same POA and make sandwich structures where we make an outer layer that's more crystalline and a lot tougher and even

lighter. And so this thing now can go in the microwave and it can now hold liquid and is now microwave safe.

And all it was, was knowing what you're designing for and thinking about the structure rather than just PFAS is kind of a lazy way out. Let's just over design it throw the chemical in it and we've got the solution. You can actually design things just a little better and get your results. So we're lucky to hang out with Corumat. Talk to Mike, he knows a lot more about this than I do. All right, there's a plug for him.

So it's like pushing a water balloon. If we ban PFAS you're probably going to see more metal wraps, plastic covered. Let me say it again, metal-coated plastics. They print well. It's a pretty good gas and vapor barrier and oil barrier, all right? You might get the birth of some of these greener sizing agents I talked about. I'm a big of a fan of zein as a corn product. It works really, really well. And then the final thing is structure and nanostructure can impart properties that may just give you the benefit without the nasty chemical.

And with that, I thank you. These are the folks I work with, live vicariously through. And that's our mission statement in a picture and me. All right, thank you.

(Applause.)

MS. SETTY: Thanks for the presentation. And with

that we're right on time for our afternoon break. We'll reconvene at 2:45. See you then.

(Off the record at 2:39 p.m.)

(On the record at 2:47 p.m.)

MS. SETTY: Welcome back from break, everyone. We're going to begin our panel discussion on the alternatives to PSAFs in food packaging products. I'll start with introductions from the far left. We've already met Dr. Bill Orts, who's a Bioproducts Research Leader at the US Department of Agriculture. We've already met Cathy Rudisill who's an Environmental Chemist at SRC.

Next, we have Clay Mayhood, who's the Vice President of Business Development and Continuous Improvement at Sustainable Fiber Solutions. His mission is to replace non-recyclable packing with products that are including PFAS-free paper products with grease resistance for the food packaging market.

Mr. Mayhood, would you like to make some opening remarks?

MR. MAYHOOD: Sure, thank you.

Okay, so a little show-and-tell, any paper makers in the crowd here? Okay, so I'll do a little show-and-tell. Sustainable Fiber Solutions, we use aqueous coatings to replace materials that are non-recyclable, so polyethylene, PFAS materials and so we use different paper coatings.

We have a coater, a large fast coater. We can do tens of thousands if not hundreds of thousands of tons of material over the course of a year. So we can scale up quite well. The beauty of having an off-machine coater is that we can use any substrate that's available. So if you're a customer looking at it, we can do wraps. We can do liner boards. We can do solid bleached sulfate, bleach board, so a number of those different things. And we combine that with the different coatings to go after your particular end-use market, because there's a lot to that actually.

But again sustainability, they're recyclable. They're re-pulpable. They've been approved by the Western Michigan Recyclability Protocol. So we're really pleased with that part of the package. We actually have some materials that have been used in the market to replace PFAS.

I want to touch on a little bit about pricing, when you make this change is that there is a slight change in the price. So that's a barrier that most folks have to come over to make the product successful.

So when we had these discussions a lot of folks were not aware of aqueous coatings as an alternative for PFAS. And so I just want to spend a little time on that to let people know what they are. They're water-based materials that are designed to provide a functionality that

the customer really wants.

And so I'll start here. Typically for PFAS obviously is, it’s oil and grease resistance, OGR. But we will get a role of paper, this is bleach board, we'll get a big roll of this, 110 inches wide 60 inches in diameter. It weighs anywhere from five to eight tons. And we'll coat that on an off-machine coater. We have a metered size press, which is long story short is that it has a rod. You can change the size of the grooves on the rod, which changes how much coating you put down. It applies it to a roll and then the roll transfers it to this bleach board. So those of you who have this, you can look on the back and you can kind of see some grooves here and there. That's where the aqueous coating goes down. We call that the barrier coating. It's providing most of the functionality. The cups that went around are hot cups, so on those the barrier is on the inside of the cup.

So from here we cut out -- well we don't cut it out here yet -- but we make rolls of that. We cut it down to the size of rolls that goes on a printing press. And then you come out and you have this printed on. There's actually another aqueous coating on the top of this to protect the print and scuffing as it goes through the process of getting to the final customer.

So in this case, this could be anything. It could

be a food boat that needs OGR. It could be a folded clamshell that wants OGR. It could be any blank that you imagine. This one just happens to be a cup. I'm doing this one because this one is heat sealable, so this one will go from this configuration to this configuration when it's all done. So again, aqueous coating is a very flexible, a very powerful tool. We can combine the coatings and the base stock to deliver the final results for the customers.

The yield on this when it re-pulps, it went through the Western Michigan, we actually got over 99 percent yield. So you put 100 pounds of material in. You got over 99 pounds out that went back to make new paper products. So a terrific amount of material is recovered.

Just as I mentioned this method of application, I mentioned the meter size press. The only important part on this one is that because the demands of this are pretty high, you have to have the capabilities to put down sufficient quantities of material to get the required functionality.

So I think Cathy was the first one to kind of touch on the cost part of the factor. So going through this, it does come down to that in the end. And so I just thought I'd give you an idea in terms of aqueous coatings where we are. The point I would make here is that PFAS and polyethylene, kind of our two targets, those are mature

markets. They've been around for decades. The volumes are pretty well established. So the economies of scale are well established on those particular products.

On aqueous coatings a lot of folks are actually doing these in test reactors, so you can see the scale is much, much smaller. But the fact of the matter is everybody knows how big these markets are. They're huge. So making the swing is going to make the swing in those supply chains, you'll get economies of scale. That price is eventually going to come down.

So I think initially you'll see that the aqueous coated solutions will run anywhere from 90 percent to 130 percent of the current PFAS or polyethylene produced materials.

Okay, quick overview and I will do questions later on, I guess.

MS. SETTY: Great, thank you.

All right, next we have our moderators that we've already met. We have Dr. Balan and then we have Ms. Branyan.

Next, we're moving on to Sarah Martinez, can you just wave for us? Great. She's the Senior Director of Marketing at Eco-Products. Her goal is to redefine the single use food packaging market through educating various stakeholders on the impacts of packaging and advocating for

waste diversion. She also serves on the Board of the US Composting Council. Ms. Martinez, would you like to make some opening remarks?

MS. MARTINEZ: Yes, absolutely.

First of all, thanks for having me. It's a very, very great event and I'm happy to be here. If you're not familiar with Eco-Products, we are a leading brand of environmentally preferable food service packaging. So that means we sell things like cups, plates, to-go containers to entities such as restaurants, sports and concert venues, corporate campuses, hospitals, hotels. You get the idea.

Everything that we make falls into one of two platforms. We have what we call our GreenStripe line, which is made with renewable resources. And the vast majority of those products are commercially compostable. We also have our BlueStripe line, which is made with post-consumer recycled contents.

We don't say that one is better than the other, right? As most of us in this room know right, I think sustainability is a very complex issue. And so our belief is that we should just be aware of and educated on the impacts and tradeoffs of every product, because no product is perfect. Providing information to our customers and then letting them make the choice that's best for them.

A big portion of our GreenStripe line is molded

fiber, primarily sugar cane. And just like basically virtually all the molded fiber product on the market, we had historically relied on the FDA approved short-chain PFAS to provide grease resistance in those plates and clamshells.

When we started hearing demand from customers and from other stakeholders for more options that did not rely on PFAS, we formed a cross-functional team within our company and we started working with our supply chain to come up with a molded fiber offering that was grease resistant that did not rely on PFAS chemistry.

After well over a year of that collaboration we were excited to launch, in 2019, what we call our Vanguard line of molded fiber products. So that Vanguard line does not -- no PFAS is intentionally added. It has been certified by BPI, so we're very excited to get that third-party validation. I should say certified under the new requirements of no more than 100 parts per million of total fluorine.

We also won from the Food Service Packaging Institute -- I don't know where Brian is, but thanks, Brian -- in QSR Magazine, their 2019 award for first place in innovation and manufacturing for being first to market with a molded fiber offering that did not rely on PFAS. So it was nice to get that external validation.

We are currently working to build out our supply

of Vanguard. The response has been very enthusiastic, which has been great to see. We are working with several large chains who have expressed interest. And that's kind of sucking up a lot of the initial supply, which is a good problem to have. But that means that we're not quite having -- we're not at the point right now where it is broadly available to the market, but certainly within the first half of 2020 we hope that Vanguard will be more broadly available hopefully into distribution kind of beyond that first phase. So that's I guess kind of the overview of Vanguard.

Oh one thing I should say too, the vision statements for Eco-Products as a company is that Eco-Products will be in the vanguard of our zero waste future. So we call the line Vanguard as a nod to our commitment to innovation and being a leader in the industry. So I'm certainly happy to answer more questions about that later on during the panel. Thanks.

