

Intro 00:00:01 Inventors and their inventions. Welcome to Radio Cade, a podcast from the Cade Museum for Creativity and Invention in Gainesville, Florida. The museum is named after James Robert Cade who invented Gatorade in 1965. My name is Richard Miles, we'll introduce you to inventors and the things that motivate them, we'll learn about their personal stories, how their inventions work and how their ideas get from the laboratory to the marketplace.

Richard Miles 00:00:37 Burning biomass to create energy. Is it a realistic option in the marketplace? I'm Richard Miles, your host. And today my guest is Stefano Alva, Chief Financial Officer of Farm to Flame Energy. Welcome to radio Cade Stefano.

Stefano Alva 00:00:50 Thank you, Richard. It's a pleasure to be here.

Richard Miles 00:00:52 So Stefano let's start by explaining what your technology is and what it does. Our listeners are probably picturing a big municipal plant that burns tons and tons of wood chips and cornstalk. So right now, at your stage in development, is that what we're talking about?

Stefano Alva 00:01:05 Not necessarily. I mean, we're not afraid of doing bigger projects, but we're definitely starting with a unique product that is an onsite biomass electricity generator that is deployed in modular shifting containers. So, the idea is for these biomass generators to be deployed at commercial buildings or commercial operations to basically provide onsite power, very similar to, uh, solar rooftop.

Richard Miles 00:01:28 Got it. Okay. So, from the pictures on your website, they're similar to what you'd see, like maybe on a construction site, you'd see those, those small offices for the construction 20 feet by nine feet, roughly that's about the size.

Stefano Alva 00:01:39 Exactly, exactly. And actually in construction settings, a lot of people use diesel generators and like large natural gas generators. We're basically trying to replace exactly those and for the construction settings, it actually makes a lot of sense because there's a lot of wood waste that is generated from as a byproduct. And it just fits really well to repurpose that wood waste without having anywhere to haul it anywhere into energy for that specific operation.

Richard Miles 00:02:02 Right. So right now there are, I guess, three specific products or versions that you're looking at offering one, is it generators themselves anywhere from 10 kilowatt to 30 kilowatt generators and then pellets and briquets that can be burned briquettes and then onsite conversion, right? Basically, a farm or somewhere got waste there that just needs to be gotten rid of, and you just do it right there on site. Can you talk a little bit about each one of those, for instance, what sort of business or what sort of entity would use a 10 kilowatt or 30-kilowatt generator, cause that's not a huge amount of power, right? Significant amount, but it's not an enormous amount of power.

Stefano Alva 00:02:37 Indeed. And actually this 10-to-30-kilowatt generator is actually 10 kilowatts. We use single phase power, but 30 kilowatts. We provide three phase power, which is typically more for commercial operations. And the type of businesses that we're looking to target are basically businesses that need base load power. And I know that sounds kind of like a gibberish word, but it's businesses that need constant and reliable power throughout the entire 24 hours of the day. So, a lot of commercial offices, for example, a lot of their energy expenditure happens from nine o'clock to 5:00 PM, which is the time that people are working. They're using the AC and they're in the office, but after 5:00 PM they leave home and then the office requires way less energy. And so, for those applications, solar panels are

actually a great option because that's when the sun is shining, but there's a bunch of other applications where solar does not do the job that well because a lot of the power need is actually from 5:00 PM to 9:00 AM the next day.

Stefano Alva 00:03:33 So for example, our first client is a commercial vertical greenhouse in New Jersey. This one is called Think and Grow Farms. And they've been fantastic. They've been super supportive with us since last year. And what they're doing is that they're growing lettuces and tomatoes. And because of that, they need lighting heat control and all these energy expenditures that are throughout the 24 hours of the day, basically. And because of that, our application fits really well. And I'm talking about our electricity generator and our electricity generator is really our core product is really the product that we spend the most time developing and around where our patent is. So that's been our focus really since the inception of the company, the pellets and briquettes are more of a side product that we realize that we're able to create pellets and briquettes that work in conventional pellet stoves and conventional fireplaces or home heating applications. Since we're using the same biomass waste materials that we'd be using to create electricity, but instead we can compress it and utilize it for heat generation.

Richard Miles 00:04:38 I see. So, the pellets briquettes are it's much more of a retailer or a home application, a business wouldn't use that as for instance.

