ENVIRONMENTAL, AGRICULTURAL, AND CULTURAL PRESERVATION COMMITTEE

Council of the County of Maui

MINUTES

November 5, 2019

Council Chamber

CONVENE: 1:30 p.m.

PRESENT: VOTING MEMBERS:
Councilmember Shane M. Sinenci, Chair
Councilmember Tasha Kama, Vice-Chair
Councilmember Kelly T. King (left at 4:33 p.m.)
Councilmember Alice L. Lee
Councilmember Michael J. Molina
Councilmember Tamara Paltin
Councilmember Yuki Lei K. Sugimura

STAFF: Kasie Apo Takayama, Legislative Analyst
Nicole Siegel, Committee Secretary

Zhantell Lindo, Council Aide, Molokai Council Office (via telephone conference bridge)
Denise Fernandez, Council Aide, Lanai Council Office (via telephone conference bridge)
Mavis Oliveira-Medeiros, Council Aide, Hana Council Office (via telephone conference bridge)

Don Atay, Executive Assistant to Councilmember Shane M. Sinenci
Gina Flammer, Executive Assistant to Councilmember Shane M. Sinenci

OTHERS: John Garnsey, Executive Vice President of Sales, Maritech Solutions, Inc.
Dick Kim, Director, Maritech Solutions, Inc.
Tom Woods, President, Synergistic Energy Systems, Inc.
Peter Flowers, CEO, Clean Water Innovations
Robin Mazor, Clean Water Innovations *(seated in gallery)*
Tim Gunter, CEO, Hawaii Energy Independence Company
Janai Kealoha, Partner, Hawaii Energy Independence Company
Dr. Albert Ratner, Advisory Board Member, Independence Energy Company
Dennis Orr, Sales and Marketing Specialist, Twin Oxide-Hawaii
Dr. Joe Nieusma, Founder and CEO, Superior Toxicology and Wellness *(via teleconference call)*
Travis Liggett, President, Reef Power LLC

Faith Chase
Jasee Law

Others (3)

PRESS: *Akaku: Maui Community Television, Inc.*

CHAIR SINENCI: . . . *(gavel)* . . . Aloha mai kakou, and welcome to the Environmental, Agricultural, and Cultural Preservation Committee meeting of November 5, 2019. Will the meeting please come to order? It is 1:30 p.m. I'm Shane Sinenci, your Committee Chair. And before we go on, may I please ask that we silence all cell phone ringers, and any noise-making devices, please? Thank you. Members, thank you for being here today, this afternoon. Today, we have Vice-Chair, Tasha Kama. Welcome.

VICE-CHAIR KAMA: Aloha, Chair.

CHAIR SINENCI: Aloha. Councilmember Yuki Lei Sugimura, aloha.

COUNCILMEMBER SUGIMURA: Aloha, Chair.

CHAIR SINENCI: Aloha. Councilmember Tamara Paltin.

COUNCILMEMBER PALTIN: Aloha, Chair.

CHAIR SINENCI: Aloha. Councilmember Alice Lee, aloha.

COUNCILMEMBER LEE: Chair, in Greenland, we say aluu.

CHAIR SINENCI: Aluu.

COUNCILMEMBER LEE: Yeah.

CHAIR SINENCI: Thanks for being here. Councilmember Mike Molina.

COUNCILMEMBER MOLINA: Good afternoon, Chairman.

CHAIR SINENCI: Good afternoon. And Council Chair Kelly King, welcome.

COUNCILMEMBER KING: Aloha, and aluu.

CHAIR SINENCI: Aluu. Thank you. Okay. So, we also have non-voting Members, Riki Hokama and Keani Rawlins-Fernandez. And if they're present, they're always welcome to join us. Today, Members, we have many visitors at our Chambers today, and I'll introduce them. I'll just read them out, and then later, you'll get to put name to face. Tim Gunter, CEO of Hawaii Energy Independence Company; Dr. Albert Ratner, Advisory Board Member, Independence Energy Company; Ms. Janai Kealoha, Partner of Hawaii Energy Independence Company; Mr. John Garnsey, Executive Vice President of Sales, Maritech Solutions, Incorporated; Dick Kim, Director of Maritech Solutions, Incorporated; Tom Woods, President, Synergistic Energy Systems, Incorporated; Peter Flowers, CEO of Clean Water Innovations; Leah Santiago [*sic*], Engineer [*sic*], Clean Water Innovations; Travis Liggett, President of Reef Power, LLC; Mr. Dennis Orr, Sales and Marketing Specialist for Twin Oxide-Hawaii; and via telephone, we have Dr. Joe Nieusma, Founder and CEO of Superior Toxicology and Wellness. For Staff, we have Ms. Kasie Apo Takayama and Ms. Nicole Siegel. In our District Offices, we have Mavis Oliveira-Medeiros in the Hana District Office; Ms. Denise Fernandez at our Lanai District Office, and Ms. Zhantell Lindo of the Molokai District Office. So, today, Members, we have our one item, EACP-17(5), Water Reuse and Energy Generation, and we'll start the meeting with any testimony, if we have any. For individuals testifying in the Chamber, please sign up at the desk just outside the Chamber door. If testifying from one of the remote testimony sites, please sign up with District Staff. Testimony will be limited to the item on the agenda today. And pursuant to the Rules of the Council, each testifier will be allowed to testify for up to three minutes per item. When testifying, please state your name and the name of any organization you may be representing, pursuant to the Rules of the Council, and if you're a paid lobbyist, please inform the Committee. We have established a connection to the Council District Offices, so, Ms. Apo Takayama, can you call the first testifier, please?

. . . BEGIN PUBLIC TESTIMONY . . .

MS. APO TAKAYAMA: Thank you, Chair. The first testifier, and actually, the only testifier signed up in the Chamber is Faith Chase.

CHAIR SINENCI: Welcome, Ms. Chase.

MS. CHASE: Thank you. Good afternoon, Chair, Council. I hope this sticks to the agenda item. I just wanted to say how grateful I am for this Committee to attention all these environmental subjects sometimes that get lost in unfortunate political timelines. I've been, at least for the last five years, trying to muscle forward solutions in my little corner of the world that I can and it's a little frustrating. I've inundated the Department of Environmental Management Office Stewart Stant, Kyle Ginoza, Mike Miyamoto, Eric Nakagawa. I small kine attacked him at the Hana meeting last week with my ideas. You know, coming from my hometown Hana, we have, I tell people periodically when I can that we have the most beautiful dump in the world. You could throw a stone to the ocean where we are and we need help. We have some serious issues, so thank you for the work of this Committee. I'm kind of frustrated with the sustainable agricultural education that we have in our schools. So that's my puka, that's my area. My window of, sort of, community give back, you know. Without getting into any contentious issues, we don't have any other forum of distribution from K through 12 in the schools other than Monsanto's education components that are able to be delivered to the Department of Education. I find that really alarming considering that this is the County that, you know, pushed through a moratorium on those issues. So, I really want to see a sustainable agriculture education piece that is available to the teachers K through 12, and I'm working on that. And in my capacity and my frustration of this lack of education, I've created a small event. It's been a bumpy road. I lost sponsors, I got sponsors. I was lucky enough to have some of the people in this room, you know, pay attention to the e-mails and come to the event, even speak at the event. We are in our second year. I have an event on Saturday. I even had to downsize it a little bit more because of budget. But next year, I just wanted to put a bug in everybody's ear that I'm going to try to apply for a OED grant to help me so that I can get a little bit wider exposure. And even in my presentation to Mayor Victorino in my hometown Hana last week, you know, I said I've got this idea and that idea, and he's like, if you got the ideas, let me see it, show it to me, so I plan on doing that through this grant, so if you hear me or see my e-mails that's what that's about. You know, I've been working on it for a long time. So, I just wanted to say thank you and just to let you know that in my little world, my little corner of the world, I'm doing what I can for that education component.

CHAIR SINENCI: Thank you, Ms. Chase. And your event this weekend would be resource recovery.

MS. CHASE: Yeah, Resource Recovery Maui 2019. I don't have, I'm sorry, if I could…I don't have any handouts, but I do have a contact related to the event for each member, if you don't mind. And I think I've e-mailed a lot of people, and I've gotten some responses, but sometimes the, you know, the CRM, the customer relation management, the invitations, it goes into your promotions folder, it doesn't, if you've never gotten an e-mail from me or from that address, so I'm not getting the kind of reciprocality that I thought I would. So, I just wanted to make sure you have my address if you're interested. Of course, there's a seat for every Councilmember if it doesn't, you know, cross any Sunshine issues.

CHAIR SINENCI: Okay. Thank you.

MS. CHASE: That's all.

CHAIR SINENCI: Members, any clarification of the testimony? Chair King?

COUNCILMEMBER KING: Thank you, Chair. Thanks for being here, Faith. You know, I think I went to that event last year and it was a really good event. Unfortunately, I'm leaving on Thursday on vacation. But can you just give us your time and place of your…

MS. CHASE: Yeah. UHMC. Last year, I lost my sponsor because the PowerPoint and the beautiful Morgado Hall at MACC was faint, and so one of my sponsors really wanted that input and I wasn't able to provide it. So this year we moved it to UHMC with a good AV room. So, it's Laulima 226, it starts at 9:30 until our, 9:00 to 4:30. And I promise if any of you wanted to come, I would move somebody from the front row and put you right there. Thank you.

COUNCILMEMBER KING: Thank you.

CHAIR SINENCI: Thank you. Members, we're going to take a quick recess so that we could reconnect with our District Offices. EACP in recess. . . .*(gavel)*. . .

RECESS: 1:38 p.m.

RECONVENE: 1:40 p.m.

CHAIR SINENCI: . . .*(gavel)*. . . Will the EACP meeting of Tuesday, November 5th, please come back to order? It's 1:40 p.m. And, so, we've established connection with our District Offices, and there are no more testifiers there. Ms. Apo Takayama, is there any more testifiers here in the Chambers?

MS. APO TAKAYAMA: Chair, there's no one else signed up in the Chamber to testify.

CHAIR SINENCI: We have one individual coming down. Mr. Jasee Law.

MR. LAW: You almost got it right, Shane. I hope *The Maui News* gets a picture of that shirt for tomorrow's paper. Jasee Law from Kula. I'm happy to see everybody here today. Welcome to the kingdom. I know it's dark in Washington, D.C., but I hope Mayor Victorino is watching on *Akaku*. Aloha, Mike. If he gets a chance to look at the waterways around the District of Columbia, he'll see how important it is to recycle not only the solid waste but the liquid waste. I mean, I got that backwards. He's over there doing the liquid waste right now but he's, it's just as important to recycle the solid waste because a lot of it ends up in the waterways around the district and it's kind of sad to see that pollution. D.C. has a major water pollution problem. Their water I think it pretty good from the source, but as it comes out, it's not so good. But they get the same thing problems down river. You shouldn't swim down river in D.C. 'cause they got the bacteria problems in the Potomac. And I want to see the bill for the hotel room when he gets back because he better not be staying at that Trump Hotel over there.

CHAIR SINENCI: Okay. Thank you, Mr. Law, for your testimony. Members, any questions? Seeing none, okay, Ms. Apo Takayama, any other testifiers?

MS. APO TAKAYAMA: Chair, there's no further testimony from our District Offices or in the Council Chamber.

CHAIR SINENCI: Thank you. So, Members, if there are no objections, we'll close public testimony.

COUNCILMEMBERS: No objections.

. . . END OF PUBLIC TESTIMONY . . .

CHAIR SINENCI: Thank you. Okay, moving right along.

EACP-17(5) WASTE REUSE AND ENERGY GENERATION

CHAIR SINENCI: As I stated earlier, we have one item on the agenda, EACP-17(5); Water Reuse and Energy Regeneration. Today, we have a very exciting line up of experts presenting on their environmental technology. Many of who've been joining us from the mainland and from outer islands, welcome and thank you for joining us sitting in the Chambers. We'll start with representatives from two waste-to-energy companies and learn about two similar but different approaches that could be possibly used here on Maui. And then, we'll move to the subject of clean water, and we'll hear from several experts on the methods of cleaning and disinfecting municipal drinking water and also technology using Native Hawaiian limu from East Maui to clean ocean water. For today, I plan to give each member of our panel an opportunity to share their expertise. When we are finished with each presentation, I'll allow a few brief questions from Members. This is to be sure we get to each presenter at the reasonable pace. If there are more questions at the end of all the presentations, I'll allow for additional questions. So, that being said, let's get moving. First off, if there are no objections, your Chair would like to designate the panel members as resource persons pursuant to Rule 18(A) of the Rules of the Council.

COUNCILMEMBERS: No objections.

CHAIR SINENCI: Thank you. I'm going to start today's panel with two, three experts on waste to energy from Hawaii Energy Independence Company. Mr. Tim Gunter is the CEO and also former consultant to the County of Maui on composting solutions. He will make a few opening comments, and then he'll introduce Dr. Albert Ratner, an advisory board member for Independence Energy Company, and with the Department of Mechanical Engineering at the University of Iowa. We also have Ms. Janai Kealoha, also Mr. Tim Gunter with Hawaii Energy Independence Company. So, Mr. Gunter, if you want to proceed.

MR. GUNTER: Aloha *. . .(inaudible). . .*

CHAIR SINENCI: Yeah, so most times we'll speak like...we want to get you guys on record, so just speak right into the mic. Should be a green light.

MR. GUNTER: All right.

CHAIR SINENCI: Okay.

MR. GUNTER: Greetings, everyone. Today, I am very happy to bring Albert Ratner, Dr. Albert Ratner, over here to explain what Janai and I have been wanting to bring to the island for close to five decades. I've been trying to help solve many of the problems that the County has. I've had for 27 years the organic compost site by the old hospital in Puunene. And approximately 5 to 6,000 people I've gotten to become organic gardeners or backyard farmers. And we are now going into waste-to-energy, which is just makes so much sense, why should we throw this energy in the landfill taking up space, costing us lots of money to get rid of this stuff when we can turn it into a clean energy. Now, I'm not going to waste Dr. Ratner's time, because he's done research on this for 12 years and is one of the foremost authorities in the United States on flames. So, he will get into much more detail. Janai Kealoha, I'm going to introduce her so she can give you a little bit of her heartfelt reasons why we got into this and…Janai?

MS. KEALOHA: Aloha, Chair and Council. Thank you very much for the opportunity to be here today. We are very excited; Hawaii Energy Independence is very excited to have Dr. Albert Ratner's attention and ability to be here to present for us. As a Hawaii resident and a Maui, long-time Maui resident as well, I have identified that this particular technology, state of the art, could really help us. So, I looked around in the 20 other states in the United States and looked at their trash, waste-to-energy municipal solid waste management opportunities and they're huge. So, as a local person, like, where do we put that? It's not scalable for Maui. Our project is, and that's the wonderful thing about it. We're managing six landfills, two of them closed, the current one close to capacity. We know that operating landfills cost a lot of money, closing them do, and we feel like this could potentially be a great opportunity for this project to thrive here. It's scalable Maui and that's the nice thing about it. Dr. Albert Ratner from the University of Iowa on biomass gasification.

