

## **Fusion Podcast Pal: “An Interview with Rezwan Rezwani”**

**The Fusion Podcast**

Host: Dr. Matt Moynihan

Guest: Rezwan Rezwani

Founder of the Fusion Energy League

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### **Guest Bio:**



### **Rezwan Rezwani**

In 2011, Rezwan Razani founded the Fusion Energy League, which educates the public and policymakers on the value of fusion research. The group is a nonprofit which advocates for a broad set of fusion approaches, concepts and research. Contributions are welcome. In our interview, we talk about the challenges of pushing for fusion research in Washington and the impact fusion could have on climate change.

### **Transcript:**

You start by introducing yourself.

Hi. I'm a Rezwan Razwani and I am founder of the Fusion Energy League and also Footprint to Wings.

When did you first get interested in it?

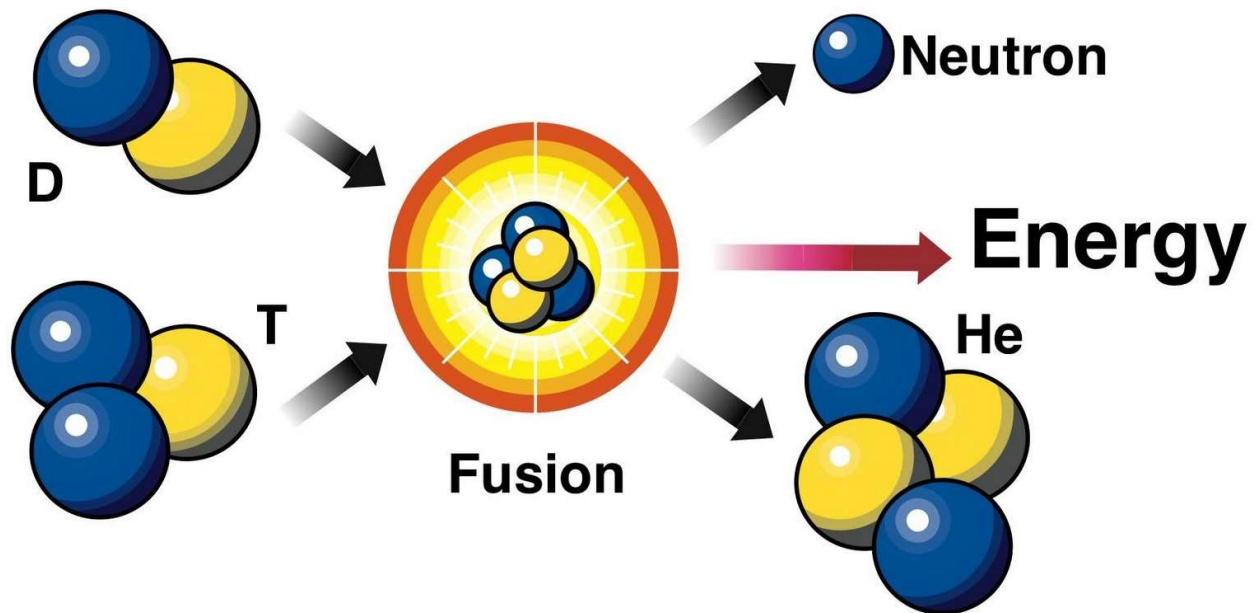
Oh my goodness. Quite a while ago, 2007, it was when I heard about the Dense Plasma Focus Fusion society.

What got you interested? When you heard about them what was appealing about fusion?

In those days, I was more interested in getting off of oil. The Iraq war was going on and I'd heard about the dense plasma focus, you know, the focus fusion society and I would have normally not really paid much attention. I think a lot of people don't pay attention to fusion, but people I knew and cared about deeply passed away. They died in Iraq and I just thought were there for oil. We need to get off of oil. And so then I heard about the Dense Plasma Focus, which is an alternate fusion idea. It's kind of, it's not one of the mainstream ideas. I'd never heard that before that there were different fusion approaches. You know, I didn't know much about fusion at all, but Eric Learner, he's the guy who has the dense plasma f focus. He had a great way of explaining it and so it just got my attention and I thought, hey, why aren't we doing more about this? It was kind of a triple play because on the one hand it seemed like it was really close and imminent. It was like an idea that really solve a big problem with energy and the selling point was also not fission. The idea being that nuclear is somehow dirty and fusion is cleaner. It could be a base load energy, so it seemed to solve a lot of problems and I got involved.