MS. SETTY: Thank you so much.

Okay, next to Sarah Martinez we have Sue Chiang who's the Pollution Prevention Director at the Center for Environmental Health. Her goal is to eliminate the use of harmful chemicals, to allow the market expansion of environmentally preferable products. Currently she's focused on hormone-disrupting chemicals in consumer products as specifically related to food and food packaging. Ms.

Chiang, would you like to make some opening remarks?

MS. CHIANG: Thank you. So yes at the Center for Environmental Health we're a national non-profit that's focused on protecting the public from exposure to toxic chemicals.

And the role that I have at CEH, in addition to just looking specifically at hormone disrupting chemicals in food and food packaging, I work with large purchasers in various sectors from government agencies, private companies, health care facilities, universities, K through 12 schools. And work with them to use their buying power to get healthier alternatives that don't have things like these PFAS chemicals in them.

And so back in I want to say 2017 we started testing a range of different single use food serviceware products, primarily plates, bowls, clam shells, other take-out containers and things like multi-compartment food trays for fluorinated compounds in particular looking for PFAS. And created a public database and started putting together resources and recommendations for purchasers on how to identify and procure food serviceware products without PFAS.

And it was a very complicated endeavor as far as trying to come up with recommendations, as we found that all these single-use options have various tradeoffs and pros and cons about them. And so at the end of our project the big

message that we came out with is really focused on trying to get the purchasers who are set up for these things to move towards re-usables as much as possible and get out of single use as much as they can.

But for those that do still have uses requiring single use, it was very complicated as far as trying to come up with recommendations, because it really depends on where folks are in the country. And what facilities and capabilities are in their area for dealing with these kinds of products at the end of life.

And so the group in particular that we're concerned about is K through 12 schools, because I was actually shocked to learn as I started working on this project, how many schools across the country moved away from the re-usables to single use. And like one small school district that we've been working with uses almost half a million trays a year that they're sending to a landfill.

And they were actually doing polystyrene foam and were about to move to molded fiber trays that contain PFAS that they were going to compost in the school gardens. So the good news about that is they actually are now in the process of trying to get re-usables and dishwashers back into their schools.

But I guess I wanted to just get back to the larger message of prevention and stopping this current

ongoing influx of products with PFAS now and moving upstream. And so hopefully with this process we can do that and address the existing sources that we have to deal with. But I think we have to stop by turning off the tap. So thanks.

MS. SETTY: Thank you. Our last panelist is Zack Leimkuehler, who's the VP for Technical Solutions, Business Unit and Business Area Research and Development for Ahlstrom-Munksjo, North America. His team focuses on delivering value and sustainable solutions for specialty papers and fiber-based products. Mr. Leimkuehler, it's all yours for opening remarks.

MR. LEIMKUEHLER: All right, thank you. We are a specialty paper manufacturer and that is a little different than in reference to commodities that a lot of the discussion is about. But basically it means we produce all of the little nooks and crannies and niche applications that are present in food packaging as a whole. Basically anything that's not a board or molded fiber that's made out of paper and protects food in some way shape or form probably touches our business in some way.

We've been involved in food packaging I would say grease resistant food packaging, probably since the inception of most of our facilities in the country with four sites in Wisconsin. All of them are more than 100 years old

and two out of the three were built to be food packaging paper manufacturers. So before PFASs were invented, we were making food packaging materials and have that history of knowledge of what was the predecessor to these chemicals now.

We also now have a pretty extensive line of non-fluorinated products that we sell and really have probably had for the better part of the last 15 years an evergreen R&D and product development initiative to continue that line of products and development.

As Malena talked about with Coop Denmark, we were the ones that were able to supply a non-PFAS treated microwave popcorn bag. So that's one of the things we're very proud of and continue to work closely with the brand owners.

We are very far back in the supply chain, so today the PFAS treatment occurs in our sites. It occurs in the paper mills where those products are created. And again as comments were made that industry is very mature, it's very efficient. So I think as it relates to our place in these discussions we have a unique perspective on what that efficiency is and what that means as well as how that relates to alternatives and how you put those alternatives into practice and go forward.

We spend a lot of time working with the market in

general, whether it be brand owners, groups like this, and really every corner of the market to understand what that looks like.

We were acquired by Ahlstrom-Munksjo. Ahlstrom-Munksjo is a company based out of Finland, which is global in nature. It's the largest specialty paper manufacturer in the world. With that brought a whole new set of tools for us that really go all the way to parchment and then we can talk about the technical definition of parchment. But parchment basically is 100 percent cellulose wood fiber structure that gives performance to oil and grease purely through the cellulose itself. So again it goes back to old technology that now has becoming very new and very encouraging as we look at alternatives.

So a lot of experience in alternatives, a lot of discussions on what that means and I'm looking forward to the conversations today for sure.

MS. SETTY: Thank you. I'd like to pass it on to our moderators to lead the panel discussion.

MS. BRANYAN: Thank you all for staying for the last half of the day. I know it gets a little tough out here but I think that this is going to be a (indiscernible).

MS. SETTY: Of course.

MS. BRANYAN: Some great conversations to be had, I think that showing your presentations on kind of what

alternatives are out there means that things are looking good for us to be able to move towards. And kind of trying to understand what the whole market is that we have potential to kind of move everybody else into.

And so we had some questions here at DTSC about more of the alternatives. So we heard about kind of the webbing that you were looking at in your aqueous coatings. And trying to understand what things are we missing, what other things are out there? How can we use those? What are the kinds of cost issues or not that are out there? So if anybody has any commentaries, you all brought up alternatives, maybe we can discuss those.

MS. MARTINEZ: I can share a little bit about Vanguard. I didn't really go into the details. So that chemistry that used in Vanguard molded fiber, it is a wet end chemistry. So it's added right in the early stages of the manufacturing process.

We worked with different suppliers that provided known chemistries to the paper manufacturing world. So it's not like this is a new chemistry. We basically took existing chemistries and combined them in a proprietary way to get to where we've planned it out with Vanguard, so just a little more detail on that.

MR. LEIMKUEHLER: I would just say as well, one of the things as you look at alternatives is there's lots of

things to keep in mind, safety and having a good alternative as opposed to a bad alternative comes forward. I think that's one of the things that we've looked at is to conscientiously select things that are going to be viewed as positive. There's no known negatives there, which again from an alternatives standpoint continues to narrow your set of tools that you have to choose from.

From a cost standpoint the biggest thing I would caution the group on, as a whole, is that one size does not fit all. And applications are very unique. And they all have their hierarchical cost structures to them. If you're talking about something that's in a fast-food restaurant cost is king and it needs to be very economical and very efficient. If you're talking about things that sit on a shelf in a grocery store for months on end, those are different cost structures and have different use and associated implications with that.

So it's really difficult to kind of cast a broad brush and say one technology works across the board. One technology could be ideally suited for one specific application, while something that is much more cost effective and/or simple could be effective for other things.

The one thing I always say too is there was a comment about a burger wrap, right? The only add to the comment I think Tom made before, there's 40 percent were

PFAS containing meaning 60 percent were not. So there are already alternatives there present in the industry today. A lot of the burger wraps don't contain PFAS.

So those alternatives are readily available. And actually if you know where to look and you know how to test, you'll see that they actually change from time to time, because again it's a procurement cost driven initiative that says where do I get the best cost for my application? Some days that's a waxed paper that doesn't contain PFAS and some days that's PFAS treated paper. And those change.

So I would encourage the group to look at where there is inherent alternatives already build in the system. There's inherent supply chains already built. And sometimes that's an easy place to start. I think as we were talking about the Alternatives Assessment that Cathy's working on, that was one of the recommendations.

And why we started with a narrow selection was because there are very easy places to put your effort first and get a large amount of ground covered. And then work towards the narrower more highly technical applications that are going to take longer to develop.

MS. MARTINEZ: If I could just build on that really quick? So in your example of a burger wrapper where there were already some options on the market that do not have PFAS, that situation did not apply to molded fiber,

right? It's not like there was a molded fiber plate out there that was similar, that looked and felt and acted like ours that didn't have PFAS.

So it's kind of interesting when you think about like where alternatives existed to your point you have to look at how is it being used and what's the function? And so that was part of our thought process. It was like what other products do we have already today in our catalog that we could offer to customers who are looking for a no PFAS option? And so we sell PLA clamshells, which is great for cold food applications, but our PLA clamshells don't work in hot applications.