MR. RATNER: Hello?

UNIDENTIFIED SPEAKER: Hello.

MR. RATNER *(PowerPoint Presentation)*: Thank you, all, for inviting me and for having me out to this beautiful island for my first time out here. I'm a professor at the University of Iowa. I sit on Independence Energy's advisory board, I'm not compensated, I don't own any stock, I'm not paid, all right, so I'm a State employee. And so, I'm going to try to maybe show you how this general topic works, and hopefully inform the board about different things and then obviously I want hear questions if you guys have them about what can be done and can't be done for any particular project, all right. But we've been running this sort of technology for a while in my laboratory and publishing scientific papers, and so I want to show you some of that stuff, so that you guys can be informed. So, first two seconds about me, I joined the faculty at Iowa in 2003, I'm currently an associate professor. I have right around 50 journal papers and almost as many conferences. I'm a Fellow of the American Society of Mechanical Engineers. I just got elected to the steering committee of the main conference the _____ conference for the society. And I'm also the technical chair for the Combustion Institute, which is the main society in the U.S. and internationally, so I'm the chair of the, both the regional meeting and the national meeting for the next two years. The University of Iowa, similar in scale I would say probably to the University of Hawaii at Manoa. You know, in the center of Iowa and Iowa City, it's a state university from 1847, so it's been around awhile. So, what I wanted to go through was a little bit of waste disposal and sort of the general perspective, combustion approaches to waste elimination. My expertise is primarily in combustion and gasification and different aspects of it. I work on this sort of problems, I work on gas turbines, and some other aspects. Why is down-draft an appealing technology? I'll explain what the benefits are. No technology is perfect, right, but every technology has some really good use cases, right. And so, what are the good use cases for this sort of technology? A little bit of the experimental system that we have in my laboratory at the university, right, and how it runs. So, waste disposal, couple basic ways, right, you can obviously burn it, which people do that. I think there's over 100 incinerators in the U.S. currently operating. There's a lot of incinerators in Europe, right. Sweden imports trash at this point for burning, all right. Can it be done? Yeah, obviously, right. The issue with incineration is the gas clean up. Generally, incinerators produce really nasty gaseous emissions and then it's an expensive and sort of extensive process to actually clean that gas, right. So, it is, it's perfectly doable, but it's expensive and generally requires really large scale to do it with any sort of economics. Another option, obviously, is landfilling. It turns out, you start to run out of space, as has happened here and happened to various places around the U.S. Recycling, obviously, we want to recycle, but there's a lot of stuff that's very hard to recycle. In Iowa, for example, a lot of the trash mix that we got out of Des Moines that we've tested had a lot of cardboard and paper, and people would ask automatically, well, can't you recycle those things? In fact, you can. The cardboard gets recycled multiple times, right, in fact, locally, but the fibers break down. And so it turns out after a while, you can't recycle it anymore, and you have to do something with it. And so in fact, a third of the trash volume that we got was actually cardboard that was being dumped. Same thing, obviously, goes for paper. Reusing is great, but it takes money and effort and so that has to be allocated to it to be viable. Energy generation, obviously, I can burn fossil fuels and make CO2. We have a lot of wind power in Iowa, about half the state is currently on wind power, and it's a good component. It's very hard to make that all of your energy mix. Solar panels, can, obviously, be a good particular component. I just heard there was a issue with the battery pack for the Lanai panels that was in the paper, I guess, within the last couple of days that they were having big problems, which is, to me, not surprising because the batteries that they're using have a five to seven year lifespan as designed, right. So, if you try to capitalize a 30-year project, be aware, right, that the batteries aren't designed for that, because they're using the same batteries that go in cars. A classmate of mine from Cal Tech, who's at LG in Korea, designed them. And so, they are not…they can't take that sort of time. So, you know, can you replace them? Sure. But you just have to be aware that they're not meant for 30-year projects, right, they're for 5 to 7 years and then you have to replace them. So, makes waste to energy a lot more appealing. Right, so what do you do? You know, again, I think the thing is, of course, like everything in life, you have to do a mix, right, so hopefully use less, reuse what you can, right, recycle what you can't, then what you can't recycle hopefully utilize the best what you can and a lot of that means that you can extract the energy from it, all right. And if you're can extract the energy inexpensively and cleanly, then you're way ahead. Combustion methods, right, so this is more into my bailiwick of things we do. You can do combustion-driven incineration, right, which obviously people do, but again, generally very large scale, very expensive clean up, right, as the general rule. Plasma-arc, I teach that to my thermodynamics class of sophomores. It's really energy expensive. It's just that it's an expensive process, so it's not something that is economical normally viable for almost anything other than people getting rid of medical waste is often done because you just want everything gone. Pyrolysis into bio-oil, this is a big push from some of my colleagues in the state, at Iowa state of making basically synthetic crude oil out of biomaterials and then using that. It turns out there's a lot of hiccups on that road, because they spent 25 years trying to do it and there's still various problems. So, worth considering in certain circumstances for small projects, the kind that I think are being discussed here, probably not the way to go in scale. Gasification, couple different designs of gasification technologies, and I'll show you guys what these look like, up-draft, cross-draft, and down-draft. The incineration, like I said, very common in Sweden, right, but again, very large facilities, right, and just a very large cleanup effort. Plasma arc, again, bio-oil, not particularly clean.

CHAIR SINENCI: Question, Member Paltin?

COUNCILMEMBER PALTIN: Is MSW, municipal solid waste?

MR. RATNER: Yes.

COUNCILMEMBER PALTIN: Okay, thanks.

MR. RATNER: Sorry about that. So, the general gasification process, and the reason people do this is because typically if I burn solid material directly what happens is there's not enough oxygen locally as the material breaks down. And so, I form soot and a lot of chemicals locally 'cause I'm, I don't have enough oxygen, right, and I can give you all a very long technical explanation for that if you care but that's basically what happens. So, the way to fix that problem is I basically convert the material, the solid material into a gas. I can then mix the gas with air and now I get the right fuel-to-air ratio and it burns clean, right, same way as propane or natural gas does in a nice blue flame, right, because it's burning cleanly it's not making any soot, which is why it's not yellow.

COUNCILMEMBER PALTIN: Chair?

CHAIR SINENCI: A question?

COUNCILMEMBER PALTIN: Yeah, sorry. So, when you are talking about gas, you're talking about not liquid?

MR. RATNER: Yeah. So, so, yeah, vapor.

COUNCILMEMBER PALTIN: Okay, sorry.

MR. RATNER: Yeah, no, so that's the same thing. So, with propane, for example, when you open up the valve it turns into a gas and then that gas mixes with air before it burns. It's a very important step, right, and so that lets you have that blue flame that doesn't make any soot, right. If I don't mix it enough, it, you see a yellow flame, which is the soot glowing. That's the key, right. So, if you want a clean process, you have to mix the air in and get the efficient combustion that shows you a blue flame. So, the process in any gasifier is generally I have some drying aspect, right, ‘cause the material comes in, it might have some amount of water in it, right. Then after drying, right, you have pyrolysis, which is the initial break down, right, whereas I'm heating the material, I get partial break down, a very light gases. Right. I have a combustion portion where I have some amount of oxygen in the air that will actually react with the solid material or with the gas and burn. And the last portion is a reduction where I have charcoal then that charcoal breaks down as I continue to heat it, right, or if I have any secondary oxygen. And depending on the process, these steps can occur at different times, right. But if you guys sit around a fire outside, you'll, that's exactly what you'll see, right, the fire burns, it gets smaller and smaller, it get mostly charcoal, and if I let it keep going, the charcoal burns itself all the way out, right. So, when you look at the process, up-draft I would say is probably the most common methodology because you can push typically a lot of material through it, right. So, typically air comes in from the bottom. I have combustion at the bottom, then the reduction, pyrolysis, and drying. The issue with a pure up-draft system is that typically you need a second step to then clean it up, because the gases you produce have a lot of tars and other things that get carried away, right. In a down-draft or cross-draft system, typically the air is coming in later in the process or even from the top, right, and what that allows you to do is it allows you to have a combustion process that's fairly high and then you produce charcoal and that charcoal can either be, you can either hold it ‘til it fully burns out or in the process that we have it actually flows out of the system. The benefit is that charcoal then cleans the gas because the charcoal is sitting between 1,000 and 600 degrees Fahrenheit. It's very hot and so that charcoal breaks down all the other gaseous chemicals that come through, breaks them mainly to CO, CO_2, hydrogen, small amount of methane.

COUNCILMEMBER SUGIMURA: If I could…

CHAIR SINENCI: Member Sugimura, you have a question?

COUNCILMEMBER SUGIMURA: So, you just said that the system that we have…so, are you recommending something…when you say we, do you mean we?

MR. RATNER: So, I mean that I have a system, down-draft system in my laboratory.

COUNCILMEMBER SUGIMURA: Oh.

MR. RATNER: So, I'm…I don't mean to particularly recommend it. I think it's a good system. If it fits the problem you have, then it would fit, right. My point is not to commercially endorse it. My point is to explain to you how it works and show you how it works in my lab. And then if you have the right situation for it, which from what I've heard, seems like it. But again, I'm not testifying for that, right. I'm trying to explain to you how it works.

COUNCILMEMBER SUGIMURA: Okay, thank you.

CHAIR SINENCI: And we'll have some more questions, time for questions afterwards if Members want to write them down, and then so we'll give some time after each presentation for questions.

COUNCILMEMBER SUGIMURA: Okay.

CHAIR SINENCI: Okay. Thank you.

MR. RATNER: Okay. So, the idea is that the down-draft system produces charcoal and that charcoal then actually breaks down all the other gases that come through. And so, that allows you to have very clean gas that then goes to an engine or a boiler, right. And so that's the sort of system that I'll show you here in a second that we've been running at Iowa, right, at the university. It produces biochar as part of this process, right, which we've characterized. I'll show you some of the data from that. About 20 percent by mass, it depends on exactly how you run the gasifier, how much oxygen, all the details. Like I said, it's generally very clean, hydrogen, CO, CO2. The gas that's produced is referred typically to a syngas or producer gas and then it's typically burned either in an engine or in a boiler for energy. You can do it, like I said, in an IC engine and the system that we have, my students have worked with a company that worked on developing the technology testing various things including plastics, creosoted wood, coated seed corn, so some pretty nasty, toxic substances that require landfilling as hazardous waste and the third-party measurements were always completely within EPA limits on the exhaust, so that made it really reassuring that it was a clean process. Right. This is a picture of MSW that we tested, right. It's about, from our guess, about 70 percent renewable, which means mainly from trees, right, 'cause it's paper and cardboard. The remaining fraction was mostly plastics, which are mainly petroleum based. You can see pretty clearly, right, there's obviously little metal, foil, and other pieces in the material so even after sorting, and this is very clean material, there's still some stuff left, so you still have to be kind of aware of what you're doing. But the benefit is it's mostly renewable, you're reducing the landfill. And from everything we've seen, it should be, it's monetarily competitive with other systems. There were several questions that came up as whether this is due to really new technology for this method and what I would say is no, that the science has been known for several decades. People have been doing this across Europe, across the U.S., India had some really good pioneering work, Brazil, I have a collaborator that's been doing this for a lot of years in Brazil. So, the basic science has been known and understood. You know, there's no secrets in this process, right, it's all published, it's all, you know, fully public. Why wasn't it done before? I think this is the simplest explanation I can give you, right, if you think about portable phones, yes, existed prior to 2006, cameras, yes, day planners, yes, but then we get that. And turns out people like the iPhone a whole lot more than the other things which all existed and worked, right, they all did those exact same things but this was much more popular, right, so scientifically the same, right. But the actual sort of implementation was different, right, and that's what I would point to you is that I think a good implementation that's inexpensive, multifaceted that actually solves a lot of the problems, scalable, right, really addresses problems and makes the technology viable, right, whereas scientifically it's been fine all along. So, what are the key attributes? Simple low-cost design, right, I'll show you pictures, right, it's quite simple in photos. Produces charcoal, right, hot charcoal cleans the gas, burn the gas for energy. Ash is typically sold as a concrete hardener, so this is a standard practice for our power plant at the university and all the other power plants I've ever seen on the mainland. They sell the ash to the concrete companies, that's standard practice. I don't know if the volumes here on the island are such that that's easily doable, but I know that in the mainland that's what's normally done, right, because it is, it's a valuable product, right, for concrete. Biochar, you have some choices, obviously, you have the preta soils in the Amazon, which have lasted a 1,000 years, right, which shows that carbon black is stable in soil, right, so it's a carbon sequestration method, right, that's one option. Right. Direct landfilling, right, depending on the situation. All are all possible. So, there's the gasifier, right, so this is the gasifier we have in our Oakdale power plant, right, there's a central core, which you can see, right. The material comes in from the top, the air comes in from the top, right, there's a combustion layer until the oxygen is burned out and then the heat basically cooks the rest of the material, right. The air is drafted by the main fan that's on the boiler, right. So, the airs blows through here and out, right. As the material goes down, it's cooked longer and longer and so it turns into charcoal and that charcoal base is what does the cleaning of the gas, right, 'cause as the gas flows through the charcoal breaks it down, okay. And the charcoal then basically moves to the edges and falls off then gets taken out to char-and-ash dumpster, right, so flows over the edges and gets taken out of the system. So, this is the facility we have, right, so this is the gasifier. So, all of you are welcome to come to Iowa and visit, right, it's public, just, you know, anybody on this island can come, just ask, and I'll be happy to give people tours, right. So, it's got an insulating blanket for efficiency, right, to keep it warm. This is the inside, you're looking down the gasifier here, right. So, this is some titanium rods that basically move to keep everything well mixed, right. This is you're looking up at the top, this is the main fire tube, so material comes down and then goes out to the sides, okay. So, very, very simple design, makes it easier to maintain, if something breaks easier to fix. Right, that's some of our data. So, this is running for corn and a lot of the other stuff is very similar, right. So, you can see up here, you have a combustion layer and then you have the reduction layer, right, where basically I'm turning material into charcoal and the gas is flowing through, flows through the hot charcoal that then gets breaks down the gas into simpler components that you burn. Alright, that's the idea. Alright, preheat pyrolysis and reduction, right, and obviously depends on how you run it, will affect the depth, how much charcoal you have and so on, right. Pellets we used when we did RDF testing, we're about 30 percent plastic, 35 percent cardboard, 35 percent paper. Composition, 63, almost 64 percent volatile matter, 7.5 percent fixed carbon, 28 percent ash, which is a lot more ash than, let's say, seed corn, which is normally like 6 or 7 percent, right, so there's a lot more ash in this material. Post gasification, what you are getting out is a little over half ash, half biochar. Right, and there is some different chemical processes in terms of how the carbon breaks down into CO_2, and that's, and some of the material forms methane but a small, in our gasifier, small fraction is methane. Most of it is CO_2 and hydrogen. The char, so the char that comes out, so this is from corn. You see it actually looks like burnt corn. So, it structurally comes out still as the actual pieces, right, so it's a very, kind of, nice process in the sense that it doesn't break apart the material, so it gives you a lot of space to do clean up over the, of the syngas that basically flows through. You can see some micrographs that my students made. Right, there zoomed in, you can see, a lot of the cell walls are broken down and you have a lot of holes but this increases the porosity and also the usability of the char, right. Now, this is not as good as full activated carbon in terms of quality of char, but it's not too far and that's one of the research topics that we're looking at is basically you're going to do some steam treatment to improve the quality, to make it saleable, right. It's plenty good enough as biochar, but it's not activated carbon levels of porosity. The analysis, so for corn, for example, right, you start out, you end up with biochar that 70, almost 74 percent fixed carbon, which is very high. Mineral content, not a big surprise, quite small, potassium, right. So, 32.2 meter squared per gram, makes it a little bit below activated carbon but not bad. Carbon, phosphorous, potassium, iron, I think all things that can happily go into the soil, so it's pretty good stuff, right. So, I'm happy to take questions.