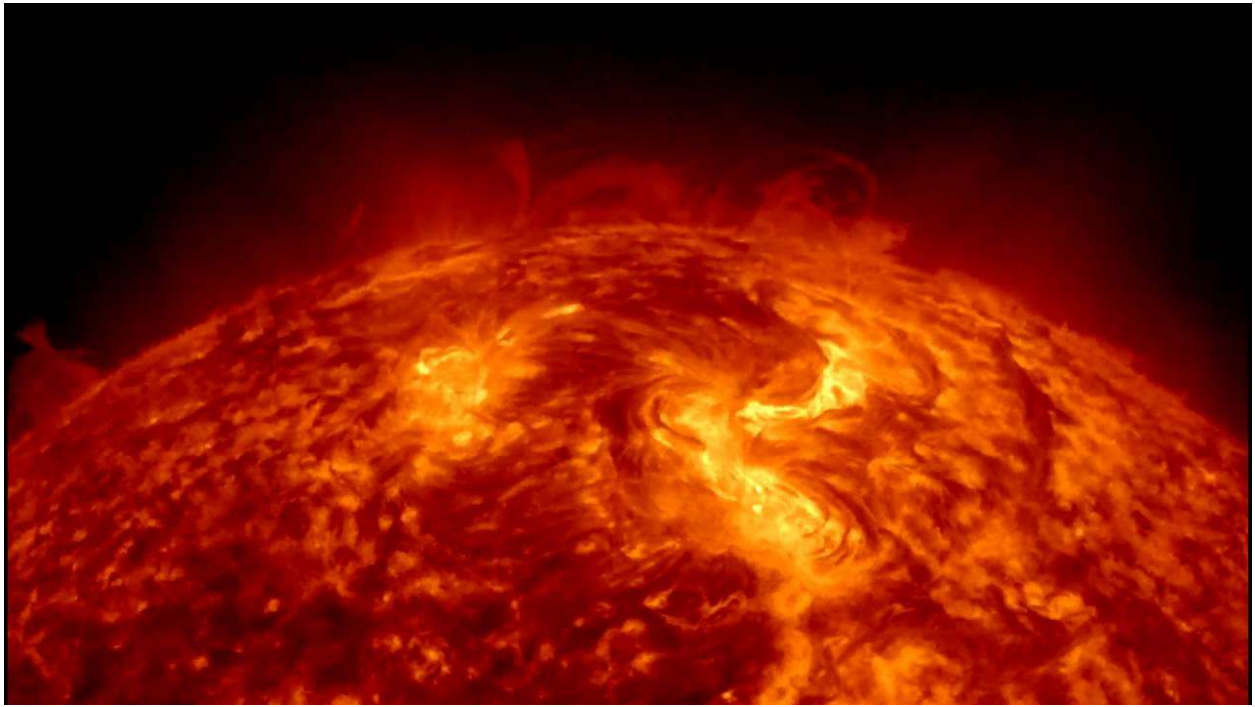
What is your definition of fusion, and how would you describe it to someone who knows nothing about the subject?

Excellent question. Fusion just the word itself just means joining things together. Some things together to make another thing. Nuclear fusion is when you join the nuclei of light atoms together, like say you had one proton and another proton and the two protons come together. Together they're less than two. It's not one plus one equals two. It's one plus one equals one point nine something and that little bit of mass that has been reduced. That turns into energy.



That's a great explanation. The mass is converted directly into energy through  $E=MC^2$ .  $C^2$  is a really big number so a little bit of mass goes a long, long way.