In our BlueStripe line, we have 100 percent post-consumer recycled plastic container. Technically it's not a clamshell because it's not hinged, but it functions very similarly. But we have a lot of our customers who are using all compostable packaging to facilitate front-of-house composting programs. And by using all compostable packaging it makes life easier for their customers. So you think about the football fan or somebody at a concert, when all the packaging is compostable they can put all of that in the bin along with the food scraps and that streamlines waste diversion and can minimize contamination for the composter.

So those customers were not excited about all of a sudden using a post-consumer recycled conventional plastic

product. And so there were some instances where yeah we could find a quick substitute, but in many we could not hence our investment in the Vanguard technology.

MR. MAYHOOD: Might I add just a couple of things? Again, there are additional products that are out there on the market today, particularly in the wrap area. You can actually just Google that, but there are known entities that are making products for wraps that are PFAS-free. It gets into this area that the other thing to look at is a lot of materials are actually overdesigned.

And earlier on we talked about the kit test and it runs from 0 to 12. Well, 12 is really a high demand. That's a high oil and grease resistant. The fact of the matter is most QSRs are asking for a 3 for their applications. So there are a number of different materials that Sarah and Zack have referred to that they can do that.

It's the same thing with aqueous coatings. Those are well within the wheelhouse of those particular materials to handle that without a PFAS solution.

DR. BALAN: We have a question from online that came I think during Bill's talk, but as Zack mentioned that kind of goes to both of you. It's from Thomas Booze from DTSC who's wondering whether wax has fallen out of favor as a coating for food packaging.

DR. ORTS: Let me say for every Zack there's

multiple big companies that have answers for you. This is a time to actually go back to the future and even Sue kind of mentioned it. I mean we're getting used to the really high end packaging that's really thin and everything. But it's not a bad time to visit reuse if it can work. We're working with a company that's making returnable plastic boxes for asparagus, because asparagus gets delivered to Whole Foods on ice and then it's a waxy box that has no functionality unless it gets returned as the old milk crates.

And then a lot of the big companies have sizing agents and coatings that work. They work. We just want the coolest one at the cheapest price. But if you're willing to just move the dial a little bit the solutions are there. And so what was the question again now?

DR. BALAN: That's okay. About wax, he's wondering whether wax has fallen out of favor as a coating for food packaging.

DR. ORTS: So this is where we work with Method Products. You might know those. They make detergents and we asked them why their refill packages can't look like a milk carton. I mean why does it have to look like a really funky multi-laminate thing that has no use? It can't be recycled. It can't. But a milk carton we know doesn't have to have PFAS. It's just a wax.

So I'll ask the same question. Why has it fallen

out? Wax works. It just has to be thicker. You use a little more material, but it has an end of life you can predict.

MR. LEIMKUEHLER: Yes, I would say that there was early on in some of the PFAS alternative discussions there was a fear of wax, because well it's not compostable. Or it has this -- it's a dependency on the petroleum industry. There are natural derived waxes. There are waxes that compost. There are waxes that do a lot of different things. I think it really depends on what is the structure? And what are the performance characteristics you're looking for?

There are things today that are built that have been on waxed products for forever. And they're still on waxed products. They could be replaced with a PFAS treated material, but they're not.

So I think those are just ways that you can look at other existing applications and sources to get inspiration that way. I think the bigger challenge comes from perceived performance. And that is one thing I will say too, performance is very much in perception. We have kit standards. We have targets. We have specifications. Most of those are subjective and most of those are based on a brand's image that they want to uphold.

So no one wants to see the french fries box be saturated with grease, because it looks unhealthy even

though the french fries are always unhealthy, right? But it looks unhealthy whereas if you have a lot of PFAS in that box it doesn't stay in the box and you believe it's not full of grease. So there's a lot of just perception and subjective things that go on in the market that help build the requirements for these products that are over engineered in many cases.

And in many cases that specification is required because something sits -- a microwave popcorn bag sits on a shelf in a grocery store for six months. Or at worst case it sits in a truck, in 110-degree heat, for a week. And if you try to hold melting butter for that period of time it's difficult. So there are applications that do require that high performance and that high level of engineering.

MS. RUDISILL: Just to build on that comment on perception of performance, we sent out a product scoping survey to our stakeholders last summer. And we were asking about at a high level some of the things like performance and availability and what is driving some of their selection or perceptions about PFAS alternatives. And it was really interesting to see the kind of scale of which some people were like, "These are the only things that work. I only use what they send me." And then you have other people that are like, "It's not a big deal, people just want their hamburger."

So it really is kind of a -- it does seem to be very much subjective. It has been coming through in some of the discussions that we've been having with our stakeholder group.

MS. CHIANG: I also wanted to just add that some of the purchasers that we worked with, we've had discussions to get them to really think about what are the performance needs of the products they're buying for the foods that they're serving. Because one company has a dry snack room and they don't need high-performing grease-resistant products. And so you really need to think about whether you actually need the worst case scenario or what kinds of products as well.

MR. MAYHOOD: If I could just add to that the supply chain also plays a big role on that. And even within the processing. So how hot is hot? Is it 160? Is it 150? Is it 140? Are they using canola oil or are they using peanut oil? All those will impact that. So any one of these solutions on the surface may be encouraging, but due diligence to make sure the fit-for-use requirements are met is something that really has to be done.

MS. MARTINEZ: I guess I'll just echo all of that. The performance of Vanguard is not the same as our conventional PFAS chemistry. It will not hold out against grease as long. And so that's one that's kind of really

high on our list when we're having conversations with people who are interested in the Vanguard chemistry, is to be very clear that you need to test this product in your application to see if it meets your needs, because really the only decision in terms of performance and what matters is the customer's. If it meets their needs in what they're trying to use with the packaging, so yeah a really important point.

MS. RUDISILL: The issue of this idea of the PFAS products or whether the OGR requirements are over-engineered has come up in our discussions. Because the challenge for us is how do we, when the law in Washington says that, the alternatives have to perform as good or better than the PFAS, which is pretty much the standard. And as Dr. Orts said, these are -- chemically speaking PFAS is very good at what it does. So the question is they've set a standard. I don't know intentional or otherwise people have gotten used to this idea of a certain level of OGR performance. But the question is, is it really needed?

But when the law says that that is the standard that alternatives have to meet, it gets to be a bit of a daunting challenge to figure out how we can highlight those and demonstrate the alternatives are there and are useful. And how will Ecology use that information is kind of one of the questions right now.

DR. BALAN: Sorry, can I quickly inject the

related question that we go online during your talk from Holly Davis from Washington State Department of Health. She said, "You didn't mention users as important stakeholders for the AA. You mentioned producers as the key stakeholders for assessing performance. Isn't performance defined by the users, wouldn't users be important for determining if the products are meeting their needs?"

MS. RUDISILL: I completely agree. If I left the users out it was unintentional. I've been wanting to get more user input into this process and we're working with Ecology to figure out ways that we can do that. And I've been having conversations just today about ways that we can get input from the end users.

And I do think that's a good point. That what is the standard is going to depend a lot on what are the needs of the customers, so they are very important. So if I didn't mention them it was just an oversight on my part.

MR. LEIMKUEHLER: One other that I would have is just when you talk to users you have to acknowledge that users are very, again subjective. If I'm talking to a national brand that has a very high brand image they have a very specific requirement for what their level of requirements are or their level of specifications are. Whether if you're talking to a small mom and pop type place who is really just about, "I just need to get it from my

counter to the customer's mouth, that's it." It's very different.

And I think the challenge with the Alternatives Assessment for Washington is that breadth of stakeholder input that really challenges keeping things consistent and trying to drive to one consistent goal, because you just get such a wide swath of expectations and requirements.

The other thing I would say is as you look at from a regulation standpoint brands will always do what brands need to do to manage their brand. Including things like an Alternatives Assessment meaning there are brands today that require a full disclosure, full down to every additive that is in the product disclosure that they do an environmental risk assessment on as well, a health risk assessment on as well. So even if you have an Alternatives Assessment that says "X" they also have assessments that require certain things.

So what you do is you tend to put industry in a place where you're not only navigating state, national legislation regulation, but you're also navigating brand specific requirements and how those go. And the more vanguard-ish the brand wants to be, the more challenging that set of objectives is managed across everybody.

MS. MARTINEZ: Great choice of words.

MS. ROBIN: So, hi. A couple of quick questions,

in evaluating alternatives for us a key component is compostability. And in that, I'm not sure how many of the alternatives you've been talking about are fully compostable and would meet a green bin requirement for example, which for us is really an end-of-life issue for our company's mission and so on.

So compostability and whether or not there are certain chemical additives in that product which would keep it from being able to be compostable. So I'm kind of working my way back up to if I am working on trying to identify viable PFAS alternatives I want to be sure that that alternative is also going to satisfy the next question, which is whether or not it can be compostable.