CHAIR SINENCI: Thank you, Dr. Ratner. Members, we'll open it up for questions. We've got about…we've given ourselves 10 to 15 minutes for questions, so if you want to and if we have time afterwards then we can ask questions afterward all the presentations. So, any questions for Dr. Ratner? I have a couple, Dr. Ratner. So, you mentioned the use of corn. So, the gasifiers require a green waste to burn with the waste?

MR. RATNER: So, the gasifier requires…I wouldn't…well, I guess, a green waste depends on what you call green waste. It requires some sort of organic material, like I said, the cardboard and the paper are perfectly good organic materials for that. You can run it with wood chips, you can run a mix, right. So, we've run mixes of corn with plastic, right, the pellets obviously have plastic you know, about a third. So, you need to have some sort of mixture. There's the other main sort of requirement is the material has to be pelletized or briquetted. You have to be able to make it into solid pieces because of the nature of the down-drafter pulling the gas through it, so it needs to hold its shape.

CHAIR SINENCI: Okay. And my second question was the gasifiers look like they might be anywhere from 5 to 8 feet, so for our central landfill produces 200,000 tons per year, how many of those gasifiers would we require?

MR. RATNER: So, the first answer is quite a few.

CHAIR SINENCI: Quite a few.

MR. RATNER: Quite a few.

CHAIR SINENCI: Okay.

MR. RATNER: So, ours runs up to about a ton a day. So, we're running 50 to 100 pounds of material an hour, right. Depending what you're running, if you're running something more like tires, which is very energetic, right, and more dense, you can probably get through it faster because they're producing a lot of energy and that energy helps gasify the material. If you're running really wet material it's going to be less, right, because you'll be closer to the 50-pound mark because the material just takes a lot of energy to turn this water into steam. So, there's…you're going to be in that range, right. So, if you say, so every gasifier, let's say, can do a ton a day, so if you need to do 500 tons a day, then you need 500 gasifiers, which is a lot.

CHAIR SINENCI: It's a lot.

MR. RATNER: But, like I said, the, this system, because we've tried with the company that developed it, they looked at physically scaling individual units. There's a lot of issues. There's…I mean, I could read you a long technical list, but fundamentally, the process depends on good mixing and air flow. If you lose the mixing and the air flow, it doesn't work and it works much worse. So, you're size limited per unit to a certain size to get the, you know, to get the cleanliness, right, because the, this system is very clean, right. If you make it bigger, you're more likely to get pollutant, you know, basically gas break through and you'll have to do secondary cleanup and other things. But individual-size units, it works great.

CHAIR SINENCI: Okay, thank you. Member Paltin, do you have a few questions?

COUNCILMEMBER PALTIN: Yeah, I'll try go fast. Wondering how many of your scientific journal papers were peer reviewed.

MR. RATNER: So, the 48 are all peer reviewed.

COUNCILMEMBER PALTIN: Okay.

MR. RATNER: And most of the conference papers are actually, it's a lighter forum, it's like there's like two reviewers instead of three or four.

COUNCILMEMBER PALTIN: Okay. And then what do you do with the biochar?

MR. RATNER: So, currently, we don't do anything. We do testing on it, but we basically dispose of it. We throw it on the fields or we let the…'cause we're part of the university so the power plant guys will put it out on some of their…

COUNCILMEMBER PALTIN: Use it for farming.

MR. RATNER: They don't do it for farming. They'll do it on some of the reclamation areas they're trying to rebuild the soil, so they'll put it out there.

COUNCILMEMBER PALTIN: And then when you said the ash can be used as a concrete hardener, would that be comparable to sand over here?

MR. RATNER: No, it's a chemical additive.

COUNCILMEMBER PALTIN: Oh.

MR. RATNER: So, the sand acts basically like a…‘cause you put in rocks into concrete, right, to increase the strength. You put in sand, I would, again I'm not a concrete expert, my understanding is that, again, that's filling a similar role as a hard filler versus the ash…

COUNCILMEMBER PALTIN: So, you couldn't replace the sand with the ash or the ash…

MR. RATNER: You would, you could probably use less sand because the ash is chemically making the liquid portion harder. So, when it solidifies, the concrete itself, right, the part that turns from liquid to solid is harder.

COUNCILMEMBER PALTIN: Is there any use for the ash in, like say, hempcrete that you're aware of?

MR. RATNER: That I don't know. I haven't heard anything. Like I said, I just know that, for us, it's a saleable product. They sell it and people happily use it.

COUNCILMEMBER PALTIN: Oh, you sell the ash?

MR. RATNER: Yeah, the university sells the ash.

COUNCILMEMBER PALTIN: What's the going rate for…

MR. RATNER: That I don't know. I can probably find out and get back to you.

COUNCILMEMBER PALTIN: And then when, for this, down-draft gasifier --

MR. RATNER: Yes.

COUNCILMEMBER PALTIN: --and you're talking about the fuel is, the fuel then the municipal solid waste or is that the corn or organic?

MR. RATNER: So, we've tested both. We've tested several different things in our gasifier, so this is, like I said this is my gasifier that we purchased with Department of Energy, it was a combined grant and the university money that we did testing for several years under that grant. So, we ran seed corn initially, right, that was our first test material, then seed soybeans. There was, I think one of the students did a wood chip test in this gasifier. And then we've run trash, those trash pellets, my student that graduated in May ran those pellets.

COUNCILMEMBER PALTIN: Do you need to sort through the trash or can you just throw it in there without looking at what they are?

MR. RATNER: So, this requires real sorting.

COUNCILMEMBER PALTIN: Oh.

MR. RATNER: Not a little bit of sorting. So, this is predicated on that you do very significant sorting, which is why I said that recycling is then a very important part because it's predicated on you taking out the metals, the glass, a lot of the other stuff, then you basically shred up the material, the plastics, the other organics that are left over, make pellets, and then gasify the pellets.

COUNCILMEMBER PALTIN: Oh.

MR. RATNER: So, you have an energy cost up front in making and sorting, obviously, and making the pellets, but then you have a very clean and simple system for gasifying and producing the energy.

COUNCILMEMBER PALTIN: And can you gasify sludge, like sewage sludge?

MR. RATNER: So, you…well, so we had a discussion about this. If you dry it, sewage sludge, I believe, is similar to other stuff we looked at, which was 47 percent ash, so it's a high ash content material. If you dry it out so that it's very dry material and pelletize it, you probably could gasify it. Probably the better thing would be if you mixed it with something else energetic, either rubber tires pieces or something else that had energy because the ash, you know what I mean, there's just so much ash it's not going to burn in sludge.

COUNCILMEMBER PALTIN: Okay. And then, so, like, in the municipal solid waste there's maybe like a bunch of diapers and people walking their dogs, in the little baggage's and like that.

MR. RATNER: Yeah.

COUNCILMEMBER PALTIN: So, would you sort those out?

MR. RATNER: No, so that you would leave in because the volume of that material is a lot lower, right. I mean, like I said, I walk my dog and I throw the thing in the trash as well, so I'm right there with you. That fraction of the trash is very small, so when you have things that are very small fractions, even metals and other things are okay, because, again, they're going to get captured in the charcoal, they're gonna come out in the ash that's produced at the end that you then separate out.

COUNCILMEMBER PALTIN: Last question, when you were saying that fixed carbon is not as good as activated carbon…

MR. RATNER: So, let me be more specific, right, so the fixed carbon amount that we produce is higher than nearly every other activated carbon that's, that we've seen that's measured. Typically there's 60 to 70 percent fixed carbon as material. Ours is up to 72, 73 percent, so it's higher.

COUNCILMEMBER PALTIN: I'm not clear what is the benefit of activated carbon.

MR. RATNER: So, activated carbon is sold for 10 to 100 times more on the open market. Activated carbon is used as a filter material, it's used very commonly in a lot of other applications, everything from filtering vodka to cleaning up, in fact, some of the gases or other power plants is all based on activated carbon. So, that material is very saleable, right. So, if you can make activated carbon, you can sell it for a lot, right. And so, what I was saying from our measurements, it's not as good as activated carbon, but we haven't put in effort to turn it into activated carbon, right. Typically, you add steam injection to make even more holes to make activated carbon. So, we think if we tried, we could probably get a lot closer, we just, we haven't tried, right. So, you know, a can't tell you yes, for sure, yes, no, or anything else, we haven't tried.

COUNCILMEMBER PALTIN: And the biochar is not saleable at all that's why you just throw it on the field?

MR. RATNER: The biochar is, I mean, in Iowa, people are selling biochar to farmers currently, so it is fully saleable. We don't make enough of it to justify packaging it up and, you know, because there's an effort to actually packaging and selling and doing everything else that from our university gasifier where we're nonprofit that this is a worthwhile activity. You know, if somebody wrote us a big check and said could please do that, sure. We'd be happy to do whatever, but it's just that, you know, our volume from one gasifier, which is, again, this is a research gasifier, right, is not, does not justify that.

COUNCILMEMBER PALTIN: And did you have to…sorry. I'm…I'll yield.

CHAIR SINENCI: Okay. Yeah. We have three more minutes, and we wanted to go to some of the other. Thank you, Member Paltin. Member Molina, you had questions?

COUNCILMEMBER MOLINA: Yes. Thank you, Mr. Chairman. Good afternoon, Dr. Ratner.

MR. RATNER: Good afternoon.

COUNCILMEMBER MOLINA: And thank you for the lesson. I mean, it's a lot of wonderful information. I was telling my colleague that we better get ready to take an exam after this, so but it's very interesting. The…my understanding with this process is the synthetic gas that's generated from this can be used for heat production as well as --

MR. RATNER: Yes.

COUNCILMEMBER MOLINA: --mechanical and electrical power. Do we have, in your opinion, can a sufficient supply be generated to run our electrical power plants here or even our wastewater treatment facilities? And just as a final throw in, how does this process compare to like methane recovery?

MR. RATNER: So, it's, I guess, it's, well, it's related to methane recovery in the sense that methane recovery typically people run pipes into landfills. You get the natural methane production, you run it out, you run a compressor, you run it to a gas turbine, typically, and you fire the gas turbine, right. This was a system we looked at for L.A. County when I was a post-doc at Cal Tech. Matter of fact, they're running this sort of system, and they had some issues because turns out that gas varies in composition and as it varies in composition, it can make the system unstable. So, you have to be a little careful that their turbine had issues, right, so because, you know, one day the composition is 45 percent methane and then CO2 another day it's 40 percent, and your engine can have problems so that has to be done carefully, let me put it that way. It can be done, but it just has to be done carefully. That depends on the natural breakdown of the material, which produces methane, but, one, it produces it fairly slowly, right, and it's fairly limited in the sense that some of the material breakdown depending how the material gets packed down, a lot of it will basically not break down. So, this method basically I artificially break it down because I heat it, right, and so I thermally break the material down into gases and then I can fire those gases. So in that aspect, the general scientific underpinning is similar but it's much faster because I'm applying heat, right.

COUNCILMEMBER MOLINA: Okay. Last question for this go around.

CHAIR SINENCI: Mr. Molina?

COUNCILMEMBER MOLINA: The cost, you know, to…for existing facilities, what are typically the cost to keep a facility going in order, types of improvements you would need to do? So, typically, I guess, you know, the facility you have in Iowa versus what we may need here it's almost like maybe an apples and oranges concept but any comments on types of cost?

MR. RATNER: So, what I'll say is that I know the facility that we run in, which is a university power plant, right, so there's the boiler that we feed with our gasifier, there's three older boilers that were converted from coal to natural gas that run. The facility has several operators and then it has, you know, a group of maintenance staff to actually maintain all that stuff. From what I've seen, our maintenance is less than theirs in terms of the standard equipment. We've had to do a couple of…we've had to do maintenance on ours. We've had to tear it apart I think twice in ten years. We had to replace a lid, one of the times, which cost about $10,000, which was pretty minor. That's one of the sort of appealing things particularly for me as a researcher, right, is the components are just inexpensive, right. So, if you have to replace a large component, it's just not that expensive, right, the ceramic lining because we have a lot of start stops, which is not a normal operation, right, because it's a research gasifier. We turn it on and then after eight hours we stop when the students go home, right. And so, that means that basically your insulation can tend to crack, which is, again, this is all well known as to how long it lasts, it lasts typically 80 to 100 cycles for ceramic insulation, which we hit about I think year six. And so, we had to replace it, that was about $5,000 to replace the ceramic, right. So, it's bearable, right, the costs are pretty reasonable and compare like I said to what has to be done with the regular boilers, it's been less, right, a lot less time.

MR. GUNTER: If I could interject, Doctor? Through our analysis, we could, we figure that we could do this with zero cost to the County and significantly cheaper electricity to Maui Electric than what they are currently paying for some of the systems they have that are environmentally sound. And we could also eliminate the greenhouse gases that are coming out the landfill, which is, I believe, is a 150 pounds per ton so…and the, you know, that money that the landfill now gets for the tipping charge could go for other recycling endeavors but there still would be, you know, some personnel needed, you know, if we have to landfill the biochar, any of it, or the ticket, you know, the scale house, et cetera.

COUNCILMEMBER MOLINA: Good. Well, thank you for that additional info. Thank you. Thank you, Chair.

CHAIR SINENCI: Thank you. Thank you, Member Molina. We did have one last question online and they asked about animal carcasses. Would that be something that the gasifiers would address?

MR. RATNER: So, this is very timely.

CHAIR SINENCI: Probably from hunters.