Stefano Alva 00:04:44 If a lot of businesses would be able to find the use for it, in the sense of having a heating purchase agreement, a lot of business start currently using for example, natural gas to heat their buildings or their operations. And we want to replicate that same relationship. We can install a heater at your building. Then the client basically uses this fuel, the pellets in the briquettes as needed the system automatically dispenses the pellets and creates the heat. And we just receive a notification when our client's fuel tank is low, we go and refill it and then we're outta there.

Richard Miles 00:05:15 Okay. I get it. What is the difference? So, in the generators, right, those are biomass, electrical generators. What is fueling them? Cause I was confused. I thought that you had some sort of fuel there for the generators. How does that work?

Stefano Alva 00:05:28 Correct. So, the fuel that we're using to power our generators is this is really where our patent is around, which is the way that we convert the biomass to a powdered fuel that is very uniform and it behaves in a very predictable way. So, what has been a challenge in the industry is really to be able to overcome the different types of biomass that are available and be able to find the system where you can create a uniform output out of this mixed biomass waste. And that's exactly what our patent focuses on and what our expertise really lies in. And our ability to convert mixed biomass waste into a uniform powder that can be used to create electricity.

Richard Miles 00:06:06 This right here shows you the power of conversation. Cause I, I read your materials, I read your website. That totally went over my head. But now that makes a lot of sense. If you had that sort of powder form, that's much easier to transport and take care of and, and so on rather than even something like a briquette or a pellet. So now I get it <laugh> so the final thing you do is onsite conversion, which I imagine is just for what, mostly for farms that it's too much to even just gather up whatever it is, corn stocks or Koka husks, whatever that you just feed it straight into a, a generator type of device. Is that how that works?

Stefano Alva 00:06:36 Indeed. So last year we received an award from the environmental protection agency and this award was centered around our mobile fuel processor. So, what we basically do is that we transport our equipment to client site and we're able to produce either a generator fuel or pellets and briquettes from the biomass waste that they have available. So, we basically transport our equipment, which is wood chippers, grinders dryers, and then the compressors, if you wanna do pellets or the fine grinders, if you wanna do generator fuel and we transform the mixed biomass waste that they have on site to this usable product. And the interesting thing is that a lot of these farms, their waste comes in batches either. It's because they're a farm and they have harvest season. And so, they have all this waste piled up. That's the ideal time to engage with us in some sort of waste conversion.

Richard Miles 00:07:26 Interesting. We've already talked Stefano about the size right now of your current product, which is relatively small, but I'm sure you've already done some thinking about the market. Who are your customers gonna be? And so of course, as you well know, you have the greenhouse in New Jersey, but customers, no matter who they are, what they're trying to do, price is hugely important, right? Because the business has gotta be able to make, to get their energy, to price that they're gonna be able to somehow convert that into making their products or running their business at a price. That's not gonna bankrupt them. How does let's say a customer that has a choice and say, okay, we only need 30 kilowatts of electricity. We can either get it from the local utility from the city or county or we can get it from Farm to Flame. Where are you in terms of competitive price and reliability, you've already mentioned that you would be able to provide it essentially 24/7. Is that 24/7/365? Or where do you expect to land on that spectrum?

Stefano Alva 00:08:20 That's about 24/7, 3/50 <laugh> the system requires about two weeks of maintenance every year.

Richard Miles 00:08:26 Year. I see.

Stefano Alva 00:08:27 But yes, the idea is that we're first targeting those operations that have high electricity costs. So, electricity costs depends on a lot where you are geographically. So, for example, here in Florida, electricity costs are actually really cheap. And unfortunately, it's because we're still relying on very cheap fossil fuels to create this electricity. And in addition to that, there's a lot of solar radiation available. And so that also makes our technology, I guess, a little bit less competitive. But when you're looking at areas like in the Northeast of the United States, New Jersey, New York, New England, those areas have low solar radiation, electricity prices are very high. I guess I'm gonna start talking about the electricity rates specifically out here in Florida, they're around like 10 cents a kilowatt hour and the Northeast, it goes up to 20 cents a kilowatt hour. So twice as much for electricity cost, the first power purchase agreement that we secured with this Think and Grow Farms client is at 14 cents a kilowatt hour.