So because I don't know enough about what aqueous solutions are. And I'm delighted that Eco-Products has identified something that works that is making use of an existing chemical that's out there, but is that -- and it sounds like it's BPI certified, which means that it may satisfy the compostability question. So I just feel like that's a really key issue for all of us when we start looking at alternatives.

The second part of this is this is a huge industry that is exploding in the mobile delivery of food, whether it's the Door Dashes and the Uber Eats and the Cloud Kitchens and so on. And they are not going to accept PFAS

products for very long. They know that many of the markets that they want to deploy in are starting to regulate this. So are some of the products that you're looking at able to satisfy those criteria? Thanks.

MR. MAYHOOD: On the aqueous coatings right now few if any would pass compostability. Just the way the standards are written, the ASTM standards are written, they will not pass that in combination with the base stocks that we have. There are a couple that could do that.

The focus that they have really is on recyclability. And so how do we recycle those materials? Can they be used? WestRock had worked with FPI and some other folks at their Chattanooga facility. And they've pulled in fast food QSR materials and have successfully recycled those. So you want to look at those and see what the options are. Recyclability is a preferred end-of-life alternative to compostability, but again depending on what the requirements are that's not going to happen as the standard currently is written.

As far as the Uber Eats and the other delivery services, I think anything that we've talked about so far would satisfy those needs in terms of going to a PFAS alternative.

MS. MARTINEZ: I guess I'll just comment on the statement that you said about recyclability being the

preferred end-of-life story for food service packaging. I think it's important to recognize that it is food packaging, right? So food is often going along with it, especially in a front-of-house post-consumer situation. And so there have been some studies done that quantify the amount of food scraps that can be diverted when the food service packaging is compostable, right? And so it can be an effective vehicle for keeping food scraps out of landfills where they go and emit methane. And instead diverting them to a commercial composting facility where it can be turned into a valuable soil amendment that can support soil health and plant growth.

So I think it's important to look at not just the package but the fact that it touches food and the broader system in which that package is used as we're thinking about end of life option.

MR. MAYHOOD: I would not disagree, Sarah. I just think there are certain applications that can go recyclable.

MS. MARTINEZ: Understood, yeah.

MR. MAYHOOD: So again it goes you've got to look at the whole structure and what the supply chain is going to be and make your call based on the technology that's available and what the requirements for that particular package are.

MS. BRANYAN: I think that going along with kind

of this theme of compostability or recyclability for many of the alternatives, we're curious to see kind of what that means end of life for the various options that have been brought up.

DR. ORTS: All right, I'm going to put in a plug. Remember that part, "We're with the government. We're here to help."

So we have respirometers in our building. I was on the committee that wrote D6400, back in the day. It's good for your frequent flyer miles. I'm old. And so if you have a question like that just ask us and send us a sample.

We worked with Mike here to ensure that his stuff could be both compostable and meet those standards and ocean degradable if it needed to be. So we have done that with little companies and big companies like Glad, you have heard of Clorox. So just send a sample and ask and we'll run one or two, because we're equally curious.

MR. EDGAR: I have a little bit of a statement and then a question somewhere in there.

MS. SETTY: Do you mind identifying yourself?

MR. EDGAR: I'm Neil Edgar with California Compost Coalition, so I represent about half the commercial composters in the state.

And the big elephant in the room earlier in the conversation, I was able to listen online, is where are the

composters? We talked about a lot about who the users are and who the end markets are. That's not the end of life and that's not part of the closing the loop. The idea of these products is all of them are being created to help establish a circular pathway for biological nutrients. And even before we get to PFAS there are a number of issues about identification determining what's recyclable and what's compostable.

The State of Washington just passed a bill, the first compostable identification standards in the country to clearly identify what we're trying to do with the materials that we're attempting to recover in the hope that we don't landfill all this material.

Right now, companies, restaurants and customers across the country are paying a premium for these products. And 99.5 percent of them are still being landfilled, because composters don't want them yet. They can't tell what's compostable from what's not compostable.

And a part of Bill's organization has something called the National Organic Program, which sets standards for organic use for the compost that's produced. Most of these chemical additives, POA, other types of products, are not suitable for organic use.

In California, 60 to 80 percent of the compost produced here goes to agriculture. And even conventional

farmers want organic certification. So if it's not CDFA registered or armory listed, the largest customers don't want it. And increasingly agriculture is setting a higher and higher bar for the inputs that are going into food production. Not just for food safety reasons, but also for market brand building issues. So the customers, the supermarkets, McDonalds, all the big chains they set some really high purchasing standards not just for your products, but also for the food that's being produced by the farmers that are buying the compost that's supposed to be the end of the chain for this stuff.

So that needs to be a big part of the discussion, a bigger part. I go to a lot of these different kinds of venues where the end of life is sort of an assumed part of the conversation. And it really needs to be sort of up front and more a part of the design and extended producer responsibility part of the product development.

And maybe there wasn't a question in there.

(Laughter.)

MR. LEIMKUEHLER: I would just add back into the conversation around designing for compostability as well as PFAS-free. And I would just say the caution I would have is if you set the bar too high you don't get either. So the question is there are places where recyclability is a good choice. There are places where compostability is a good

choice. There are places where the threshold of performance is so high that if you require compostability you'll never get performance. And I think that's just a watch out as you look at these things.

I always steal Rhodes's line and say, "We make things out of trees that's compostable, but if the tree falls in the forest it's not compostable." So it's a subtle nuance in how we're building the product and how we're building performance and ensuring compostability as well as giving barrier properties and other things that in effect are opposing forces in most cases.

So it's just I think there's not a one size fits all answer. It's really depending on what kind of a structure, what's the application, how likely is it to end up in one or the other. And then you design for those things as you go forward.

MS. JACKSON: Hi, Jen Jackson City of San Francisco. It sounds like several of you have created alternatives to PFAS for either fiber or paper products. And I'm curious what kind of hazard assessment you conducted. So yes there's the BPI certification piece of it, but in your own businesses I'm sure you have ways to assess the chemicals that you've chosen instead.

MR. MAYHOOD: We have a list of criteria and the FDA is the primary one for us for our food packaging. So we

work with the materials folks, our coating suppliers and our different material suppliers to make sure that we have FDA compliance for direct food contact is our primary barrier as far as compliance requirements.

MS. MARTINEZ: Eco-Products is part of a consortium associated through Iowa State University called IdeoPak. We, when we were developing the Vanguard chemistry, reached out to them to have a conversation about regrettable substitutes and better understanding. Obviously yes, FDA, they're the floor minimum right, for sure. But we wanted to understand kind of beyond that what was in the chemistry.

And so IdeoPak, they looked at the GreenScreen List Translator along with a number of other lists of similar Chemicals of Concern potentially. I don't know if I'm using exactly the right term, but they said there was the GreenScreen List Translator along with some other lists as well. And so they ran an assessment and said that nothing came up as being flagged, if you will.

Many of you in the room know, I think Clean Production Action I think is the organization that runs the GreenScreen process. We had a phone call with them really to learn more. We obviously want to be very careful and do not want to replace PFAS with something that has major risks. And so we're trying to learn what are the expectations of stakeholders out there in this regard and

what can we do to try to work towards and meet those expectations.

So I would say what we did with Iowa State and IdeoPak was the first tangible step that we took in that regard. In our conversations with Clean Production Action, we learned that they do not yet have a true full GreenScreen certification for food service packaging. So we want to -- we're trying to get on the phone with them to schedule a follow-up conversation, so we can continue to learn more. To say, "Okay. In the absence of a true GreenScreen certification for our product category now what? Help us."

So I would just say that's where we're at in the process. And we are continuing to try to learn more.

MR. LEIMKUEHLER: I would say we tend mirror the other comments about the FDA. Anybody who's a direct food contact supplier has to deal with all the regulatory requirements. And being a global supplier we need to not only watch FDA, but everything globally that's out there. So our regulatory group has a pretty good understanding of not only what's currently legislative and also regulated, but also what's also coming.

In addition to that as I said we've worked with brand owners and brand owners are very, very sophisticated when it comes to watching out of what's coming and being pretty well attuned. So I think we've come up with

formulations that through all those iterative learning steps continue to show that we don't have any issues in working our way through that.

We’ve talked about doing GreenScreen and other more formal methods. And I think if we were using something that we felt was a little more concerning we would. But we've intentionally selected some of the materials based on their acceptance into food additives themselves. And in being very suitably safe, I guess is the way we've looked at it. But it's a variety of sources I think that you have to use and try to stay ahead of the forever changing regulatory landscape quite honestly.

MS. CHIANG: I just wanted to add so I think it is a really, really beg step that we're talking about PFAS as a class and not substituting one fluorinated compound for another. But we are, in our conversations with purchasers, getting questions about well so what are they replacing it with and have they assessed it?