MR. RATNER: Yeah. So, this is kindly timely because we just had a paper that was accepted. It'll appear online within probably a week or two and it's open access, so it'll be free to download for everybody, looking at chicken carcasses and poultry. Particularly for avian flu, there was an avian flu outbreak in Iowa. It killed 6 million birds or 6 million birds were killed to try to keep it from spreading. Those birds were dumped in a pit and covered with wood chips, that was the method, right. And that makes a lot of folks, including myself, very worried that that could spread either into the groundwater or through other animals. So, we did a study with a gasifier design using four gasifiers, basically provide the heat and then the heat in a sort of oven-like arrangement to actually feed the material through and heat it up high enough to inoculate to destroy the virus, right, and then the material would come out and you could use it as fertilizer. So that, in fact, it can be done, you know, not directly with just, you know, I wouldn't recommend throwing carcasses directly into the gasifier, you know, if you chopped them up small enough, I guess, with a lot of other stuff you probably could, but, yeah. It's not the first choice, but there is a method for actually doing this and, like I said, that paper should be available here within a couple of weeks publicly and people can download it and look at it, like I said, it just got accepted after peer review.

CHAIR SINENCI: Okay. Thank you, Dr. Ratner. So, thank you for your presentation. If you don't mind hanging around, if we have some time afterwards if we could field more questions, so.

MR. RATNER: I'd be happy to.

CHAIR SINENCI: Mahalo, Mr. Gunter and Ms. Kealoha, for being here. Call of the Chair, we're going to take a quick recess, so we can swap out our next presentation. EACP is now in recess. *. . .(gavel). . .*

RECESS: 2:29 p.m.

RECONVENE: 2:31 p.m.

CHAIR SINENCI: *. . .(gavel). . .* Will the EACP meeting of Tuesday, November 5th, please come back to order. It's 2:31 p.m. And so, Members, moving on to our second presentation. Our next presenters will be on the same subject of environmental responsible waste management solutions, we have two speakers who work with Maritech Solutions on waste technology. Mr. John Garnsey, --

MR. GARNSEY: Garnsey.

CHAIR SINENCI: --yes, has worked with Maritech for the past 12 years and Mr. Dick Kim is the director with Maritech. So, go ahead, gentlemen, if you want to begin your presentation.

MR. GARNSEY *(PowerPoint Presentation)*: Chair, thank you very much. Aloha. I'm Vice-President as the Chair mentioned of Maritech Solutions, and I've got my colleague here, Mr. Dick Kim, beside me, and we're going to talk about what we do. And to give you an idea of what…can you hear me? Is this…oh, I need to be a little bit closer here. Maritech Solutions was established in 2008, and we're developers of alternative energy projects and that's solar, wind, waste to energy, geothermal, all different types of renewable energy projects. We represent Dynamis Energy, which is the technology we're going to talk to you about today and that is the waste-to-energy technology. It's a unique technology in our opinion, and it's patented and we've been using this technology for about the last 20 years. We make units from one ton a day to thousand tons a day. It's a scalable modular-type approach that we take to waste to energy. So, I'm going to concentrate today, or focus my talk today, on our smaller units, the 1 to 12 ton. These are modular. We call it the WasteStation and you can see right here, let's see if the pointer will work. No. You can see in the WasteStation here, these are our 20-foot containers that we, on a small system like this. I've got a little video here. It's a one-minute video which I think will show you the basics of our system and it's worth a thousand of my words. So, we'll see if we can get this to go. Well, maybe we can. Will it go? I guess it won't. Huh?

UNIDENTIFIED SPEAKER: *. . .(inaudible). . .*

MR. GARNSEY: Okay. Well, if it won't, we'll go by that and maybe come back to it unless you can get it going. On my computer it works, so. But what we do with our systems, these 1 to 12-ton systems, again, they're modular and they're portable, so you can move them anywhere you want. We concentrate, the market we focus on are the resorts, military is a big user of our equipment. I'll go into that a little bit later. Medical waste, we, medical waste, this is ideal for a lot of hospitals that have been sending out their waste. We've got quite a few hospitals that are planning on using these, setting them up beside their hospital so they don't have to send the waste out and they can generate some of their own power as well to feed back or steam to feed back into the hospital. Disasters, the islands in the Caribbean hit all the hurricanes recently, we've been inundated with requests for our units, again, for these smaller islands where they can move them around and take care of the debris. This is our unit, just a basic standard unit. Now, this is a two to three-ton unit and its got, you can see here, we have a primary burn box, I call it, and then we've got our secondary chamber here, which brings the…this produces the syngas, which this basic burn box is 800 to 1,200 degrees. You can just take your frontend loader, dump anything you want into it, this is fire brick here, you close it, you start the process, it's a simple process. Unfortunately, we didn't have the video there, but it's a PLC controlled. You just push the start button, the PLC starts all of the process, the syngas is produced. It goes into this secondary chamber where it's brought up to between 1,500 and 2,200 degrees, which is real important. But we call this a starved oxygen system and I'm going to go into that in a little bit later. You can see these are 20-foot containers. This stack here slides right in, you can see a trolley here, it slides right in there so the entire unit and two trucks you can take this unit, it's three-ton unit you can take it down any road, and that's one of the reasons that smaller villages and the military like it. Matter of fact, they asked us to do, to see if they could push it out of a C-130 with a parachute and we said, no, no, no, no, we're not quite ready for that yet, but they were serious, see if they could drop it. But anyway, here's a little flow diagram and these are the burn boxes, this is a little bit larger system than what we saw, but it's the basic same technology. You have your trash here, your syngas comes up, and is routed into the secondary chamber here, which is this long tube here, the air is added to it, temperature comes up to 2,200 degrees, and then here at the end we can convert that to steam, run a steam turbine, or just run the straight steam back into the hospital or hotel or whatever we want. So, this is your basic flow diagram, and this can be anywhere from 10 tons to 1,000 tons. We just scale these boxes up and if you, let's say, you have a 40-ton system, you can do a 40-ton system and then, let's say, 5 years later, you need a 80-ton system, you just add another one and tie it in. So, again, it's just the same building block, modular style. Here's a sort of flow chart, the same kind of flow chart that was mentioned in the previous presentation. You got your, we call it, the primary chamber, which is your burn box, your syngas goes in the secondary, and then it goes here, and you've got your heat recovery, and then the boiler, and it can go out to the stack of it can go to steam turbine. So, you can, there's several different ways you can do it, but it's the same flow pattern through the whole system. Incineration versus gasification, that's the important part of our system as well as the previous gentleman's situation or scenario. Incineration is violent by nature. It's got, needs a lot of oxygen. I always think of it as a forest fire. You look at a forest fire, you've got a lot of flames, you've got fly ash going everywhere, and it needs to be in an oxygen-rich environment, again, turbulent, heavy fly ash and that's what carries the airborne contaminants around is that fly ash. Gasification, we use the waste as a feed stock, not a fuel. The incineration is they use the stuff as a fuel. I say starved oxygen because we inject and control the amount of oxygen that goes into the burn box. We have just enough oxygen so that it will burn. And my colleague uses the scenario of a cigar, a lit cigar just sitting there and it just sort of smolders along, and if you look in there there's no movement, virtually no movement, no fly ash, no turbulence, we want it to be as quiet and still as we can make it, and that is the key to our system. We do produce the syngas between the 800 and 1,200 degrees. We produce the gas, which goes in the secondary chamber and that's how the, our gasification or most gasification systems work. Here's a little quick slide of our burn chamber or we call it our primary. You've got a hatch, which is, all of this is lined with standard fire brick, all the materials are standard. The containers are metal containers, it's beefed up, it's not your stuff that you buy at the corner store, but it's a common fire brick that you get anywhere. We line the top, now one of the key things about this design and this top is the tolerances are very close, because we pull a slight vacuum on this system with the door closed, so it's got to fit extremely tight. And then we bring in air in the bottom and then but you can dump anything you want in there; we like tires in there that's high BTU content, helps the burn cycle. And we, unlike other systems, we take basically any waste and here's the primary here, we threw a few tires in, we always like to have a few tires in there, but dump whatever waste in there and then afterwards the burn, you'll burn it for 8 to 12 hours usually and then after that you'll clean it out. And if you have multiple primaries, and I'll show you that in a minute, while one is cooling down the others is operating, so you can operate 24 hours a day. If you just have obviously one primary or one burn box you're only going to be operating, you know, on 12-hour days. You mentioned, the Councilmember mentioned sewage and sludge, that's one of the biomass, that's one of the things that we can burn in our system. Again, you have to have, it can't be all sewage sludge and it needs to heat dry, but we try, we do take any kind of municipal waste, solid waste 'cause you've got, you asked about diapers and cheese sandwiches and everything else that is dumped in there. We can dump anything in there but we like to have about 4,600 to 5,000 BTU average, that's what we sort of calculate for our system here. The, our system, we have a plant that's been operating for 19 years in Barrow, Alaska. It's a 30-ton plant per day and right now, we just put in some new controls last year, it's up to 35 tons a day. We get 35 tons a day. It's a fixed plant, it's not a portable plant. But the EPA has been monitoring that system for 18 years and with some fantastic results. You can see, I don't know if…well my pointer doesn't work, but you can see the EPA requirements, you can see California's requirements, and you can see the results for this system. Because of this quiet burn, slow burn technology, now sometimes we'll put a little charcoal filter, not a scrubber that some of these units but a standard charcoal filter in the stack to catch anything that might get through. You can see, well, the results that we're getting and they're pretty remarkable in my opinion. We also, the, I mentioned earlier that the Department of Defense is very keen on these smaller units and they spent a year at our factory. They bought 21 units but they spent a year at our factory putting all different types of trash mixtures, combinations, everything you can think of they put in there and they burn, they monitored the flue gas, everything, and unfortunately I can't share that with you 'cause it's proprietary to them but all I can say is that it was well within this scope here. They, during the Iraq war, they, you know, after the Iraq war all the soldiers left but there was tons and tons of trash that was left over from the war and most people didn't realize it, myself included. Then Iraq called us and said, hey, you guys need to come back and clean all this stuff up, you left our country in a mess. So, we're like, oh, so we, they found there was a lot of documents laying around there at the old campsites that shouldn't have been in there and a lot of other sensitive stuff. So, they made a executive decision that they were going to put one of these portable units with each camp. And so they've done that in a number of areas, we have units in Iraq and Afghanistan right now. And what they do is they burn the trash from the commissary and things like that and then with the trash, with it they'll generate a little electricity, the small unit don't generate a lot of electricity but they do generate electricity to supplement the camp generators. So, it's about .25 megawatt per burn box or per primary. So, it takes four or five, about ten tons to get a megawatt out of the thing. So, they're very happy with that and it's worked out well. Unfortunately, three or four of them that we had at the air base in Florida disappeared when that last hurricane went through. So, that's good for us because now we get to replace them but bad for the military. This WasteStation, you know, I've talked about, you saw the picture of the single burn box but you can, these things are modular so this about 4, to get to 12 tons you need about 4 of these primaries or 4 additional burn boxes. And this is, just shows a diagram here of that and again you can recuperate the waste heat, you can exchange it, you can make, turn it into electricity. One of the things here that the military wanted and we liked is we have a flue gas recirculating system here. So, from the top of the secondary, we can recapture some of that heat, feed it back into these primaries so they stay hot or use less energy firing them up to temperature. So, it's a...and the military their units were all this configuration. And this is a six ton, two, four, six or two to three, so it can be six to nine ton setup there. This is again going back to the modular side of the technology. This is much larger. You've got seven or eight primaries here. You've got two secondaries, but again, it's the same principle, you're just going to a larger scale for larger application, a bigger city, that type of thing. This is our plant in Barrow, Alaska. You can see the scale is a lot larger. This is a 30-ton plant and you can see the secondary. Look at the size of that secondary there, it's much larger. But it's a fixed plant and you can see here they're loading it with a frontend loader, they bring it in, just dump it in. These, burn boxes were recessed into the ground a little bit, so it's easier for the frontend loader just to drive up, dump the trash in. These are...there's two 15-ton burn boxes here, so we just scaled them up, same technology, just scaled them up. You can see here is one of the boxes after it's been burned, you can see the amount of trash that came back, about a half of a 55 gallon drum is the, what came, yeah, what came out. Here we have again PLC controlled, we've got a little command center here, we just upgraded this last year, because after 18 years all the electronics, all the new instrumentation is so much better, so we upgraded that last year. But that's...this is only a 35-ton plant now, the 80-ton plant that we're going to do in America Samoa will probably be a little bit larger than this. It will be larger than this but probably a little bit longer but about the same height. This here is a 400-ton plant that we've just quoted to Veracruz, Mexico, and then they called back and said, no, we need it to be 800 tons, so we're going to duplicate, we're just gonna double this, since we got 400 tons already engineered, we just said well, we'll go ahead and make this a 800 ton. But they've got severe problems there, like a lot of cities particularly in Mexico. Their current dump is now basically a hazard and like a super fund site. I mean, you can't even, they're going to close it down, it's just, it's bad there, pulled 100 tons of trash out of the river, next to the city. Earlier two months ago, saw they have severe problems but they've, we quoted this four years ago and they didn't do anything about it, now they're really in a bind. So, what I'm saying is that we can scale it up to any size that somebody would like. There are some, I put it and probably in your handouts, you'll see this, I put the, here's just the technical specs, dimensions, and things like that of a standard WasteStation just so you'd have that information. And I did the same thing with a detailed explanation, all of…the doctor did a good job of explaining it already with, let's see, with the pyrolysis and all of that. It's similar a discussion, but I wanted you to have all of this detail. And this is the rest of it here. Well, that's my presentation. I appreciate you, your time, and I'm open to any questions.

CHAIR SINENCI: Thank you, Mr. Garnsey.

MR. GARNSEY: Oh, well, I tell you what, Chair, if we could, I've got my computer, and if…I'd like to see if we can get that video to work, if that's possible.

CHAIR SINENCI: Okay.

MR. GARNSEY: 'Cause it's only a one-minute video.

CHAIR SINENCI: In the meantime, we've got a question from Member Kama.

VICE-CHAIR KAMA: Thank you, Chair. So, what is the smallest unit that you're able to create on one of those containers?

MR. GARNSEY: You mean, how much tonnage a day?

VICE-CHAIR KAMA: Yes.

MR. GARNSEY: One ton a day or two tons. One box, one burn primary chamber will handle up to three tons, but you don't have to use three tons. If you just had a one ton, you could throw the one ton in there. It's a standard 20-foot container, 20-foot burn box. So, one to three tons is the smallest we make.

VICE-CHAIR KAMA: So, when you make the, these, what you call 'em burn boxes?

MR. GARNSEY: I call 'em burn boxes, primary chamber, it just depends how you want to phrase it. Yes, I say burn box.

VICE-CHAIR KAMA: Okay. We'll call it a burn box. But lack of a better word…

CHAIR SINENCI: Pizza oven.

VICE-CHAIR KAMA: What'd you call it?

CHAIR SINENCI: Pizza oven.

MR. GARNSEY: Pizza oven, pizza oven, yeah, there you go, pizza oven, yeah.