Stefano Alva 00:09:22 So it's basically on par with the average residential electricity rates that people around the us are paying and how it compares to other technologies is, is really interesting. So, on one hand there's diesel generators, diesel generators are about twice as expensive. Maybe even more. Now that diesel is off the roof, but that costs around 28 cents a kilowatt hour to run just that diesel fuel cost, natural gas actually very cheap. You can get onsite natural gas power for around 10 cents a kilowatt hour. But now we've seen that the price volatility of natural gas are leaving some people worried. And then finally there's solar and solar plus storage aspect to it and explaining this is maybe a little complicated because the power that solar produces from 9:00 AM to 5:00 PM is actually very

affordable. And we've made great strides in the United States to installing as much solar power as we can.

Stefano Alva 00:10:14 That is able to provide power from 9:00 AM to 5:00 PM. But when you need to use that power in other times of the day, you need some sort of energy storage and whether that's coming from batteries or there's a lot of other technologies out there right now, lithium-ion batteries are the most popular solution. And when you integrate solar panels with batteries, the levelized cost of electricity goes up to like 40 cents a kilowatt hour just because the storage aspect of it is very expensive. And this is something that is also worrying on a sustainability side because we've been using lithium for let's say like less than 10 years for battery purposes. And there's already supply chain issues. There's already all these issues in the developing world where conflict minerals regarding like the nickel zinc, uh, lithium that is used are causing social problems are also causing environmental problems. And so, there is a need for renewable base load power, which is basically what our technology is exactly targeting.

Richard Miles 00:11:10 Right? That's fascinating. What about the initial capital investment? Let's say I'm a business and I'm trying to decide, do I get a diesel generator? Do I get a Farm to Flame generator, say 30 KW? What is the price, the upfront cost of getting that generator?

Stefano Alva 00:11:24 Let's see initially we thought that selling our equipment and selling our fuel in a long-term contract was a great way of dealing with our clients in a way of presenting our value. But after a lot of customer interviews and kind of just talking with clients, we realized that we wanted to engage in a little bit more of a business model that is more friendly to our clients. And so instead of us selling our equipment and selling our fuel, what we do is we secure with our client's power purchase agreements. So, this means that the client does not have to pay any of the upfront costs associated with the generator. Instead of them paying a hundred dollars, let's say to the utility bill every month, they're paying Farm to Flame \$90. And so, this business model really takes a lot of the risk out of the clients since they don't have to incur any of the upfront costs and they can experience savings from day one, which really, we have found is something that makes our clients at ease.

Stefano Alva 00:12:13 And just, I guess also to mention our technology qualifies for renewable energy certificates, investment tax credits, accelerated depreciation schedules, and having ownership of this equipment kind of entails that you have to go through the process of applying for these and then kind of like following through with them and that's a burden to our clients. So instead, we chose to keep ownership of the equipment and then take care of all this process so that we can just bundle this as savings. And at the end deliver a dollar per kilowatt hour solution that is similar to what our clients currently are paying from the grid.

Richard Miles 00:12:45 That's really innovative way of doing it. You must require some sort of minimum contract, right? Cause you wouldn't wanna do all this for say 30 days and have somebody go, yeah, I'm not wild about it, right. Is it like a minimum one-year contract or something like that?

Stefano Alva 00:12:58 Yes. And it's a little bit longer than that. Actually. I see basically trying to replicate the business model and financing model that solar projects have put forward. Right. And we found that clients are very comfortable with this business model and the contracts are typically for 20 years. So, a solar project similar to what I'm describing you lease it for around 20 years, which is a lifespan of the product itself. So that's the amount of time that you typically end up securing your power

purchase agreement for, and it just happens to be too that our equipment has a lifetime upwards of 20 years. So, it also makes sense to just stay within that timeframe.

Richard Miles 00:13:33 So you've clearly done a lot of thinking about the core technology and the core business model before we sort of talk about where you are in terms of business development and raising capital, that sort of stuff. One thing we should address is, uh, particularly for listeners in Gainesville, Florida, or any city that has a biomass plant, there are at least a couple of examples of biomass plants. They have not gone as planned or have not met expectations. So, let's focus on, for instance, the one in, in Gainesville, Florida, where the city purchased a biomass plant, a number of years ago, miss operating in a fairly big loss remains controversial politically, what are they doing wrong? Or what would you be doing differently? And assuming, let's say you're doing much larger power generators. What are you doing differently that would correct for whatever is going on in the large biomass plants. That don't seem to be economical.