So I think this is a really big next step that we need to deal with. And so The Center for Environmental Health is actually partnering with Clean Production Action on the development of a GreenScreen certification for food contact materials. And we're hoping to have something this year.

MR. MAYHOOD: I should have added that we also

work with the brands or our customers as well as any requirements they might have. So to that extent given a lot of these coatings are proprietary at this time will also go to the extent we'll go to a third-party certifier.

So we'll go to a Keller & Heckman and our suppliers will share their list of ingredients with them. They'll break it down and make sure that they are in compliance with what the brand owner wants and their requirements. So as Zack said they have a variety of requirements and they have some are much, much more deep in terms of the overall process for compliance than others. So that's another means that we would use.

DR. BALAN: So we have another question from an online attendee from Holly Davis at Washington State Department of Health. She has a question for Sarah. "Can you tell us something about what is used in the Vanguard line like GreenScreen hazard assessment benchmarks for the propriety ingredients?"

MS. MARTINEZ: You want more specific information about the ingredients versus? Personally, I cannot answer that question. Our product development team would have more specifics on that, but I apologize. I just don't know the specifics to share at this time.

DR. BALAN: Okay, no worries. I also have kind of a follow-up question. So I really liked Bill's metaphor

about the water balloon, that if you pop it somewhere it can come out in other places. So I understand that one of the alternatives we would need to watch out for if to pursue any kind of Priority Product in this field would be for instance things like the metal and plastic that makes a product non-recyclable.

Are there any other alternatives that would create less preferred end-of-life fate for this product like decreasing recyclability or compostability or increasing hazard during manufacturing or end of life?

MR. LEIMKUEHLER: I think the risk for changing its recyclability and/or compostability are the biggest risks. Because again as you're creating barriers to water and grease and things like that, you're inherently fighting the mechanism of breaking it down in the environment.

So you're inherently building opposition to compostability and you're inherently building opposition to recyclability. And some of those things actually lead to permanence, meaning you can't ever put it back into an individual fiber form.

So I think all of those things are very, very bit watch outs, because the better the barrier, typically the worst compostable it is in most cases. So the two just don't always go hand-in-hand, there are exceptions to that. But that's one of the biggest watch outs that I would say is

that.

Most of the facilities we have, and we have pretty staunch records of employee safety. So we know we have to go through regulatory processes just to bring materials in our facility. And in being a direct food contact facility we have to maintain those. So most of our issues are really around end-of-life changes and how that further implicates the supply chain and making sure that we don't create an issue that we can't deal with later.

DR. BALAN: Are there any specific chemistries that would create those issues?

MR. LEIMKUEHLER: There are a lot of chemistry issues. I think even in the last three years you've seen chemistries change over time. And Clay can probably mention this as well, but there was the first -- four years ago everybody was talking about things that had styrene bases to them and now no one does. Or most of those have been phased out because of Prop 65 and other places where those things have changed the landscape.

So I think it kind of continues -- again, the regulatory landscape changes a lot as we're going. And there's already things that aren't formally regulated, but were on the watch out for silicon-type materials as one of them. So I think we have to be watching those. And that's going to be a challenge too. You might find a really good

replacement today. And tomorrow it becomes an issue. So we're trying to stay ahead of that curve, but that's a steep curve to stay ahead of.

MR. MAYHOOD: I would just add to the supply chain that Zack talked about, it is imperative. I mean it's one of those that will blindside you very easily. You have to go through the entire supply chain. It may not be, "Is it recyclable? Is it compostable?" It may be, "Can it go in a truck at 110 for four weeks?" There are a lot simple things that these changes may do great on compostability or recyclability. But that doesn't work in the process that is already existing, so that's another watch out.

MR. LEIMKUEHLER: Yeah, I think that's probably - thank you for bringing that up because that's probably one of the biggest things we've developed over the last 10 years is not only it works, but now it works in a converting process that corrugates. Now it works in a process where it's turned into a bag. Now it works where it's got to be laminated or printed, something as simple as printing, because the barriers that you apply change that supply chain dramatically, which inherently can negate a really positive development that you have in use.

MR. WAGGONER: Mike Waggoner from Corumat. I think another thing that sometimes comes up is just the life cycle. Talking about recycling versus composting, you know

the idea behind composting packaging is that you have lower overall carbon emissions by composting more food waste. And so a lot of companies are going more towards recycling right now, which gets rid of more composting. And so my opinion is that you're kind of making a call like carcinogens versus composting in some situations. And so coming up with a framework for that would be helpful just so we could kind of (indiscernible) ourselves from our end.

MS. BRANYAN: With talking about kind of the end of life of these products, like we know that we're having an issue in terms of recycling and compostability. Have you seen any issues with some of these alternatives kind of further up the supply chain with maybe like procurement or sourcing?

MR. LEIMKUEHLER: Yes, and yes. I think one of the biggest things is to Dr. Orts' presentation there are lots of new technology. There's lots of really, really interesting new technology.

And to the comment before, the supply chain is very well-established for most of these applications. So you also have to have a solution that either fits within the supply chain or is well-adapted or adaptable to the current supply chain. Or else you're starting a whole supply chain from scratch, which is really challenging.

So for us it's we have papermaking assets that

apply materials online to those machines. That's one of the farthest back in the supply-chain places and one of the most efficient places to do it. And a lot of the chemistries don't work that way. A lot of the chemistries are not applicable that way.

So that is one of the other just fundamental challenges from a supply chain standpoint for sure, because you disrupt the supply chain that's mature and the supply chain is lengthy. If we're talking about a corrugated container that goes into a fast-food restaurant for a burger there might be six people in between the paper manufacturer and the customer at a fast-food restaurant. And each of those six people have established their part of the supply chain. When you change that you disrupt that entire supply chain. And that supply chain needs to find its new "normal."

And when you talk about costs and procurement availability that's a huge issue, to kind of letting that all settle back into its place again and rebuilding that. Or completely starting from scratch and rebuilding something that way.

MS. MARTINEZ: Since Vanguard is a new offering it just takes time to build up a supply. And as I mentioned the performance is not the same as the conventional PFAS chemistry. And so we're committed to trying to improve that

over time to meet certain customer needs.

And once we do come up with hopefully a better or an evolved formulation in the future that's another round of BPI certification. Of making sure it checks all the boxes and other GreenScreen assessments, right? And so it's just a continual comparing where we're at today to some of these legacy really old, established supply chains. I mean we are just in our infancy.

MS. BRANYAN: What do you think are the most difficult ways to shift kind of this mature market in a way to get alternatives? We've mentioned supply chain procurement, availability, compostability. What do you think is kind of the biggest hill to get over in terms of changing?

MR. LEIMKUEHLER: I think it's been the subjective performance criteria. Because if you get the end identity, whoever that is, the larger the better, to move forward, accept performance criteria and move that out into the industry and have it be known, the industry starts to follow. But with those things being so subjective you want -- most brands want to be able to make this change and have nobody know that they made this change.

So again that performance criterion means you can. A project that we had, and just I'll digress a little bit, we had a project on a pizza box and we had five solutions

that all worked. They were all non-PFAS, they all worked. But because they didn't look like the PFAS-treated box it did not fly. And they were cost-effective too.

So it was going back to the subjective nature of the brands and how they perceive their image in the market and want to protect that image in the market. That they don't want anybody to know they were bad before and they're not bad now, or they made a change at all. They don't want anybody to see that.

So that to me, if you could address that part alone, the rest of it would eventually work itself out. It's not going to be easy and those are always difficult things to happen, but it would work. That end-all goal is still a challenge to make it happen today.

MS. MARTINEZ: I concur.

MS. VENTURA: That actually goes right in line with what I wanted to say. And I'm going to state the obvious here and it's going to be very idealistic, so let me say that I understand the complexities of what you're all trying to accomplish and I appreciate that you're doing it.

But whenever I hear discussions of -- and I think this is something DTSC should hear too -- is that part of their job is how do we produce safer products? Or drive the use of safer products that still work? And I think that subjectivity of performance needs to be challenged in a lot

of things, okay?

I mean frankly as a consumer I think we're probably all appalled by the idea of being faked-out because it doesn't show the grease on the french fry. But I totally get that when you're trying to produce something that's what your customer wants, so I get it.

But we sometimes -- it's who is deciding the performance. So it's not showing the grease or it's not getting all over your hands and making a mess. But to me a product that does all those things and holds the food in and doesn't allow bacteria in but is toxic and is going to leave some sort of toxic footprint whether it's in the earth or in our bodies doesn't work. It's kind of like saying, "The operation was a success, but the patient died." The process works, right? You might get the cancer out, but the person died.