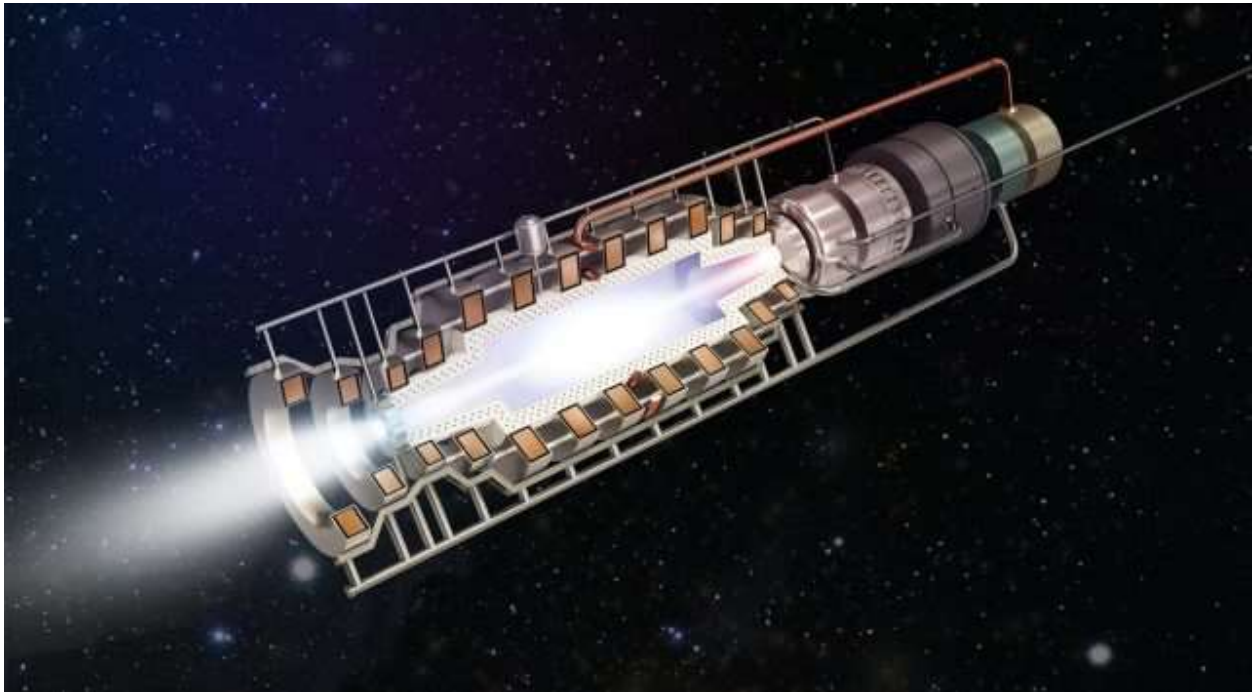
There you go. When you try to explain it to somebody who doesn't know anything about it, who hasn't spent much time thinking about it, there's a lot to explain. Protons are positive and they repel each other and electrons are negative and they repel each other and what? What's going on? Yeah, you're in the middle of that. When you study fusion, your, you're looking at in the face. That's one of the difficulties with fusion. We've only known about this recently. Like in 1868, we discovered helium and 1898, the electron and proton, so this is like over a century ago and then in 1932, so, it hasn't even been a century that we discovered neutron. We didn't even know how the sun works or what it was made of so we could not even figure out fusion until the 30's. That's when we're like: hey, wait a minute. It's really difficult. Like in the thirties that we figured out, wow, fusion, that's how the sun works.



Then we realized, wait a minute, the sun, the only way it works is because it's so massive, so big that these things are smashed and they really can't go anywhere. They try to escape, but they just collide into each other and so they're generating all this energy because these protons repel each other. They do not want to get together, so the only thing that can get them together is an enormous amount of force, but once they get close enough, this nuclear force takes over and they click and their stuck together. Now we're trying to do that on earth without mass. This is really impressive and I don't think people have really. If we just compare ourselves to the sun, how efficiently -- we have achieved fusion on earth controlled fusion. We've actually gotten the energy out, lit some light bulbs. The problem is we put more energy into it then we got out, but compared to how much energy the sun puts into it for the energy that we get, we've actually really advanced quite a bit.

So why are we so interested in fusion? What do you think fusion offers the human race?

So most people, they start with the energy upside. Fusion, it's all about energy. We're going get a massive energy in perpetuity, which is really cool. And if we crack this soon enough and it be done cheaply, we could even help avert climate change. That's super important. And that's not all. In addition, we've got three other benefits like space propulsion. Most rockets, they work with chemicals so you're just burning something and you can only go as fast as the force expelled with burning. Nuclear propulsion goes much faster so instead of taking years to get to Mars, you would take a couple of weeks. So that's, that's really cool.



This is very different than the other people I am going to talk to. What is the story behind the founding of the Fusion Energy League? Why was it started and who were the first members?

I was in a place in my life. I wanted to short circuit our dependence on oil. I was helping out with focus fusion society and right away I was thinking to myself, well wait a minute, how do I know that this is legitimate? So I hit the road, went to DC, I went to Princeton Plasma Physics Labs and just asked questions and started meeting a lot of physicists to see what was going on and it was very interesting because I'd start realizing that there are a lot of fusion ideas that are not getting funded - they're underfunded. The parameter space of fusion, we hardly touched it. We're barely looking at it and the real problem is getting people on board with this kind of research with embracing the risks and the unknown. You have this paradox because there's a couple of main ideas that are getting funded and a lot that aren't a big part of the problem is the way funding happens. So it's a very specific set of problems and the more I started understanding those problems the more I realized, well, we need to do something about that.