Stefano Alva 00:14:19 Like I said, every biomass power plant requires its own tailored process of procurement and kind of like financial planning. It seems that that financial planning was really the crux of this biomass power plant in Gainesville, the biomass power plant received an extremely large grant to develop the biomass power plant and seems that those funds were not properly distributed. And that the, like you mentioned, the plan is operating at a loss that financial planning part is hard. It's something extremely complicated in the sense of trying to match up financing grants, leveraging facilities, personnel, it takes quite a bit of planning. It is really a task that you have to be extremely careful about because we're talking about 20, 30, 40-year contracts. So, if you're tied down to a 20, 30-year contract and you're operating at a loss, obviously that ends up accumulating and creating problems. I say that what we would've done different is basically be able to take a look at the situation a little bit more carefully and maybe understanding a little bit better. What are margins? What is our ability to deliver electricity at a specific price? And then also take a look at the market itself. How was the electricity rates behaving throughout the state of Florida in comparison to all the other utility products that are happening?

Richard Miles 00:15:33 Good point that sort of financial planning is key. I imagine particularly an industry in which you're making long-term investments and long-term commitments. Let's talk about that for a minute. In terms of your business development of Farm to Flame, sounds like you got a good concept, very good concept. You've got a pretty good business model. How has it been so far in terms of attracting the capital that you're gonna need to grow and whether that's coming from investors or grants or loans, how has that been so far?

Stefano Alva 00:15:58 Thank you for that question. It's actually been going really well. So last year we had our first big check, I guess, from the environmental protection agency, they gave us around a hundred thousand dollars in order to develop this technology under the S V I R program. So, this program is called Small Business Innovation Research, which is basically giving the opportunities to small businesses, to be competitive with the big layers, by providing them grants that are specifically focused on innovative ideas that can really shape the industry, which we are targeting. And after that specific grant, we were able to develop the 30-kilowatt unit. We received another grant from the New Jersey Commission of Science, Innovation and Technology. It's a new program called the Clean Tech Seed grant. And we're super grateful for both of those because they really enabled us to put together this 30-

kilowatt unit and show a lot of progress and achieve these very important milestones around combustion, building the generator, kind of like having a physical product.

Stefano Alva 00:16:56 This year, we were very fortunate. We received an investment from the Richard King Mellon Foundation. The Richard King Mellon Foundation found in us, not only that we have an innovative technology and that we're really trying to disrupt the energy industry but are also our ability to provide jobs in the clean tech industry. Something that they were very excited about. For example, right now we're hiring a boiler maker that used to work in coal power plants. And so, the interesting thing is that solar and wind power do require skilled workers, but the skills that the workers are using are not really the skills that were needed when putting together natural gas, power plants, or fossil fuel power plants, which had been the most popular electricity generation solution out there. And so, it just happens to be that our technology, we use, uh, boilers, alternators turbines and all these pieces of equipment that have been used by coal and other fossil fuel power plants in the past. So, we're providing an opportunity to transition into clean jobs basically.

Richard Miles 00:17:58 Sounds like you've done a lot of thinking about this. Stefano, I know Farm to Flame is still a fairly small organization, small company. How many employees are you currently at and what is your thinking? What is the company thinking in terms of milestones, say a year from now or two years from now and how big and fast you wanna grow the company.

Stefano Alva 00:18:14 We're definitely very ambitious in our goals and we have a network of supporters that really have helped us get to where we are today. And we're very excited of what's coming ahead. So, the team is currently compressed of me, Kwaku, as a full-time employee. Will, who's another, co-founder also part of the founding team. We have Jeremy and Sage, both our engineers at our manufacturing space. And then we have a couple of business development advisors and employees that are helping us drive client relationships forward. We're currently working with, for example, Mark DeSantis recently came on board as a board member, which I'm delighted about. Mark DeSantis is an expert in machine learning related to agriculture, and he has contracts with NASA developing his own technology. And just having such an experienced entrepreneur on board, having a couple gray hairs, I guess, to compliment the fact that we're all very young is very exciting. We're also working with Nyserda as an organization in New York. They provide us with a lot of assistance that have helped us secure interns, employees and mentors basically have been around the block for a lot of years, have done this a thousand times and we've been able to connect with plenty that just see a lot of, of value in what we're doing and, and are just helping us move forward.