So what I'm trying to say is we need to work into the definition of performance. And I think industries and end users of your products have to start hearing this too, is that toxicity however we define that whether it's environmental or human health or whatever I understand that it's very hard to get to the perfect. But a light bulb with mercury that's more energy efficient is not the end product, because you haven't succeeded. You're just creating one problem for the other.

And so I think that when we talk about performance, performance is also the benign nature of that. Now I know you're all working on that, so I'm not casting aspersions here. But I keep hearing different people talk about what it means for the product to work and with the performance you said it has to be compostable, which I think is a good thing. But everybody has a different marker as to what performance means. And I just want to put in the obvious that if it's toxic we haven't gotten there yet. We don't have a workable product.

So anyway that's my rant for the day.

I'm Andria Ventura with Clean Water Action, but also I'm a consumer. And actually that I want to take my professional hat off and say I won't buy certain products, because it might be convenient, but it doesn't work for me for those reasons.

MR. MAYHOOD: I don't think we would disagree. I don't speak for everybody, but I would say I definitely agree if it's not toxic, we definitely check that.

But again going back to these being mature markets, quite honestly a lot of the brands they don't really know what they need. This is even more the case with polyethylene and the fact that it's been around for decades. And it just works. So if I have this cup I've got it today, I go to McDonald's, I put it into my car. It's 110, oh I

forgot. I left it there for a couple of days. It's probably still holding the liquid. It may or may not be.

In an alternative what's acceptable? Am I okay if it lasts for -- I had one fast-food restaurant tell me it was okay as long as it got the customer off the property. (Laughter.)

So the other one was do I go is it two hours? Can it get a little soft, we call a little punky. So again it's defining those criteria. What defines fit for use? And what makes it there and how do we make sure that we hit those marks in developing this? And so a lot of variables come into this whole situation.

MS. VENTURA: Definitely (indiscernible) especially for DTSC to think when they're trying to make decisions they also do consider we don't want to have markets that are just failing products. People want soap to work, they want food packaging to work.

But I'm just trying to add that if there is that end of it we have not created that product again. And I can hear that that is complex. I'm not trying to make light of it. I am not some idealist up in the clouds, but we sometimes forget about that. And when I hear performance, I hear somebody's specific need.

And I'd love for you to tell us which company just wants to get us off the property, so we don't go there. But

I won't put you on the spot. (Laughter.)

MR. MAYHOOD: Okay, thank you.

DR. ORTS: Let me just say the opposite. California and a few states have a thing called the PBC, Public Benefit Corps. If you don't know what they are you can be incorporated, you can be LLC, or you can be PBC and PBC can bring in the environmental impact into things or global pictures.

And so many of the companies that we talk about here are PBCs, which is so if you're working with PBC you know that just a fiduciary bottom-line dollar value is not their only decider. They can look at the bigger picture.

MR. LEIMKUEHLER: I would also say that from there's a quality piece. There is also the cost piece. So Cathy was mentioning the requirements of the Washington legislation that says it has to be as good as or better performance. It also has to be as cheap as or lower than the alternative.

And that is another thing to your point that is depending on the conversation I just talked to Jen about this. And I was sitting in a meeting with the marketing person, the stewardship person and the procurement person. And the person looked at me and said, "At three cents a bag more? Puff, people pay that all day." And the procurement person came out of his chair and said, "Are you kidding me?

That's an X percent increase. We can't tolerate that."

So it's the same thing on a cost standpoint where the consumer by and large, if you would poll the consumer would say, "Sure I'll pay three cents more just in case that stuff's bad, so I don't have it, I don't have to worry about it." Versus the procurement person making a decision that, "I can't sacrifice this part of my budget for that, because of my company's goals."

MS. RUDISILL: And just your comment I think is a really good one. And it kind of made me think of the presentation previously by Danish Coop [sic] where when they were trying to make the transition away from the PFAS in microwave popcorn bags they took it upon themselves to advertise and communicate to their customers why they were doing that. And why they made the safety and health case for why they thought that it was important to do that. So I think it's an interesting aspect that might address some of your concern of that. I think there's probably some consumer education that needs to be continued.

DR. NG: Can I just follow up on that? Two things, one is we know we started earlier this morning talking about how consumers shouldn't have to have a PhD. And so we really do want to get to that point where people assume things are safe and they actually are safe.

And the other thing about costs that I think is

being sort of discussed, but not really is who is paying the cost for these things? And I want to bring up the equity piece. So if we come up, we know the consumers will pay for safer products in their really fancy new outdoor jackets that are PFAS-free.

But food should not be a luxury item and it shouldn't be that you have to have a bigger food budget to afford the organic, the safer foods. And in a way we're kind of making it that way right now because nobody is paying the costs for the end of life. Or at least it's not the producers that are paying the costs for the end of life. And so when we need new products and costs come up it's the consumer that has to pay. And I think that's really unfair.

MS. MARTINEZ: That's such a challenge for most sustainability issues, right? Whether that's organic food - I mean, fill in the blanks. So yeah, it's a great point and a big challenge. I don't think there are any simple solutions for it. But you're right, that's got to be the equity piece has to be part of the discussion for sure.

MS. BRANYAN: I did want to bring up one more point. We're kind of talking about the issues and the difficulties in finding either cost or sourcing for all of these alternatives. But has there been a type of food packaging that it's been particularly difficult to find an alternative for?

MR. LEIMKUEHLER: Popcorn. Popcorn has, cold cups have. I mean there are several of them. And I think in certain cases you can find instances where even though they were really difficult there is success. It's just that success might come with more costs or a little tighter supply chain or a smaller supply chain. But I think you can find evidence of that occurring.

Microwave popcorn is the one that again Malene talked about, and in the industry is one that's there are very few people who can do it. And it is something that -- but it can be done. You'll find fluorochemical suppliers that will say it can't be done without PFAS.

So I think it's also a matter of a scare tactic to some degree to say that it's not doable. But in the reality is it is something that tightens the supply chain, it is something that creates a constraint to the current conditions that the market is used to.

DR. ORTS: We'll add the pizza box. You don't want to get home and have your pizza box drooping, condensation and oil. You can get a liner if you want.

MS. ROBIN: Can I just speak about the pizza box for a second? Because it is I think a big challenge of there's a lot of data out there about how many pizza boxes are ending up in landfills rather than in compost facilities. And so the idea of creating a compostable pizza

box is a real problem. It also has food waste in, so that raises an issue as well.

But I think it's just a product out there where the performance standard is going by a kit test, which you were talking about earlier. I mean if they were using a different kit test for it to determine whether or not it is successful in performance that might open up some opportunities.

But I think a compostable pizza box is one that we're hearing that there is a huge demand for, and there's a desire for them not to be continuing to end up in landfills. Liners are really not real popular with the consumer. So part of it can have to do with the design of the box, but definitely a wet-end solution for oil and water is what everybody seems to be looking for.

DR. BALAN: OK, I just want to make sure I understand it. So you're saying that pizza boxes contain PFASs. And I'm asking because I know that's something that you see pretty much everywhere in the literature that pizza boxes contain PFASs. But when I talked to FDA they told me that PFASs are not used in pizza boxes except perhaps in the small single-slice boxes. But for the big pizza boxes they're not used because they're too expensive. And at most there would be a liner that contains PFASs, but the box itself does not and that's a misconception.

MR. LEIMKUEHLER: Yeah. In this case the inner ply of a box is different than the rest of the structure, and that inner part of the box usually is treated. So if you look at the whole box as there are three other parts of it, two of the parts of the box that are not treated, but that typically that inside one is.

DR. BALAN: Okay. All right.

UNIDENTIFIED SPEAKER: That molded fiber (indiscernible)

MS. CHIANG: Right, I thought Toxic-Free Future had done a bunch of testing of pizza boxes in Washington State and they didn't find it in that many of them?

DR. BALAN: So there may be some have them, but not all. Okay.

MR. YEPSEN: Yeah, we have a BPI-certified pizza box, Rhodes Yepsen with BPI.

MS. RUDISILL: Just a comment on the requirements. When we were engaging with some of the stakeholders they communicated to us that the difficulty starts to increase with the performance, the more extreme the performance requirements are, so the higher heat, the longer duration of that expected performance.

And then if you want a lot of other things that PFAS can also provide like the vapor transmission and the water vapor, water transmission, that sort of thing. Is the

more layers you add on to it I think that generally speaking they said that that's when it gets really hard to enact an alternative.

DR. ORTS: Yes, so we've run across that. To replace PFAS you need two or three sizing agents often, or that's what we hear at least from people.

So PFAS is really good on a couple of regards: grease, water and even vapor. And if you want to replace it, with a milk carton you'd have to add one vapor barrier, one something else, one something else. So just adding three steps instead of one is a hassle, even if the cost is right there.