Can you take us back to when the FEL was actually founded and who were the first members?

I think that was 2011 and the first members were just myself and a few people. Right now we've got like a thousand people on Facebook and almost 2000 people on twitter. But I've never really done a formal membership, so it's kind of more like a blog.

Well, it's better than nothing. People are used to 4 million views on YouTube and then you make a little YouTube video and you start at zero. If you can touch 30,000 people or 10,000 people or a thousand people, that's far more than zero.

That is true it is a big deal. At the same time, it could be a lot bigger. At the same time I started working on Fusion Energy League. The idea for Footprint to Wings also came to me, so in a way I've been incubating both of them and I haven't been prioritizing membership and I've been trying to work out the best strategy to make it a movement that actually is effective and does something. It needs to have a goal, something that is trying to achieve. So I do feel that we have developed that with the people that I've talked to. A lot of people, different fusion scientists, people in government and individuals behind the scenes. Right now we do have a strategy. We're trying to roll that strategy out. The problem is there's some conflicts in the messaging and I feel



until those conflicts are resolved, it really can't go forward as effectively as I would like. So there it is.

You talked about conflict in messaging, what sorts of conflicts are going on right now?

There are people who hear about fusion, they feel kind of threatened by it because we live in a world where everybody's kind of scrambling for those research dollars and we kind of turned against each other. This happens within the fusion research environment because there's researchers, they're trying to get a dwindling pot of research money and also outside with any energy approach, onshore versus offshore wind, wind versus solar, and of course everybody against fusion. So within fusion there's this zero sum game going on between mainstream fusion approaches and alternate approaches because then the alternate guys say, well, we're spending too much money on the mainstream, and so then the mainstream guys were like: whoa, wait a minute, no. Fusion also has been putting down fission. Usually the way they do it this, they say we're not as dirty as fission, which then means that fission is dirty.

Whoa, that sounds like a lot of conflicts. How can we resolve those conflicts?

So right away, I think the most important thing for all the energy people is to be more supportive of each other and in truth, physicists do have to come up with a way of figuring out how to not cut each other down. They wouldn't say, well, I'm not cutting this person down I'm just pointing out these are some shortcomings of their research and so in a way it's hard for them to do what they need to do and I think it would work much better if it was in the context of a much more supportive world. People who cared more about fusion, in general.

What do we need to make a supportive environment and what would that look?

Team Fusion, that's how I would look at it. So, Team Fusion is made up of the science team and the scientists that are researching fusion and then everybody who still researching the related stuff. Those guys are right on the front line, but for them to be successful they need a critical mass of people supportive of that work and it really opened kind of support that allows for failure and gets that part of research is finding out a way not to do something and that gets you closer to finding out ways to do it, so you need to kind of a generosity towards fusion, which we kind of lack. Right now, we are very stingy and I don't know why! Because fusion is so interesting, but anyway, so you've got the Support Team, which is the investors who fund things and advocates who promote research. These guys need to get more active and maybe there's a relationship problem, like they're not as connected, but that's one reason why the Fusion Energy League exists, trying to fill that gap.

How do we make that happen?

A lot of times the fusion folks, they ended up talking a lot about the science, which is great, but kind of shying away from more of the cultural support and the funding support. Things like, well, why don't we just call our Congressman and say we support fusion because that's one thing everybody can do and they should just make it a regular practice. Oh, I'm thinking about fusion today. I know, I'll write a letter to my congressman and remind them that it's important to me. People who support fusion need to really take a hold of the message of optimism, of fusion and just how profound it is. How it's not just an energy thing, but this is doing what the sun does, but in a room on earth, if we can do that - well and we can, we've done it - and if we can go beyond it and actually to it. So it's on demand and with, you know, energy to spare, we level up in civilization and I think people don't really know grasped that.