VICE-CHAIR KAMA: Oh, okay. So…

MR. GARNSEY: Oh, there you go. She…okay, click.

VICE-CHAIR KAMA: You got it?

MR. GARNSEY: Yeah, got it.

…(beginning of video presentation)…

UNIDENTIFIED SPEAKER *(Video Presentation)*: Welcome to Dynamis Energy's short video presentation of the WasteStation. The WasteStation is a portable thermal oxidation system --

MR. GARNSEY: See, there's the stack. There's the unit.

UNIDENTIFIED SPEAKER: --used to reduce the volume of municipal, industrial, and medical waste streams by up to 95 percent. After the WasteStation has been transported to location --

MR. GARNSEY: There they opening up the door --

UNIDENTIFIED SPEAKER: --instead of *. . .(inaudible). . .* --

MR. GARNSEY: --of the primary chamber or burn box --

UNIDENTIFIED SPEAKER: --operations can be *. . .(inaudible). . .*

MR. GARNSEY: --they're opening up and see it's hydraulically operated. Here's the fire brick as you see.

UNIDENTIFIED SPEAKER: To begin operations, the hook door is opened. Municipal solid waste, --

MR. GARNSEY: MSW, municipal solid waste.

UNIDENTIFIED SPEAKER: --industrial waste, and medical waste call all be loaded into the WasteStation. After loading the waste is complete, --

MR. GARNSEY: Again, tight seal on this door.

UNIDENTIFIED SPEAKER: --the load door is closed and sealed and the process begins. The automatic control system ensures that --

MR. GARNSEY: Just a couple of buttons to push.

UNIDENTIFIED SPEAKER: --operations run smoothly with little to no --

MR. GARNSEY: It's all automatic --

UNIDENTIFIED SPEAKER: --operator interaction required.

MR. GARNSEY: --which is the…

UNIDENTIFIED SPEAKER: The primary chamber control is engaged, which notifies --

MR. GARNSEY: These are to train somebody how to…

UNIDENTIFIED SPEAKER: --the main logic controller that the primary chamber is ready for operations. At this point, the start button on the main control panel is engaged and the gasification process begins. The display on the main control panel allows the operator to monitor progress of the process.

MR. GARNSEY: Now, this is looking inside the secondary chamber --

UNIDENTIFIED SPEAKER: Synthesis gas is created from the waste --

MR. GARNSEY: -- and you can see your synthetic gas…

UNIDENTIFIED SPEAKER: --in the primary chamber. The gases are then conditioned in the secondary combustion chamber.

MR. GARNSEY: And then you'll see in a minute --

UNIDENTIFIED SPEAKER: As the gas is increasing in _____ --

MR. GARNSEY: --you see all of that, that's auto combustion.

UNIDENTIFIED SPEAKER: --the secondary combustion chamber moves through --

MR. GARNSEY: We had to feed, but now it's automatically --

UNIDENTIFIED SPEAKER: --several stages --

MR. GARNSEY: --combusted.

UNIDENTIFIED SPEAKER: --including auto combustion and the gas as seen here.

MR. GARNSEY: And it's got enough heat where it's auto combustion, so you can see that.

UNIDENTIFIED SPEAKER: The WasteStation operates with no visible stack emissions, --

MR. GARNSEY: Yeah, no stack emissions . . .*(inaudible). . .*

UNIDENTIFIED SPEAKER: --and it's based on simple but dynamic engineering allowing for lower costs than traditional technologies.

MR. GARNSEY: Turn off the ads.

UNIDENTIFIED SPEAKER: And because there are very few moving parts, the WasteStation requires less maintenance and is less expensive to operate than other systems. Thank you for watching this short --

MR. GARNSEY: All right.

UNIDENTIFIED SPEAKER: --presentation of the WasteStation.

MR. GARNSEY: I'm glad we got that in.

UNIDENTIFIED SPEAKER: For more information, please go to www.dynamisenergy.com.

…(end of video presentation)…

CHAIR SINENCI: Member Kama, you had a follow-up?

VICE-CHAIR KAMA: Yeah.

MR. GARNSEY: Excuse me. Okay. I don't know how to turn it off or maybe just quit. Okay, there we go.

VICE-CHAIR KAMA: So, I guess it's called a WasteStation.

MR. GARNSEY: Yeah. That's the trademark for that, yeah.

VICE-CHAIR KAMA: Okay. Okay. So, we'll call it that. So, what is the cost of your smallest unit?

MR. GARNSEY: It's about 800,000 to 900,000.

VICE-CHAIR KAMA: Outright? That's what it just…

MR. GARNSEY: No, it…yeah, something like that.

VICE-CHAIR KAMA: So, we just bought one from you, that's all we'd have to pay for? Is there any maintenance?

MR. GARNSEY: Well, you got to get it here.

VICE-CHAIR KAMA: Yeah.

MR. GARNSEY: Yeah. And we include some training and some things like that. The last one we sold, they had a little bit extra, it was about 1.2 million.

VICE-CHAIR KAMA: 'Cause right now our garbage is picked up by…well, I dump my garbage in a dumpster and then that dumpster gets emptied every week by the garbage company, Aloha Waste or whatever, and then they take it to the dump, but one of these would just take care of that right away --

MR. GARNSEY: Absolutely.

VICE-CHAIR KAMA: --at the apartment building without having to go --

MR. GARNSEY: Right.

VICE-CHAIR KAMA: --through all that dumping and dumping and redumping.

MR. GARNSEY: And another thing that just following on that same concept, industrial parks are using this because they got lumber and other things at the industrial park. So, at night, they're burning this right there at the industrial park cutting down on their electricity costs and not having to transport the waste away from the industrial park.

VICE-CHAIR KAMA: So, you know, one of the things that we do over here when people pass is we don't necessarily bury them 'cause we don't have that kind of a land to do that, so we just cremate. Could these things do that too?

MR. GARNSEY: You talking about human?

VICE-CHAIR KAMA: Yeah. I'm just thinking.

MR. GARNSEY: Well, to be asked, to be honest with you, we had, I'm not going to mention names, but I actually had a group come to us and ask me that same, asked us that same question, and the answer is yes. If you don't want to get into the religious aspect of it.

VICE-CHAIR KAMA: Yeah.

MR. GARNSEY: But the…we don't get a high enough temperature for the bones, to dissolve the bones.

VICE-CHAIR KAMA: That's why you got to grind them.

MR. GARNSEY: Yeah, but we can take care of everything else, but the skull and the bones are still left.

VICE-CHAIR KAMA: Right. Yeah.

CHAIR SINENCI: And, Member Kama, just for --

VICE-CHAIR KAMA: Okay, Chair.

CHAIR SINENCI: --some County statistics from the Solid Waste Division, 2,500,000 pickups per year, 90 million pounds of trash picked up per year, and so, that's just some of the amount of garbage that we…

VICE-CHAIR KAMA: Yeah.

CHAIR SINENCI: Yeah, that we create.

VICE-CHAIR KAMA: Yeah. That's why I'm asking. I'm just thinking that maybe we can eliminate a lot of that.

MR. GARNSEY: Yeah.

CHAIR SINENCI: Thank you.

VICE-CHAIR KAMA: Yeah. Thank you, Chair. Okay.

CHAIR SINENCI: Any other questions from the…we have…

VICE-CHAIR KAMA: I'll yield my time.

CHAIR SINENCI: Thank you. Member Paltin?

COUNCILMEMBER PALTIN: Thank you. So, there's no sorting involved in this one?

MR. GARNSEY: No sorting. You just dump it in, no pelletizing, just…now, you can sort if you want. There's copper cables and stuff like that. A lot of our customers prefer to separate that, but you don't have to. You can do that after the fact. It'll burn the rubber off the insulation and then you can extract the copper wire after if you want.

COUNCILMEMBER PALTIN: And just a question about permitting, like in the continental U.S. and other places like that, do you need to get permits?

MR. GARNSEY: Yes. And the EPA, you know, has a lot of records on our stuff and we haven't had any problem getting permits. 'Cause we…they've got more records than anybody because they were a little skeptical at first because of the numbers, they were so low. So, but after so many years, now it's, we use them as a reference as a matter of fact. Obviously, we do but that's, they're our number one reference, the EPA.

COUNCILMEMBER PALTIN: And last question on the picture with the island resorts, do you notice if maintenance near a ocean environment is more so than in the middle of the continent?

MR. GARNSEY: Probably the saltwater, we, if it was right on the coast we would probably treat the, you know, treat the unit with some type of coating to protect it but…

COUNCILMEMBER PALTIN: Is that what you currently do for the island resorts that have _____?

MR. GARNSEY: Yeah. We normally coat it anyway. But as far as additional maintenance, we don't see any additional maintenance. Matter of fact, the plant is not portable but the plant in Alaska for 18 years, you know, it's been maintained, they maintain it and have…but there is a cost for maintenance, but it's a minor cost because just like some of the other systems everything is off the shelf. We don't have anything that's really difficult or extra proprietary, if you will. All the PLCs are standard PLCs. All the, you know, the sheet metal is sheet metal. Fire brick you can buy anywhere. So, all of the material is pretty much easy to have access to.

COUNCILMEMBER PALTIN: Thank you. Are you currently operating anywhere within the Hawaiian islands?

MR. GARNSEY: No. At this point we're not --

COUNCILMEMBER PALTIN: Okay, thank you.

MR. GARNSEY: --but we see or believe that a small unit like this would be good for some of the smaller towns here. Yeah. That's my timer. You have to slide it. But…my assistant, yeah, okay. No problem. But anyway, we're looking at some…we think that…oh, I got it here. There we go. It's a BlackBerry, not too many people have BlackBerry's or know how to operate them anymore. But so but we feel there's some smaller towns in the area, Hana being one of them that this would be a nice application for that town. Again, it's portable, it's easy to get. It's as easy to get into as anything because you just put it on a standard truck, 20-foot container, and drive it there and you set it up in a day. So, it doesn't require any, you know, any…and the training, we would send somebody here to, obviously, train the personnel and…

UNIDENTIFIED SPEAKER: *. . .(inaudible). . .*

MR. GARNSEY: No, I haven't, maybe take it by boat over there.

VICE-CHAIR KAMA: *. . .(inaudible). . .* C-130.

MR. GARNSEY: Yeah, so there you go. Yeah, maybe that's what the military had in mind. They were going to drop it in the, parachute it into Hana. But anyway, it's… it might not make the road for Hana, yeah. But you can…I don't know how big the airport there is in Hana, but, you know, you…is it small? Okay. Well, maybe boat is our…

UNIDENTIFIED SPEAKER: . . .*(inaudible)*. . . C-130 though.

MR. GARNSEY: If a C-130 can get in there, it can, you can load both pieces in a C-130.

CHAIR SINENCI: Yeah. Mr. Garnsey, we have one more question here from Chair King.

COUNCILMEMBER KING: Thank you, Chair. So, when you had the slide where you were comparing it to incineration, how does this compare to H-POWER on Oahu? And are you calling that incineration?

MR. GARNSEY: Yeah, that's what I'm calling it, yeah.

COUNCILMEMBER KING: Okay. So, your slide said that this gasification was EPA approved. Does that mean incineration is not…

MR. GARNSEY: No. I didn't want to imply that. I'm just saying that our technology…

COUNCILMEMBER KING: Because you left it off of the slide that said incineration and you put it onto the gasification one that gasification is EPA. But is that EPA approved?

MR. GARNSEY: I can't…

COUNCILMEMBER KING: You're not sure.

MR. GARNSEY: I'm not sure of that. I just know that our gasification patent and our process is EPA approved.

COUNCILMEMBER KING: Oh, okay.

MR. GARNSEY: Yeah.

COUNCILMEMBER KING: Okay. So…

MR. GARNSEY: But I'm not saying that incineration, some types of incineration are probably with the right scrubbers and all of that stuff might pass muster with them, yeah.

CHAIR SINENCI: Okay. Thank you, Chair King. Any…yes, Mr. Molina, you had a question?

COUNCILMEMBER MOLINA: Yeah, thank you, Chairman. Thank you for the presentation. You got a…

MR. GARNSEY: Well, you're welcome.

COUNCILMEMBER MOLINA: Interesting stuff, you know, potential crematorium and…

MR. GARNSEY: That's a little creepy, yeah.

COUNCILMEMBER MOLINA: That was an eye opener.

MR. GARNSEY: Yeah, exactly.

COUNCILMEMBER MOLINA: In your handout, you mentioned that the syngas can be burned to generate products such as drinking water, can you, like, could it be used potentially for desalinization?

MR. GARNSEY: Yes. The heat, the waste heat can be used for desalinization, yes, absolutely. And we haven't done that yet, but we've had people approach us for that. I use Mexico, again, because we do, we have a lot of traction in Mexico and that's one of the areas in the Cancun area that they're talking about, using a desalinization unit, wanted to use this to feed that. I don't know about the tie in, I'm not the, you know, on the engineering side of it, but yes, that's been definitely discussed.

COUNCILMEMBER MOLINA: Good. And how many states do you have facilities in?

MR. GARNSEY: Units working? We have…all of our units are overseas. We don't have any in the U.S. except for Point Barrow, Alaska. But we are in the process of putting one right now in the valley of Texas for medical waste right in McAllen, so we'll have that probably within four or five months and all the rest are like Caribbean islands and Iraq, you know, those areas right now.

COUNCILMEMBER MOLINA: Okay.

MR. GARNSEY: So, but we're just getting, we're getting a lot more interest now particularly on the medical waste side, so I expect to see quite a few more of those in the U.S.

COUNCILMEMBER MOLINA: Okay, thank you.

CHAIR SINENCI: Thank you. Ms. Apo Takayama, do you…how we doing on time?

MS. APO TAKAYAMA: *. . .(inaudible). . .*

CHAIR SINENCI: Okay. So, if there are no more questions, thank you, Mr. Garnsey.

MR. GARNSEY: You're very welcome.

CHAIR SINENCI: We've reached…Members, we've reached our mid-meeting mark, so we can take our ten-minute break now, and then when we return, we'll have some of our clean water technology presentations. But we did want to thank Mr. Kim and Mr. Garnsey for your presentation, and if you want to hang around for --

MR. GARNSEY: Absolutely, we'll hang around. Thank you very much.

CHAIR SINENCI: --when we have some time after. Thanks for being. EACP meeting is in recess 'til 3:17. *. . .(gavel). . .*

RECESS: 3:07 p.m.

RECONVENE: 3:21 p.m.

CHAIR SINENCI: *. . .(gavel). . .* Will the EACP meeting of November 5th, Tuesday, please come back to order? It's 3:21 p.m. Members, so we will now move on to the clean water technology. Our first clean water technology presentation will be presented by Mr. Tom Woods of Synergistic Energy Systems, Incorporated. And from Clean Water Innovations, we have Mr. Peter Flowers. So, gentlemen, if you want to begin?