DR. BRUTON: Hi. Tom Bruton, Green Science Policy. I think that one of the toughest questions we got when we were up there this morning was what do you think DTSC should do? And I'm wondering if any of you would venture to answer that question? Did I steal your thunder?

MS. BRANYAN: Thanks for stealing my thunder, Tom. (Laughter.) I appreciate that. But yes, we are coming to the end of our panel. And so I am very much interested in what all of you think might be the next steps for DTSC. What kind of are the hindrances or where should we move from here? Okay, let's round robin.

DR. ORTS: Okay, so one of the worries even when I was talking to you and I put up this siloxane slide, you ban

C8s and the industry moves to C6, right? I mean that's the water balloon thing. You just, "Okay, great that worked well." And that's just because there's less data on C6. Who knows if it's safe? A slight worry that you're going to move to -- so if you just say "PFAS-free, done, no fluorine in anything," the options are not -- they need to be well thought out. And siloxanes aren't necessarily way better, metal films aren't way better, multi-laminate steps.

So in order to make a really good milk container that does everything PFAS does you need a polyvinyl alcohol layer, you need maybe polyacrylate in there, maybe even a lay, right? Three layers or whatever, you name the sizing. That makes it really untenable in recycling. It makes it harder to recycle. So everything you do needs to be thought out. Unless you go back to the future, maybe the old sizing agents: starches and celluloses and parchment and things like that.

What should they do? I'm in favor of PFAS-free perhaps, but you have to think of can you get a life cycle, or can you get a ramification, a study that says what's going to happen if you squeeze the water balloon?

MS. RUDISILL: I would say for our perspective in working in with Ecology I would just say that your program is based on Alternatives Analysis, Alternatives Assessment. And I would just encourage you to stick to the basic guiding

principles of Alternatives Assessment, which is, I mentioned in my talk, of considering all of these different aspects of the issue. And I had a thought and it just went away. You can tell it's getting late. So yes and I know that Ecology is looking forward to collaborating with California and keeping that engagement happening.

MR. MAYHOOD: Well, I would just reemphasize again I'm going to beat the dead horse on a couple of things. But the solutions are available, so they are in the marketplace today. And so I think you can certainly start there and begin with that dead horse part is going back to fit-for-use requirements. Getting those properly defined, properly understood, making sure that the entire supply chain is considered and evaluated.

I would also look to see where you would require PFAS-free certification, some type of guidance, some kind of testing. And I didn't mention Prop 65. We do Prop 65 as far as our requirements as well. So the basic compliance requirements, PFAS-free should be added to that list to make sure that happens.

And then I think you also have to look at the cost equation and kind of go back and say, "Look, new technology you can't expect it to be at parity with the current materials." Get rid of the short-term profit focus and look at the long term to get rid of dangerous materials that when

they're replaced will come down to parity in terms of cost if not actually do better.

MS. MARTINEZ: I think every point that's been raised so far, those are all very good. I think that continuing the information-gathering process, right? I mean I'm going to come out of here with lots of questions and so I'm sure you are too, right? And so I just think continuing to engage stakeholders and gather information.

I think the points that were raised earlier about shifting consumer expectations and the subjective understanding of performance and what that means. I don't know, I didn't hear today sort of a more formal approach to understand that, like how do brands think about their standards? What are consumers willing to give-and-take on? I think that area is so important for the reasons that we discussed today. And I think doing some more focused research and effort on that specifically would be beneficial.

MS. CHIANG: So I think we have the position at CEH that we don't see these as essentially used for this particular category of products. So we would like the scope to be as broad as possible. But understanding we have limited resources I would probably echo maybe it was Jen's comments of still looking at all the categories of molded fiber, paper, paperboard, but maybe prioritizing the ones

that are intentionally used for the grease resistance and oil resistance to start.

MR. LEIMKUEHLER: I would say that there was a comment made in the first panel around targeting applications where there is the highest concentration of the PFAS chemistry itself. I would actually say that that's not the right approach. And this was a conversation that I had with SRC too. If you look at where you have the biggest problem of end of life so molded fiber may be a great place to start because you have to push everything to, or most of that end of life is geared towards compostability. And you'd find the places where a change in regulation is a large impact with one application, because from a volume of materials in the system that's where you're going to get the biggest bang.

If you target microwave popcorn, for example, you're going to get this little piece way over here. If you target quick-service restaurant you're going to get this gigantic piece way over here. And I think from a technical complexity standpoint that's easier. That's from an overall end of life goal that you have for the state. You can gear that there.

If you know that you want to have compostability and non-PFAS then you can gear your solutions that way in which it may be easier to accomplish those goals versus just

casting this big, broad net where you have a lot of challenging applications, technical requirements, subjectivity, all those things. My concern is it will mire you in the details and you will never get past it. So the engineer in me goes better, not best. Work your way. Take big bites where you can, and get rid of those pieces. And then work your way towards the more difficult, challenging ones. Keep them on the table, but just prioritize that list.

MS. MARTINEZ: And engaging composters, right?

MR. LEIMKUEHLER: Yeah. Yeah, exactly. Exactly.

MS. MARTINEZ: I mean, I think that was kind of explaining what you were saying and to Neil's point earlier, right? That if they're the ones are receiving a lot of this material they need to be very much a part of the process.

MR. LEIMKUEHLER: Same on recycling. Because if you're going to go down the recycling lot you'd need to engage in FPI sitting here, the Fiber Box Association, things like that who are the net recyclers of the U.S. You have to engage them too, because they are going to be the ones that pull it through.

MS. BRANYAN: What do you think is the biggest impact? Like you've mentioned kind of the full breadth of it and the issues that come with each of those, but if you had to pick what would you do?

MR. LEIMKUEHLER: Well I would, if I were to be just somewhat vague in my answer, I'll say I would go to a market study and say, "Where do you have the biggest volume? Where do you have the biggest volume applications?" Because today there was a conversation I had in the hallway about food-waste contaminated paper doesn't go in the recycling bin ever, right? It almost always goes into a landfill, unless you have a composting facility nearby which is not the majority of the United States.

So I would just say that if you target those places where you have the largest volume, the largest mass in the system then you're going to take the biggest amount out of the system. So it's pretty readily available to find where those volumes are larger and where they are more significant. And typically those are ones that are also they have a performance criteria and (sounds like) and a size as well. But to Clay's point, a kit 3 instead of a kit twelve.

MS. CHIANG: May I make one comment? So I just wanted to mention that the Compost Manufacturing Alliance has been engaged on this. And they also recently put in the restriction On PFAS compounds in their field testing and their composter-approved list of products. And so that will go into effect I think by the beginning of 2021.

DR. BALAN: So in the first panel we heard a

couple of recommendations that if we had to prioritize something, molded fiber products might be a good place to start. So it sounds like Vanguard is the first PFAS-free solution for molded fiber products. Are there any others as of now? And it also sounds like that Vanguard might not -- you said that it doesn't have all the performance benefits of PFASs, so it sounds like it may not work for all applications. So I'm just wondering if there are any of the solutions besides Vanguard. If there was any work that industry is already making to expand to other applications? And how would an Alternatives Analysis like the one mandated by our program benefit the search for alternatives in this area?

MS. MARTINEZ: Sure. I know that we just hear in the industry that our competitors and others that play in the molded fiber space are working on solution as well. I believe there may be, you know Eco-Products was the first to get BPI certification under the new standards for molded fiber. I believe there may be some others by now. I'd have to go to the website to double check for sure. But I think that there are some other options on the horizon.

MS. CHIANG: I believe Footprint also makes a molded fiber product without PFAS. And then we have been hearing about others that have are working on alternatives.

MS. ROBIN: I'm going to say we do make a PFAS-

free molded fiber product, but it's not meeting a performance standard for certain kinds of hot food which I think is the same as Eco-Products. Or maybe you do, I wasn't quite clear what you said on that.

MS. MARTINEZ: On the performance issue?

MS. ROBIN: Yes.

MS. MARTINEZ: It's definitely worked. I mean, for certain customers yes, it works fine for their hot-food application for sure.

MS. ROBIN: It just depends on the customers performance standards?

MS. MARTINEZ: Just their specifics exactly in terms of (indiscernible) --

MS. ROBIN: And that's where we go back to dishes. We have the same thing.

MR. WAGGONER: You know one thing that would be really helpful is that right now there are a bunch of CalRecycle grants, but you only get points for diverting material from landfills. You don't get points for displacing things that otherwise go to landfills. And you don't get points for eliminating carcinogens. And so if the framework you came up with could get points on those sorts of grants and get more money to bring these alternatives to market and get more of them made in the U.S. that would be extremely helpful to manufacturers.