Richard Miles 00:19:24 That's great. I noticed that one of the hallmarks of a true startup in its first phases is you're able to name everyone by first name, right? Not even titles, titles don't even make sense. I remember the days when we started the kid museum and three, four employees, titles are kind of silly, but at a certain point, obviously you start referring to people by the titles. Stefano, let me ask you about your own personal background. I know you were born and raised in Costa Rica, but you did visit the United States frequently in your family. I know you have family members in the US. Tell me what were some of your first impressions of the United States, even, maybe as a young child?

Stefano Alva 00:19:55 That's a good question. I think that I've always been very enthusiastic about the United States and has been something that my family's always instilled in me, that there is such a future to make of yourself when you come to the United States. I mean, it's really limitless and Costa Rica don't get me wrong. The country's fantastic. I love it. It's very dear to my heart. And I'm very much

looking forward to the day where I can retire and go back to Costa Rica. But when it comes to achieving the goals that I see myself achieving and to aspiring to the level that I'm aspiring to United States is really the place to be. And I learned a lot about sustainability and about being green in general and Costa Rica. And when I came to the United States, I noticed that there's a lot of work to do here in that field. And that inspired me personally. And when I met Kwaku our CEO, he also mentioned to me about his mission of how he wants to bring clean energy to the developing world, specifically Sub-Saharan Africa. And that also honestly brings me to tears like that. I'm so inspired to work every day in the work that I do, because I know that we're aiming to do gigantic, massive impact. And you know, really that's what gets me to wake up every day and do the work that I do.

Richard Miles 00:20:59 That's a great story. And what makes even greater is it so common? My mother came from Mexico roughly the same age as you are now, maybe a little bit younger and made a life and a career for herself, but she of course did miss Mexico, as you probably miss Costa Rica, which is a beautiful country. I've been there several times, your parents, are they engineers? Or were they engineers? Are they anything to do with the energy business?

Stefano Alva 00:21:18 Not energy, but my dad is an engineer, industrial engineer. He definitely thinks very logically still in me like a passion for mathematics. I was always like a student going to like mathematical competitions and I was pushed to be successful academically, but this energy and sustainability has something that I found within myself and probably because of my upbringing and in Costa Rica, I can't exactly pinpoint a specific experience where I'm like, this is what I wanna do, but it was more like a realization like this is what the world needs right now. And I have the tools and I have the skills and I have the passion for it. So why not put all my eggs in this one basket and then try my best.

Richard Miles 00:21:52 Great, great answer. So, Stefano final question, which we usually ask of all the guests, you're still very relatively young entrepreneur, but I'm sure you've already picked up some lessons along the way. And so, is there anything you'd wanna do over on or any sort of warnings or advice for someone listening to this podcast going? Wow, that sounds cool. I've got an idea. I'd maybe need to think about starting a company. What would you tell them to do or not to do?

Stefano Alva 00:22:15 I love that question because I always think like what not to do and always doing stuff that I shouldn't be doing. And so like my very honest advice, obviously coming from someone that is young and still going through the process of learning, but just do, do something, you know, like go out there, fail, go out there and try do your best of course, but don't tell yourself too much with the expectations of what could happen or what to do or what not to do most of the times, I feel like giving your best effort and putting out there the fact that you wanna do something and you're giving it a shot, gets you there eventually. And maybe you don't succeed the first time. It's a matter of learning what you didn't do well that first time and then moving forward.

Richard Miles 00:22:53 Stefano great answer. It's been great having you on the show. I neglected to mention, I think you all will be starting a Wefunder Campaign or some sort of fundraising campaign soon. Hopefully by the time this podcast comes out, we will have a link in the show notes, but if not, encourage listeners go to Farm to Flame Energy, the website, get the details on that. But I think you have a bright future in your company as a bright future. So, thanks very much for coming on Radio Cade and telling us about it.

Stefano Alva 00:23:18 Thank you, Richard. It's really my pleasure. I really look forward to see more updates of the Cade Prize and the Cade Museum. The work that you guys are doing are, is fantastic. And I just had a fantastic experience with you, Phoebe, and just everyone in the team. I just also want to thank Carmen for setting this up.

Richard Miles 00:23:32 Great. Thank you.

Outro 00:23:34 Radio Cade is produced by the Cade Museum for Creativity and Invention located in Gainesville, Florida. Richard Miles is the podcast host and Ellie Thom coordinates inventor interviews, podcasts are recorded at Heartwood Sound Stage and edited and mixed by Bob McPeak. The Radio Cade theme song was produced and performed by Tracy Collins and features violin, Jacob Lawson.