MR. WOODS: Okay. Good afternoon, everyone. It's a pleasure to be here with you.

CHAIR SINENCI: Okay. Hold on. Hold on, Tom. We're waiting for your –

MR. WOODS: Okay.

CHAIR SINENCI: --television shot.

MR. WOODS: Oh. Okay.

CHAIR SINENCI: One moment, please.

MS. APO TAKAYAMA: *. . .(inaudible). . .*

CHAIR SINENCI: Okay. Proceed, Mr. Woods.

MR. WOODS: All right. Good afternoon, everyone, and afternoon to everybody at home watching us on TV today. It's an honor to be here with you. My name is Tom Woods. I'm a resident of Kauai and it's really an honor to be with you all today. And my heart opens up so I might get a little broken up just talking to you guys, 'cause we get to watch you in the papers every day of what you're trying to do for the people of Hawaii and what you're trying to do to clean up these waters. And I'm sorry that my heart gets stuck in my throat whenever I talk about things I care about. But you all are doing a wonderful job and I know the hurdles that we're all up against. I, too, am in a renewable energy world like some of the gentlemen that are here today, and in renewable energy, we're breaking new, we're breaking, we're getting over hurdles, big hurdles of what we can do with the energy that we deal with on an everyday basis whether it's going to be renewable fuels . . .*(inaudible)*. . . with plastics and trash that we have to deal with to a bigger scale in the world that I work with has to do with the millions of acres that have been killed by beetle, wood beetles and things of that nature that we're producing millions of acres of dead trees across our nation all the way up into Alaska. That's the world that I work in. And with our systems, we're able to turn biomass into not only renewable energy like electricity or drop-in diesel but we also produce products like graphene, like pyroligneous acid. This is a form…it's a liquid that's very, people in Asia are very familiar with and people in Brazil are familiar with 'cause it's used in the plant world. It helps plants in many different ways. But in the quantities that we make it in unless it's highly diluted, it's almost toxic. And our company and the companies that we work with, we're looking for a solution for the millions of gallons of fluids that our plants produce. We're having a hard time finding a solution of what we can do with all of this acid that we're producing, very beneficial acid. But until a market grows in the United States, it's not a benefit to our plant producers, it's more of a liability. So, as we were looking for a solution, we were introduced to Clean Water Innovations, and the technologies they have that really, for me, was an eye opener because being a resident of Kauai and knowing the issues that we have with water, knowing the issues that you are all confronting here on Maui, I began to realize is that technology is at a point right now that we do not have to produce dirty water anymore. The technology is there. We just have to raise the awareness of the public and different industries that technology exists that we can clean up this water. We don't have to think about putting it into wells anymore. We can just, as Peter will go into it, he's going to describe to you the methodology and the technology that exists that we can create pure water. And without further ado, I'm going to introduce Peter here because I think he has something to share with us all of how we can confront the water issues that we have, the wastewater issues that we have from many different points, not just centralized, it could be in other ways. So, I'll let him tell you the rest of that story and, again, I really appreciate all of you and all that you're doing to try to handle this issue that we all have with wastewater right now.

MR. FLOWERS *(PowerPoint Presentation)*: All right. Thank you, Tom. And thank you, Councilmembers, for having us here today, pleasure. My name is Peter Flowers, and I will be introducing you to a technology that some of you may have been familiar with in the past and how we have actually taken it to the next level. I'll tell you about the technology, but more importantly, how it can be applied, where it can be applied, how it has actually been used in the municipal, oil and gas, and mining type of industries. So, this is a long name and just to clarify the different names. Awainnova is, we are the licensed, we bought the license for the technology from a company called Awainnova. They're based in and developed it all in Mexico and a counter to most technologies but it's, I'll explain it to you, and it's quite amazing. Low voltage ionic electroflocculation DC and DSA electrodes, great name but it's not a marketing name. by any means. But I'll take you so, through what we can do. Sea water, we can actually do desalination with our technology, efficiently and more cost effective than RO. Oil and gas, we can actually, we're in a project now where we will recycle for fracking purposes the water that they use. Instead of it being dumped, they recycle it and reuse it in their steam injection systems. Industrial and municipal wastewater, obviously, to the heart of everyone here, this is where it actually started and in Mexico City. Give you a bit of a history on it, it was probably, this technology is probably 25-plus-years old, but what we've been able to develop is to take it to that next level where we can actually make it economically viable. Mining as well, so what you're seeing is a mix of both organic and inorganic waste that we can deal with through one system. We also have the ability if we know what's coming in, we can actually design it so that we can produce the water levels that are required by the customer or the municipalities. You can take it right to human use, you can take it to human consumption, but most common is the agricultural level, which we can exceed any standard that exists in the U.S. Recreational use, industrial use, again, we can actually get it to a level where we've softened it as well to a point where it can be...so that it does not damage any of the equipment that the water is used for. Now, many different areas and these are just some of the areas that we've dealt in, delved into. Municipal, what are the issues in municipal? You have high ammonia, nitrogens, phosphorus concentration in effluent. You want to be able to treat it to the level of reuse that, for irrigation. What, the problem now for systems that have to deal with some of these ammonia and phosphorus issues in particular is the high cost of retrofitting anything that they have in place. We have this situation actually in Salt Lake City where we are actively, we're putting a project together that will do what's known as a side stream from their main system. It will remove the phosphorus and ammonia out of the system so they can be recycled in because the current system that they had could not do it and it just keeps accumulating and accumulating and those are, obviously, one of the highest pollutants that we have in the, generally, in the system. Now, we get into oil and gas, for example. These are just samples of some of the things that we've, we're engaged in. Generating, the wastewater generated from gas production, oil and gas production often you'll see in some...one barrel of oil you'll get up to ten barrels of wastewater, that's the necessity for...but there's some really nasty stuff in this, not only salinity and H2S, the hydrocarbons that are in there, we can _____, and I'll get into how we do that. I think in mining, so you've got the toxic metals, you've got the high levels of suspended solids, and dissolved solids. One of our key things is if you're in wastewater they understand a total dissolved solids. Total dissolve solids is one of the most difficult thing to bring down. We can do it, that's our claim and we can prove it. The technology itself, as I said, it's been over 28 years in development. It's...I think I'll get into this now. What we call electro-flocculation. What we're actually doing is we target, we have to know what we're dealing with, so we do with the analysis on the water, the influent, as it's called, coming in and we actually and then knowing what we have to produce at the other end we devise the combinations of what are known as anodes and cathodes or electrodes in general that carry a positive and negative charge. So, the only consumables in our system are these sacrificial electrodes along with the power or the direct current power that we use to generate this environment. This is where everything happens in this chamber. We call it the reactor, but what happens is we actually change the actual compounds, chemical compounds within this chamber. What does that do? It separates out water, for example, from different things but it also makes them so that they can actually flocculate which means they go up to the top or they just fall out on the bottom of this chamber. Now, we use what is called low voltage direct current. So we can...we don't have to have anything special as far as power coming in, a 440 or 220 even, we can use coming into our system. The direct current is around 40 volts. Water offers high conductivity; electrodes are extension of the power supply to the system. The key thing and obviously where the intellectual property lies is what these electrodes are made of and how they are designed and it is specific to each site. In other words, we do a site in Lahaina or if we come here, we may do a different combination of electrodes depending on what's in the water. That allows us to create modules of various sizes that will do a point solution or a general solution depending on what the problem is, but you have to find out what the problem is first. And there's no one solution that fits all, that's why you have giant systems there now and things like ammonia and phosphorus and nitrates get through it. So, it can take most of it, but you're missing some of the key pollutants in the water. Just to give you an idea of a simple, this is a very simplistic flow chart of the process. Here's you source of influent, maybe the wastewater or a part of the wastewater or a side stream or direct from industrial waste or whatever it may be. We've done the analysis on it. We've done the lab testing on it. We know exactly what we're going to put in here and the power that's required to generate a change in that molecular structures so that we can participate…we can extract and separate water from all other component, compounds. Power, reactor, and then you're into more standard things, sedimentation capacitor and filtration equipment, ionization. These are not that…these are not, these aren't the magic. The magic's right in here, where we can actually do that separation of molecules. From that, what happens is you have obviously sludge coming off this and it's collected in the sludge. The sludge is innocuous, it's inert. You can take it right to landfill. Big claim. Now, one of the systems, and I'll get into where it's being used, I'll tell you about how this things works. Now, I'm going, not going to get in to this one, it's a little bit detailed but it gets into the stages of what happens in that reactor. It's hydrolysis, it's activated oxidization, it's electromagnetic fields, it's also all the physical reactions that happen. So, it's actually more than…most of the industry comes to here. At this point, this is well known and a lot of people do it but they haven't been able to do it…they have to do it in a fashion that is highly, let's say, the O&M cost of it is very high. So, it hasn't made it practical. We've been able to achieve levels that make it practical and add further science into it that makes it a viable technology. So, why are we better? Well, this electrode, this combinations, anybody else in this field is probably dealing with two to five combinations. We're at currently at 7 and 24 and growing, and that's different types of electrode plates and rods that are required custom design for each reactor. System utilization, as I mentioned just previously, electrochemistry, electrophysics, electromagnetism laws are all deployed, used in this process. And again, roughly we'll go through innocuous sludge, water treatment has been proven technology and I'll get into where it's been proven. No chemicals needed, nothing added to this thing, very important. No odor from the plant. You install this, these plants are installed in Mexico and they're in a garage, in a parking lot, underneath a big shopping center. It is their full wastewater treatment system and there's no odor from it. What we do now, I just want to take you through kind of the process that we follow when we want to look at a particular opportunity. Obtaining the fluid quality of the water quality and quality data meaning exactly how much arsenic may be in your water, how much in the influent, how much nitrogen, how much phosphorus, how much…once we know that, we can design a system to remove it. We've had challenges of cyanide. We've been able to remove cyanide from this water. One of the original projects was to remove TNT and that is a chain of about this long and been able to break it up into smaller and precipitate that out. So, we got other samples. We determined the optimal point or treatment process. We want to know how much volume we have to deal with and what standards and targets that we have to achieve or go beyond. We will design the system and price it out. We do not even, we won't only give you a price, if we have gone through, we do this first initial stages. We determine, yes, we can or no, we can't. And no, we can't, adios. We haven't had to say adios yet. The design of the treatment systems, the project O&M costs, these are all the information that you provided from us when we provide a quote. We do…we have options to sell it, lease it. On terms from an economic perspective, we make it viable in any fashion that works for the customer. So, we provide both to, obviously, municipal environments and, obviously, private industry. Just to give you kind of the feasibility testing, it's really interesting because this is the sort of stuff that you have to do to actually test what's in that water. This is a sample and I like this one because it shows you different stages and when you do reactions in the order that…and what types of material actually comes out of the water. And this was, I think, if I recognize it, that looked like it came from actually the oil fields up in Canada. So, basic advantages of the technology, you get the, you can obtain the water quality that you want. It's up to you. It's a flow through process. It can be turned on and turned off. If you only, if you want it to work from 8:00 in the morning 'til 5:00 in the afternoon, so be it. That's how they're actually using it in one of the installations. The…there's…it can be, the water can be recycled, reused without limit. If you're, if anyone's familiar with RO, RO does about, if you have a gallon of water, you clean about 70 percent of it and there's 30 percent of brine. In one of the…what we have been asked to do is actually clean the brine of the RO systems. Now, process, 100 percent including the dissolved solids. Dissolved solids are one of the trickiest things to get out in water, in cleaning water and we've been able to achieve that and it's really through that electro-flocculation system that we've designed. It's reliable and low operating costs. It has a small footprint, let's say we do 250,000 gallons a day, that will take up approximately 2,100 square feet, so not even as big as this room. So, it's very economically and it can be modified and such. Here's some examples of some of the challenges we've had. We've take, ammonia was at a level of, that's milligrams per liter, 261, the target was, we'll take it to 15, no problem, phosphates at 7.58 down to 2, TDS from 120 down to 10. We've had other TDS in the 16, 2,000 level, we can drop it down. That's where a lot of the systems like RO cannot handle high TDS, where we can. I wanted to talk about this one 'cause this is where it all kind of started, . . .*(inaudible)*. . . In Mexico City, and you've heard other people talk about problems in Mexico City. They basically ran out of capacity. If they wanted to expand, they could not actually grow. So, Walmart being one of the biggest gross companies in the world put out an RFP worldwide to try to find a technology that they could put on site and deal with all their issues. That was over five years ago and the original plant is still in operation and they are recycling not only the water within the building but they're actually recycling the sludge that's produced. In Walmart building, it was not drinking water requested, just…and for the most part that's a difficult sell more from a human perception perspective than the actual science behind it. You know, toilet to tap is not quite there in our heads, so what we find is most of the requirements come to either agriculture or reuse within toilets and things and whatnot. So, a key thing, they have everything. I wanted to point out in this Walmart environment, they have associated a apartment complex. So, you think of it as one of these giant malls with apartments attached to it. All the different types of stores, Walmarts, they produce meat byproducts, they have dairy products, everything goes down the toilet, everything comes into this system. It is basically a microcosm of a large municipal system. That's what's being done. That's what's been done for over six, five, six years now. They're happy. They're going to grow. They've put in a request to grow this company and grow the store locations in Mexico to over 500, so the demand and the success of the product is proven. Take away, I want to really stress again this cross section. It has that similarity to any municipal environment, but at the same time, we can address any specific issues. We do the analysis upfront so we know what we're dealing with. It's not a one size fit all. That doesn't work anywhere. Some of the customers, you'll know some of these big names, Walmart, Cargill, SuKarne, it's in Mexico at this point in time. We have been…CWI or Clean Water Innovations is about one year old. We started this. We are dealing…we are very active and have generated a tremendous amount of interest in multiple industries. We're working with municipal; we're working in Colorado with both oil and gas and municipal. They're looking to generate drinking water to one of _____ a town from deep water reservoirs. But there…that's not drinking water, they're pumping out of the water, out of the ground, it's toxic. It cannot be used. We can clean it, bring it to the level required. So, these are kind of the size. Now, modularity is very important, whether you can build something for 15,000 gallons per day, another one. This one, just, we just want to say that this is in an open area. This is doing all the sewage treatment and it doesn't smell. There's no complaints from any of the neighbors or anything like that because everything is changed instantly in that reactor. Larger systems, this one does 200 or it'll go up to 250,000 gallons per day. As you can see, we can size modules and then duplicate those modules for growth as required. So, scalability, not a problem. Difficulty of influent pollutants, not a problem. Those are the key things that we can do. The…this is actually tough; I don't know if you're familiar but textiles puts some really nasty stuff and chemicals into their waters. That's been…and we've been able to clean it. So, this is my conclusion slide, but I really wanted to, you can read it, I mean, you know, we've got pilot plant and design. It can do…I want to…the last point is probably the most relevant to situations that you may have. And that is design it to fit, centralized or decentralized, and to tell you the truth the move is towards more decentralized than centralized in treatment because if I'm treating water from a new residential area, I can clean that water right there and then. If I have a new industrial area that's generating a lot of potential nasties in there, we can target that and clean it efficiently versus trying to clean everything in one giant pool. We can do that too. I mean, there's systems out there and where you, like I said, in Salt Lake City they want to have side stream because there's particular items that they want to remove and we can remove that for them. So, I want you to think of this as a tool when you're looking at problems that rise up wherever it be in the islands, it has something that can be of value. Just so you get understanding of price points, you'll probably…everybody's familiar with reverse osmosis, we're half the capital cost, probably one-fifth the operating cost, and half the electrical cost. So, I'll leave you with that and, of course, if you have questions, I'm happy to entertain anything you have.