And this is Mike Waggoner from Corumat, sorry.

MR. YEPSEN: Yeah, Rhodes Yepsen with BPI. The other one in our database right now that's certified is Cycletech. So that's the other one. But there are many companies that are working and are hopefully close.

DR. BALAN: So sorry, so then an Alternatives Analysis through our process, would that help manufacturers? Or are manufacturers of molded fiber products already working to eliminate that and would continue to do that even without our involvement? Because that's also something important for us to keep in mind, right? Like is this -- are PFASs already being phased out from this part of the market? Or would our intervention help in any way?

MS. MARTINEZ: You're asking if regulation would be a driver for demand?

DR. BALAN: Right.

MS. MARTINEZ: Sure. I think with most issues there's going to be a certain voluntary demand for new, emerging technologies. And then when something is regulated that can accelerate it and make it happen. So I don't think this would be unique in any way.

MR. WAGGONER: I mean if there's anything that changes a financial incentive to solve the problem. So if tipping fees went up for non-recycled products, so that there was more a financial incentive to get rid of poly

coated paper, which doesn't really ever get recycled very often, if the tools that you came up with would highlight those things and create more market incentives for these new products to be developed and made locally then that would make manufacturers do more R&D.

MS. ROBIN: I would say I favor the regulation in concept and also as a consumer. From the industry's perspective my sense is everyone is trying to get rid of it as fast as possible now whether or not a new regulation would make that happen faster I can't really say. From our perspective we would like it to be yesterday. But we haven't been able to identify an alternative for ourselves that satisfies certain customer performance standards. I don't know that the regulation that you would pass would change that, but maybe.

I think about what the City of San Francisco is doing. And that is starting to have an impact on some of the performance standard expectations. So I guess my answer is I don't see a need for the regulation to go into place faster to make us as an industry participant do it faster.

MR. LEIMKUEHLER: My only counterpoint to that would be that with the suppliers with that mentality, for sure I agree, and there are a lot that are out there. There is a lot of people in the industry that don't have that mentality that are going to go kicking and screaming into

things. So to Sarah's point there is always that population that legislation forces to move. I don't know that you need legislation to make this happen. There's enough momentum to your point with people moving voluntarily. But legislation is always going to prompt movement that wouldn't happen otherwise.

DR. GRANT: Hi, Kelly from DTSC. Cathy I was wondering if you could comment a little bit on when your Alternatives Assessment would be completed and how broad the scope is? And whether that would help folks if we decide to regulate PFAS and food packaging?

MS. RUDISILL: So at the moment the general timeline is that it has been adjusted again. So we're looking at summer, this summer, for a report to Ecology. I'm actually going to Ecology tonight. Well, I'm going to Washington tonight, so I have an in-person meeting with them tomorrow. And I'm hoping to clarify some of the milestones that we'll reach in between there. So that's what we're looking at right now in general.

And what was the other part of your question again? I'm sorry.

DR. GRANT: (Indiscernible) just whether your assessment would be able to help the folks who would be regulated in California?

MS. RUDISILL: I definitely see overlaps. I mean

you're looking at the ultimate goal sort of being the same as the identification of safer alternatives.

I understand that the California regulations work a little bit differently as far as what they are allowed to -- the kind of rulemaking that you are allowed to enact versus what's going to happen in Ecology. But as far as the actual information I definitely see overlap and the chance for California to kind of build on or expand on what we're doing. And I know that we consider them to be a stakeholder in this process. And we're happy to share information as soon as we can with them, so yes.

MR. EDGAR: Neil Edgar, California Compost Coalition. I would just circle back as I certainly don't want any alternatives that are not fully vetted with recycle processors, recycling companies.

There is a massive move to try to create domestic markets for a lot of the recycling materials and commodities that are coming back in that China is no longer willing to accept. And there are a number of emerging products and product lines that could be impacted. So along with the composters and the recycle processors need to be engaged in that conversation to not create, again, push the button in one place and then a piece of the balloon goes out the other side.

DR. BALAN: So a follow-up to that, so Ecology is

looking at liners, bags and wrappers, right?

MS. RUDISILL: I think at a minimum in the scope we'll include wraps, liners and bags, likely also dinnerware. We're kind of roughly defining at the moment as like plates, bowls and food boats, food trays. What we're trying to refine at the moment, which will be very soon, is to the extent that we can include containers.

We have a couple of constraints at the moment, obviously one being budget and then also being timeline. The more complex we look at the different types of products the more we're going to have to clarify things like performance for those different products. And we only have about six months or so to really get this report out.

So in dealing with the stakeholders and procuring information and that sort of thing it just takes time. So we're still working on how we can broaden scope as much as possible to have that maximum impact. But I think at the minimum wraps, liners, bags end dinnerware is probably where we're looking at.

DR. BALAN: So would the dinnerware include molded fiber products?

MS. RUDISILL: We would. You said molded fiber? I think if -- we're trying not to constrain by these materials, so if we're considering an alternative we would be looking at paperboard, molded fiber, different types of

plastics like PLA plastics or PLA foam, for example.

DR. ORTS: This is an aside, but mold-release agents seem like a no-brainer. There are a lot of mold-release agents that don't need to be fluorinated.

MS. BRANYAN: Okay. It looks like we are coming close to the end of our day. And so I was hoping to see if anybody might be able to chime in on anything that maybe you thought we had missed in our discussion. Something I know that Sarah had mentioned, kind the functionality component that maybe we should dig a little deeper. Is there anything else that you think that DTSC has maybe overlooked? Or we should dig deeper into in terms of the discussion of alternatives?

In that case (indiscernible).

MS. CHIANG: So, I guess it was already mentioned, but just really also an emphasis on looking for promoting reusables wherever possible as well.

MS. BRANYAN: In that case, then I will go ahead and thank our panel for coming and sticking with us all day. And being engaged and asking all our questions before I didn't have to. So thank you.

And I'll go ahead and turn our closing remarks over to Karl.

ACTING DEPUTY DIRECTOR PALMER: Thanks Jennifer.

So I know I speak on behalf of Secretary

Blumenfeld and Director Williams and our SCP team here at DTSC in thanking our panelists and speakers today. We have people coming from very far away. And their time and energy and thoughtfulness, we really appreciate. It's really important to our ability to get the job done and do it well, so thank you all. Thank you all in the audience, and online and here likewise for participating. I like to say information is the coin of the realm and the more information we get the better. And the better decisions we can make, so you're really key to that process, so thank you.

I also want to take a quick minute to thank my staff who have worked diligently to put on this workshop as well as they do every day. And certain people like Baoku who here behind the scenes make all this happen. And when we're having PhD scientists and engineers do everything from signing you in to picking up the plates and forks it's an all-hands operation, so we appreciate that. So thank you.

I just wanted to close and I had one thought. I was struck by Malene's, one of her bullets in her presentation that said their strategy was to target the few through many to make a difference for every one of us. And I thought that was powerful.

And I think it speaks to our mission here at DTSC too, which is there are many targets of things we would like

to do. And on some of those things that we talked about today, everything from the concept of promoting equity and factoring in cost and looking at the various layers of scientific challenges for performance and setting standards and clarity and then engaging with retailers and brand owners and everyone that touches these products and has a role in their use, development and efficacy.

It's really important that we all have this conversation. And so I wanted to say that the next steps we are going to do from here at DTSC is one, we're going to go back and digest all the information we heard today. And no doubt we're going to have additional questions, so you can expect that some of you will be getting calls from us to follow up as we contemplate what we heard today.

And then what we'll do is we'll get together. And as we ask and answer some of those questions we will decide at DTSC what our next steps are going to be in terms of this space for food packaging. And if we decide to identify a specific product or products then we would then take our background document and move towards developing what we call a Product Chemical Profile, which would specify what we're looking at and why. And then we would seek additional comment on that before we go to rulemaking to identify it as a Priority Product to go through our process.

So it's really important, that information. And

it's an iterative process. We learn a lot every day and every time we talk to all of you and we really appreciate it. So I do encourage you to, when you leave, and you think about what you heard and learned today that if questions and thoughts come up to please contact us. Obviously by midnight tonight you can comment formally on our background document on via CalSAFER, but don't let that stop you. Please pick up the phone or send us an email or ask to meet with us as we are on this journey, because we really need all of your help.

So with that thanks again, a safe journey to all of you heading home, and in all the things that you make and buy.

So thank you. (Applause.)

(Whereupon, the Workshop was adjourned at 4:25 p.m.)

REPORTER'S CERTIFICATE

I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were reported by me, a certified electronic court reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

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IN WITNESS WHEREOF, I have hereunto set my hand this 14th day of April, 2020.

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Martha L. Nelson

MARTHA L. NELSON, CERT**367

April 15, 2020