CHAIR SINENCI: Thank you, Mr. Flowers. Members, in the interest of time I'll take one or two questions, if we have any, if not we'll keep Mr. Flowers and Mr. Wood up here and then we have two more presentations on water technology. If we can have those people come up and then maybe afterwards we'll take just some general questions for the water technology section, if there are no objections.

COUNCILMEMBERS: No objections.

CHAIR SINENCI: Okay. So, we can wait for some questions afterwards, okay. So, Ms. Apo Takayama, we were gonna bring up Mr. Orr and we have online…and Mr. Liggett, and then we have online, Dr. Nieusma. Mr. Flowers, you guys can stay on, yeah. We'll take a quick recess. *. . .(gavel). . .*

RECESS: 3:50 p.m.

RECONVENE: 3:55 p.m.

CHAIR SINENCI: *. . .(gavel). . .* Will the EACP meeting of Tuesday, November 5th, please come back to order. It's 3:55 p.m. And thank you, Members, for your patience. We have two more presentations on water technology. So, next we have Mr. Travis Liggett, President of Reef Power LLC, and he's gonna share with us his work using the East Maui limu to clean our ocean waters. Mr. Liggett?

MR. LIGGETT *(PowerPoint Presentation)*: Aloha. Thank you, Chair. Aloha, everyone. Nice to see you today. My name's Travis Liggett and I'm president of Reef Power, which is really just me, a researcher, at this point, but I'll tell you what I'm getting into.

CHAIR SINENCI: Travis?

MR. LIGGETT: Oh, sorry.

CHAIR SINENCI: Yeah, we want to *. . .(inaudible). . .*

MR. LIGGETT: Put this up. So, I'll tell you a quick story. I got sick from wastewater when I was little to the point where I had to wear gauze around my hands, I had sores to school, to the point where we had to move away from the river where I lived. So, this is like an early childhood trauma for me that really formed my whole career, so.

UNIDENTIFIED SPEAKER: *. . .(inaudible). . .*

MR. LIGGETT: Indiana, Mississinewa River.

UNIDENTIFIED SPEAKER: *. . .(inaudible). . .*

MR. LIGGETT: Yeah…no. But when I, after this trauma, I came to Hawaii in 1984 and I saw the reefs and it was just such an inspiration that the whole world wasn't ruined. There was somewhere that was still pristine. When I came back in '99, I saw the reefs how they were then, that's when I decided to go back to school and try to solve this problem and this is the result of that. So, the reefs are in trouble and I've been told I have ten minutes, so I'm going to try to rush through this. The reefs are in trouble. We all know that. There are three municipal facilities that inject wastewater. This is what the plume of an injection well looks like. The waters injected down and because it's freshwater it floats on the saltwater substrate and flows right into the ocean. This is a visualization of the plume in Kihei. It's about a mile wide. It's about 2 million gallons a day injected and it's centered around Kalama Park. And what we can see in the limu that live in this plume is that they have elevated types of a certain nitrogen that are associated with human wastewater treatment, N-15. Same in Lahaina. So, what we see is the limu is already cleaning this up. They're already doing this job for us, so this is kind of their natural role. They're both the indicator and the response to nutrient problems. In all, the County dumps about 14 dump truckfuls into…a year into the ocean. It's about four pounds for, per person on the municipal system. So, we look at how is surface water treated of nutrients in Maui naturally and in these streams we have freshwater limu. Now, limu in other, the Hawaiian word for algae. Algae created our atmosphere. They are the material that created all our petroleum products. And when they created all that oxygen a long time ago, they actually created more than half the minerals on our planet due to the great oxidation event. So, they're major players in the life support of our planet. So, what if we take the algae and we put them into a system that's basically like a synthetic stream. It flows through just like a stream in East Maui and the limu consume the pollutants and use the biomass for various tasks. This can be scaled up to several acres as this test system in Florida. And if you look close at a test system you'll see it has a mesh where the algae attach and at the top is a headworks, it creates pulses of water that create a turbulent type of flow that the algae like. They don't like it just be flowing smoothly. This is a close up of the mesh. You can see how the algae, many species, will attach to it. Here's a close-up of some limu. This is a system on the mainland. And if you…these are actually Hawaiian, Maui species. And if you look up close, they're actually quite beautiful. And Councilmember Rawlins-Fernandez asked me what species I had last time and I've identified it, it's Chlorophyta, Rhizoclonium hieroglyphicum. So, but yeah, there are…

UNIDENTIFIED SPEAKER: *. . .(inaudible). . .*

MR. LIGGETT: Limu, there's no Hawaiian name for this specific species. A lot of these are found in other parts of the world, so they have names from other places. So, this is a large-scale system. You can see the surgers create a large surge at the top of the flow way and it flows across the algae much like a synthetic stream bed. Another picture of a scaled-up system that is what one might look like in Kihei or Lahaina. And what is the scale of this? So, how much stream bed do you need to clean up, say, Kihei, which is 2 million gallons per day? That would be about ten acres, basically aquaculture of limu. So, that sounds like a lot to pave and put algae on, but, you know, it really is a matter of priorities. We pave 12 acres for Target and didn't even think about it, so if we make the reefs a priority then ten acres really isn't that much when you think that we farm 36,000 acres of sugar cane. So, when we grow all this algae on the wastewater, it creates a lot of biomass, 50 to 100 tons per couple acre installation per year and that biomass can be composted into viable potting soil and the potting soil can be used to, with, along with the water to grow a giant forest, like 100-acre forest instead of injecting into the water. Now, you know, reuse is not new. Everybody says we should reuse everything, but reusing in the standard way to, say, a new golf course requires a lot of infrastructure to get the water to that site. And we just build or plant a forest right there next to the wastewater facility, we avoid all those costs. So, it's just kind of a shortcut to what everybody wants to happen. Now, I've done some studies of how big would this forest have to be in order to take all this wastewater. Now, once we've treated it with the limu, the nutrients go down about 90 percent. So, there are two constraints in the code when you reuse, evapotranspiration, how much water the plants can take, and nutrient uptake, which is how much nutrients they can consume. So, using those two methods I honed in on about 1 to 200 acres for Kihei and that is somewhere between the size of Maui Nui Golf Course and Maui Meadows, so it's not huge, it's big but it's not like, you know, we drip irrigated all that sugar cane. It's really a matter of priorities. This is a visualization of 7 acres of algae, limu, and about 70 acres of forest, so, you know, it's not that much bigger than Monsanto, so again it's a matter of priorities. Here's a zoomed-out view. It's really not that much area of Kihei. I did some basic cost estimates and to eliminate injection and develop about 4 to 500 acres of forest for disposal would be about $100 million. That sounds like a lot, but we compare it to an ocean outfall, which is supposedly hundreds of million dollars per facility. I've heard a technical rumor that some people in the County think it will be a billion dollars to eliminate injection. I can do it for 10 percent, $3 per visitor per 10 years, and I can eliminate injection. I receive and am in the process of receiving a grant from a private foundation to demonstrate this at small scale at Maui Solar in Kihei. This is a small prototype in Germany. We would do one about 100 feet long and what the gives us is the removal rates and the biomass production rates of the algae so we can do the math to scale it up and see how big a large-scale system would be. And, you know, we're at a crossroads here. We could be the County that, you know, opens the door for polluters, which we're going to the Supreme Court tomorrow, I guess, or we could be a bastion for other little kids that come here, who come from polluted places, and fix this so we get back to where we were. And the holy grail would be to be nutrient neutral, not discharge any nutrients into the environment and it's doable. I'm telling you it's doable. And there's my handle, Reef Power Maui if you want to see some more and that's it.

CHAIR SINENCI: Thank you, Mr. Liggett. If you would want to hang tight, we'll have our --

MR. LIGGETT: Sure.

CHAIR SINENCI: --last presentation and then we'll, Members, we can take some questions afterwards. Thank you. Mr. Orr? Next, we have Mr. Dennis Orr, the sales marketing specialist from Twin Oxide-Hawaii and then Dr. Joe Nieusma will join us after his presentation. So, Mr. Orr?

MR. ORR *(PowerPoint Presentation)*: All right. Let's try this again. Thank you, Chair. Thanks, Council. Aloha. My name is Dennis Orr and I'm with Twin Oxide, again, sales and marketing but it's more than that. I learned about this product, basically taking out biofilms in my sailboat and cleaning up the drinking water there and it's just gone so much further. With some of the folks earlier, learning a lot, and again, I live here, I love this place and I want to do everything I can to help the aina as well as take care of generations to come. Twin Oxide is a total water treatment. It's more, it's a disinfectant. Twenty-first Century water disinfection, we need the disinfectant requirements that they last long enough with a full spectrum disinfection capacity against all known microorganisms in the water without the carcinogen byproducts, carcinogenic byproducts. It's got to outperform it without all the side effects that, honestly, a lot of times now we're trying to correct the side effects. It's got to be safe for our health and also eco-friendly, easy to use, store and transport, no hazmat requirements, if possible. It's got to be safe to handle, simple to apply so you don't have to have a million different certifications to do it. And it's got to meet or supersede all of the stringent quality standards all around the world, some of which change as we're learning now, and it's got to be cost effective. None of the conventional water disinfection, disinfectants now meet these aforementioned practices, or wishes, or demands. The governments and the water industry have been looking for a long time to, for substantial eco-friendly, sustainable eco-friendly alternative to overcome the limitations and problems that we're facing with the current disinfectants. Many of the chemical and mechanical concepts that have been tested already and evaluated, they come up with new problems and such as well. Most commonly used disinfectant is chlorine and for more than a century it's been used in our drinking water and used to save lives and destroying germs in unsafe water sources. Despite substantial progress made, the use and application of the chlorine still implies a number generally acknowledged disadvantages and hazards. The hazards with chlorine involve safety, environmental, and health-related risks and effects. Use of chlorine causes wide range of carcinogen mutagen, carcinogen and mutagens in the drinking water. THMs, HAAs, Mutagen X, and all of these things are linked to cancer, miscarriages, stillbirths, and birth defects. The Mutagen X is 170 times more potent than chloroform. Why chlorine dioxide, which is what Twin Oxide is? It's present biocides have limited capabilities. The 20th Century water disinfectants are under increasing regulatory scrutiny, safety, water control, health and health play an increasingly important role in potable drinking water and the food chain. It has to have the clean water as well. Increased consumer and political awareness of water in combination with growing health and environmental, environment consequence requires a 21st Century answer and the answer is Twin Oxide. The Twin Oxide solution was first discovered in the late 1800s and since then the superior disinfection of CLO2 has been well researched and documented. It's proven to be a superior sterilant and all microorganisms, it's safe, reliable, and consistent batch processes. Chlorine dioxide is EU, U.S. EPA and NSF approved and listed in the WHO Guidelines for drinking water quality. Chlorine dioxide is also recommended by the Building Services Research and Information Association as the best available technology to control legionella in hot and cold water systems. Broad spectrum of antimicrobial efficiency. The time versus concentration record over a wider pH range. It doesn't build up immunities to, these microorganisms don't build up immunities to it. It's a highly selective oxidizer that doesn't break down in water and/or build a toxic or carcinogens, I spoke about earlier. It's a superb oxygen or oxidant for iron, manganese, nitrite, phenols, and hydrogen sulfide. It's favorable for an environmental footprint and green chemistry. It doesn't hurt the ocean, non-corrosive. Improved aesthetics, it takes away orders, taste as well in the water. And instead of onsite generation, it's safe, simple constant, or a consistent batch process. It's reliable results and consistent from quality and quantity, it's the same every time. Unique formulation developed in 10 years producing it, it's 99.9 percent pure, stable chlorine dioxide for 30 days, and this has resulted in a cost effective, safe, simple, and reliable solution. It's the only one being used in the states today as the sole disinfectant from water plant to point usage. You can put in at the water plant, clean the system all the way to the faucet. Produce zero TTHMs and HAAs over the two-year process that we've done it here much more than that out of the country. Demonstrated effectively to remove biofilms in the drinking water systems. The way it works is you take the amount of water, put the A and B components together in it, it's got a waiting time and depending on the amount of time that you're or the amount of volume that we're putting together and the temperature, we create the solution. Slightly stir up the solution after the waiting period and you have a .3 percent or 3,000 parts per million concentrate that can be used in many different applications. It's an effective, full elimination of all known water microorganisms, bacterias like giardia, legionella, viruses like hepatitis and anthrax, protozoan, crypto and giardia, and it also takes care of yeast, fungus, algaes, and cysts. Ten times more disinfectant power than chlorine, but it's compatible and synergistic with it. Long lasting residual disinfection capacity throughout the water systems, 72 hours for us, only 2 to 6 hours for the chlorine that's currently used. Effective in the broad pH range and doesn't build up on the resistance. Biofilm removal works great and the E.coli, legionella, listeria, all of that in the water systems, no problem at all with it running through. Zero THMs, zero HAAs, low toxicity, water soluble, and the byproducts or the disinfectant byproducts like the chlorite and chlorate. No claims, problems with it. No adverse taste, odor in the disinfected water. It's green, environmentally friendly, UV sensitive, marine friendly, obviously, in large doses wouldn't be but as many other chemicals that we have in use but at the relevant doses is perfectly good in the marine environment as well and releases into the ground, release into the ground is permitted. There's some economic advantages in this biofilm removal, lowers your overall disinfectant demand at 60 percent, increased infrastructure life, you don't have to flush it like many of the products that we currently use. Cleaners and filters, talking about the desalinization plants, it saves those components as well. Reducing demand, the biofilm removal, the algae, the spores, all of that is not, is can be eliminated, definitely kept at bay. It extends the infrastructure life, lowest oxidative potential of all oxidative disinfectants, lowest dose of all disinfectants by ten times, neutral pH. Biofilm removal eliminates acid producing bacteria that's corroding the pipes, et cetera. Low safety cost and low personnel risks, helps out with insurance in that as well. No environmental hazards or disaster insurance required either. And five year shelf life on the product. Typical dosing system here, it's pretty simple. There's a storage vessel, a spare vessel, and your dosing pump, injection point placed either into the system or into before in between a say catchment system or a house on the Big Island or Upcountry here. It can be done on a very small level or a very high level at the treatment plants. The technical equipment and apply to standard level of sophistication in the dosing system and we can build any program that we need to for you. Pretty simple, the sensors, dosing pumps, and a flow sensor. Most of this stuff, a lot of the systems we have now already have in place. We put a small, a few small flow sensors and the proper dosing pumps in it and be able to take care of it as pretty much a swap over in some of these chemicals. Industry and applications, it's not just used for water treatment and water disinfection. In the drinking and wastewater plants it can be used for the water disinfection, biofilm removal, legionella control, effective against all microbes, no known resistance to the buildup, like we were talking about, and as I had explained earlier, this is a lot of redundant stuff as well, in the livestock industry, we can put it into the water systems for the animals. It cleans the water system going in, it cleans the animal and as it goes out, as it comes out of the animal and onto the production line, et cetera. All the way to market it can be used because it's also food friendly. Into the meat and poultry processing, lots of different stuff that it does there in the processing plant as well to market. Maritime industry, drinking water disinfection, water circuit treatment and, I believe, the crew ships and stuff that are running around a very good product for them to be using as a disinfectant and all of the different areas 'cause when it hits the ocean it's not going to do any damage. Some awards and basic certifications. It's been used all over the world for over 15 years. Why it hasn't been in here? I'm...it's a good question. Twenty-first Century alternative to chlorine, stabilize chlorine dioxide and other 20th century disinfectants. With Twin Oxide, chlorine dioxide is available without that expensive generator and danger. High purity and enhanced stability. Very effective against all known microorganisms, bacteria, and viruses, protozoan, fungi, yeast, and algae. The best available technology for biofilm eradication and legionella control. Optimization of your disinfection results with less chemistry. Easy to transport and stock, safe to use, simple dosing, plug-and-play system. It's not corrosive, as I said earlier, it doesn't blow up there, doesn't mess up the machinery and things in place. Meets or supersedes the world's highest quality standards, endorsed by many governments and companies worldwide. Applicable for potable water, wastewater, and cooling water. The cooling water process, RO membrane cleaning, et cetera. One single concept addresses multiple challenges in water disinfection. And that's it. Thank you very much for your time. Hopefully we can get Dr. Joe on to answer any questions that you might have.

CHAIR SINENCI: Thank you, Mr. Orr. Yeah, we also have Dr. Joe Nieusma. And he's also available for questions from our Members.

MR. ORR: Yes. Can we get him on the phone already?

CHAIR SINENCI: Did we get him on? I believe we do. Okay. While we get Dr. Joe, Members, do you have any questions for any of our water technology systems presentations? Anything blaring came out as question? Chair King?

COUNCILMEMBER KING: Actually, I did have a question for Mr. Liggett about the limu project because you were saying that the actual limu that's in the ocean right now is cleaning some of the effluent out of the waters. Was that, did I hear you correctly on that?

MR. LIGGETT: What I'm saying is you can see around the world where you have harmful algae bloom there's always a nutrient problem. So, if you look at the integrated system of the ocean, they're the custodians, they respond, they're both the indicator and the response to nutrient imbalances. So, in Florida, they have terrible nutrient problems and that's why we're seeing their, those blossoms there.

COUNCILMEMBER KING: Okay. But there are, you're, so you're project is promoting algae to clean the waters, so does the algae that's in there, is it cleaning anything out of the effluent that's bubbling up under…

MR. LIGGETT: You could say it's cleaning it at the expense of harming the reef.

COUNCILMEMBER KING: Okay.

MR. LIGGETT: So, it's just an imbalance in the system. I say it's like if you had a mansion but you had so many parties that the, there were hundreds of custodians in your house all the time and you couldn't enjoy your house, it's kind of like that.

COUNCILMEMBER KING: Okay. And then you're using the word limu kind of broadly to just…

MR. LIGGETT: Right. There's freshwater limu and then salt, well, ocean limu. Most people think of ocean edible limu when they hear the word limu, but the word, the Hawaiian word limu, is actually more broad than algae, it's moisture loving plant according to _____.

COUNCILMEMBER KING: Okay. No, I just I was going to ask you about that --

MR. LIGGETT: Oh, sorry.

COUNCILMEMBER KING: --because I do like to eat limu and I want to make sure that what I'm eating, if it's coming out of the ocean, isn't full of all these toxins that…

MR. LIGGETT: Well, I saw a really cool graphic from an oceanographer at the university here and there was a very cool graph about where this N-15, this nitrogen associated with wastewater processing is found and it's pretty much a gradient away from the wastewater facility. So, basically the further away you get, the less of the N-15 that you'll find in the limu.

COUNCILMEMBER KING: Okay.

MR. LIGGETT: But I wouldn't eat it from next to the facility.

COUNCILMEMBER KING: Okay. That's good advice.

MR. LIGGETT: That's just my opinion.

COUNCILMEMBER KING: Okay. And then you said you have a grant. Did you find a site to actually…

MR. LIGGETT: Yes, Maui Solar, the largest solar array on Maui. It's, they've got a facility right there next to the wastewater facility in Kihei. It's actually the old _____ algae farm. I actually used to work there, so.

COUNCILMEMBER KING: Oh, okay.

MR. LIGGETT: Yeah.

COUNCILMEMBER KING: Is that the one in the R&T park?

MR. LIGGETT: No. It's actually right adjacent to the wastewater facility next to the recycling place.

COUNCILMEMBER KING: Oh, okay.

MR. LIGGETT: Yeah.

COUNCILMEMBER KING: Is it still there, the algae farm?

MR. LIGGETT: It's not an algae farm anymore. They have a chocolatier, a beer brewery, a kombucha brewery, a defunct tilapia farm, all kinds of really cool stuff going on there.

COUNCILMEMBER KING: Okay. Alright. Well, that'll be interesting. And do you have somewhere to put the water after it comes out?

MR. LIGGETT: Yes, we're actually doing a test stand with trees as well. We're working on our reuse permit for that right now.

COUNCILMEMBER KING: Oh, okay.

MR. LIGGETT: But we're actually going to demonstrate that we can grow trees, what species, how much we're going to water them, we're really trying to prove it so that we can just scale it up.

COUNCILMEMBER KING: Okay, great. I hope you find some indigenous trees to plant.

MR. LIGGETT: Yes, we're looking at ohia and ahalee [*sic*], yeah. Thank you.

COUNCILMEMBER KING: Okay, great.

MR. LIGGETT: Oh, sorry.

COUNCILMEMBER KING: Thank you.

CHAIR SINENCI: Thank you, Chair. Mr. Molina, you had a question?

COUNCILMEMBER MOLINA: No. One question for the Twin Oxide presentation. Have you had a chance to discuss this product with our Water Department?

MR. ORR: I've spoke to a couple of people at the Water Department but not high enough up to actually get much interest yet.

COUNCILMEMBER MOLINA: Okay. And you mentioned the communities in the United, mainland, can you give us more specifics on that? Which communities you've had this, your product?

MR. ORR: I think we've got Dr. Joe online now too, right. Yeah, Joe, can you --

MR. NIEUSMA: Yes, I'm online.

MR. ORR: --tell *. . .(inaudible). . .* a little bit about that?

MR. NIEUSMA: I couldn't hear the question. Please repeat it.

COUNCILMEMBER MOLINA: Yes. Doctor, the question is what other communities do you have your product in? What other municipalities or states? Can you elaborate on that?

MR. NIEUSMA: *. . .(inaudible). . .* One more time.

MR. ORR: They're looking for where we're using Twin Oxide stateside and around, basically what you're using but around the world if possible as well.

MR. NIEUSMA: Okay. Twin Oxide is being used in Europe. It's being used in India. It's being used in Australia. It's being used in Africa. Our largest drinking water facility is in Africa. Right now it's 62 million gallons a day in Burundi, Africa using nothing but Twin Oxide. We're using it in wastewater in a couple different places in Florida. We have it in drinking water in Florida and Texas and Colorado. We have it in post-harvest agricultural uses in Florida and Washington State in the apple industry. We have it in dairy farms in Georgia and Wisconsin. We have it in chicken farms in Arkansas and Georgia. So, there's quite a bit of use, and we have it in Puerto Rico and we have it in New York City and all around the eastern seaboard for legionella control and infection control in assisted living facilities, high-density apartment complexes, that type of thing. Cooling tower work, Puerto Rico is using it for drinking water and wastewater issues and the manganese control in the drinking water supply. And we have it in breweries in Seattle, in Florida, in the main Heineken brewery in, over in the Netherlands. We have it in Coca Cola in Mexico. And quite a few places in Brazil. So, it's a fairly international product.

COUNCILMEMBER MOLINA: Oh, okay. Thank you for that information, Doctor. If maybe at some point, we could get the specific municipalities where your product is being used at, maybe some of our Water Department representatives if interested they could contact some of those municipalities. That would be helpful. Thank you.

CHAIR SINENCI: Thank you, Member Molina. Any other questions for our water systems? I did have one for Mr. Flowers. Just a real quick question about electrolysis…

MR. FLOWERS: Electro-flocculation.

CHAIR SINENCI: Electro-flocculation and how does it address the phosphorus and nitrogen and…

MR. FLOWERS: I'm sorry. Is this on?

CHAIR SINENCI: Did I butcher that?

MR. FLOWERS: Oh, okay. So, the electro-flocculation, think of it as a chamber that is designed to go after the chemical compounds or the, such as ammonia, nitrogen, et cetera. What it does is it creates a flocculation that either the pollutants are attached to or they're driven down through magnetic fields that are created within that environment so that they precipitate out into the sludge. So, it's very similar type of process for all types of things, but the way it's done within the construction or the metallic construction of the electrodes, the, and also the currents that's involved and the design of the tanks and the, is all part of that how we extract it. Therefore, knowing what's come, what we're dealing with allows us to design it so we can remove it.

CHAIR SINENCI: Thank you. Thank you for that explanation. Any other questions for…Member Paltin, did you have any…we also have any other questions for our previous presenters, waste to energy?

COUNCILMEMBER PALTIN: I had two questions. The first one for Mr. Liggett about, you know, for the current reuse, the concern is during periods of heavy rain and your system looks like it's open air. And so if there is like, you know, a cloud burst or sustained long period of rain, how does that affect?

MR. LIGGETT: *. . .(inaudible). . .*

COUNCILMEMBER PALTIN: Green is on.

MR. LIGGETT: Got it. Sorry. So, one of the problems with reuse as we have it now is it's still loaded up with nutrients. So, you're right, when it rains we have dissolved inorganic nutrient solids that can flow right into the ocean. So, that's why we need more treatment. The challenge is getting down below the 5.6 milligrams per liter total nitrogen and about .5 milligrams per liter total phosphorus. With conventional treatment, it's hard to get much lower. It's just your energy consumption goes up for a lot of these physiochemical processes, so the thing with the algae is they use sunlight to do this last chapter of removing the nutrients so they're...your only cost is pumping costs and it's not trivial but it's not like a bank buster, so. But what it addresses is that there's residual nutrients in that reuse water so they don't make it into the ocean. So, right now we can plant a forest but in 10 years we will have put 200 tons of nutrients on that forest. I'm saying over 10 years it can handle maybe 20 tons.

COUNCILMEMBER PALTIN: So but --

MR. LIGGETT: I know it's hard to *. . .(inaudible). . .*

COUNCILMEMBER PALTIN: --what is there's no sunlight because it's raining for long periods of time?

MR. LIGGETT: Right, actually the algae can be limited by too much sunlight, so cloudy days are actually ideal for them.

COUNCILMEMBER PALTIN: And then, I guess, my second question for the water is have you done, tested like on the residual of pharmaceuticals from people's waste and does it or like lead, flint, kind of thing.

MR. ORR: I'm sorry. Say that one more time.

COUNCILMEMBER PALTIN: Like, you know, sometimes people take like birth control or Xanax or whatever and then it sometime shows up in fish in lakes because it's not something, it's like an emerging concern. So, have you folks addressed those emerging concerns?

MR. ORR: The product after, the byproducts that's left over after the Twin Oxide has gone through we're gonna test the residual to make sure that the products doing its job.

COUNCILMEMBER PALTIN: So, you specifically test for pharmaceuticals?

MR. ORR: For...Joe, did you hear that question about pharmaceuticals?

MR. NIEUSMA: Restate it for me, Denny.

MR. ORR: She's asking about pharmaceuticals that are in the water systems. Are we able to test with that or is there any...we aren't going to take...anything that we'd be able to take out would be strictly organic. Is there as far as the pharmaceuticals go, has there been any testing as to whether we can do anything against those is the question.

MR. NIEUSMA: Well, it certainly wouldn't be our wheelhouse, Twin Oxide's wheelhouse is a disinfectant against bacteria, viruses, molds, fungus, and spores, but it is an oxidizer. So, if any of those pharmaceutical structures have points that can be oxidized like a nitrate, nitrite to a nitrate, or a sulfite to a sulfate, but if there's any of those types of functional groups Twin Oxide would eventually oxidize those but Twin Oxide is also preferentially targeted at the single-celled organisms and a size basis. So, that's why it preferentially gets after the microbial life and leaves a lot of the large organic molecules alone. So, I would tend to think that it would not have a whole lot of activity against those pharmaceutical products.

COUNCILMEMBER PALTIN: Thank you. And, Mr. Flowers, same question.

MR. NIEUSMA: I'm sorry, Denny. I didn't hear what she said.

UNIDENTIFIED SPEAKER: That was all, Dr. Joe.

MR. FLOWERS: Okay. So with the different types of chemicals that come in as long as we know what it is exactly if the influent coming in has those types of chemicals, we can do the analysis to determine whether we can remove them or not. We do that upfront, so if you supply me samples with that and the volumes that…we can actually determine whether it can be done or not.

COUNCILMEMBER PALTIN: So, you haven't successfully done that at this point?

MR. FLOWERS: We haven't had the requirement yet to, that's all, and we have so many. But I'd love to, we'd love to challenge it. I don't see it…we haven't stumped them yet. I mean, that was the big thing to be able to stump them as to what, if we can actually take out anything and they do it in different ways. So, I'm confident they can do it, but until we prove it I won't say.

COUNCILMEMBER PALTIN: So like heavy metals, lead, --

MR. FLOWERS: Yeah.

COUNCILMEMBER PALTIN: --like that Flint, Washington…or Michigan.

MR. FLOWERS: Yes, no problem.

COUNCILMEMBER PALTIN: Okay.

MR. FLOWERS: No problem.

COUNCILMEMBER PALTIN: Cool. Thanks.

CHAIR SINENCI: Thank you, Member Paltin. Is there any other questions, Members? Okay. Seeing none, Members, we've reached the end of our EACP meeting today. Before we close, adjourn the meeting, we wanted to thank all of our esteemed guests for coming and sharing their guidance, their expertise, their manao with us today, and especially for travelling far and joining us today in the Council Chambers. I think this Council is committed to developing infrastructure and new technologies in anticipation of