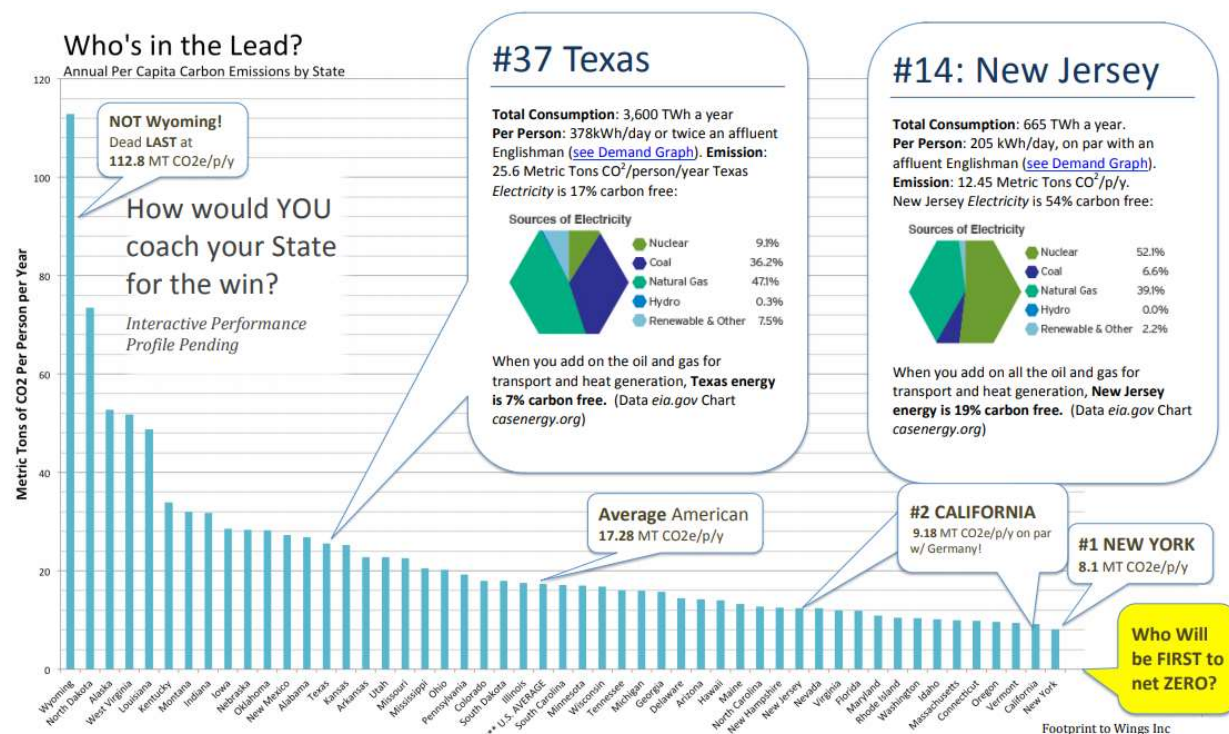


Sure, but why the urgency for getting fusion?

Right now we're facing epic climate change, which I'm really worried about. Climate change is really terrifying. We are going to solve the climate change problem. We need everything. It's a fire on all cylinders to make sure everything is being tried. Fusion, fission, wind, geothermal. And that brings us to the money. So a lot of conflicts do come down to money. This is where people who advocate for fusion should know the numbers, what, they are saying we need for the transition to 100 percent renewable energy world, and that's about 44 to \$53,000,000,000,000. If you look up on Google and you'll see that they're discussing how much money they need to make that transition. The point is that: right now we're not acting like it's really that urgent.

Yes. Climate change is really important. That's a great segway to my next question. You developed Footprints to Wings, at the same time you were doing the Fusion Energy League. Can you talk about Footprints to Wings and how that grew?

We're going to turn the race to zero carbon into a national pastime. As a state against state race.



And I guess, who's winning the race? Is it Maine?

No its' not Maine? Would you believe?

It's not Maine!

Why isn't it Maine? It should be Maine. It makes no sense. It should be Maine.

Well, I figured it'd be a small state somewhere where they don't drive a lot. So maybe Connecticut. Nope. Okay. Well what is it?

Well, alright, it is New York State.

Why is New York State winning the race?

They are at 8.1 Metric Tons of carbon per person and they have a number of reasons. One, is of course is, the urban advantage - because everybody lives on top of each other and also New York state has a lot of hydro power, so it's got a hydro advantage and they use nuclear power and of course a little bit of renewables.

Let me guess. The worst state is Texas.

That is not correct.

Mississippi.

Uh, no.

Oh, okay. Maybe I get one more guest here. Um, Georgia.

No. All right. Who is it?

Wyoming. Wyoming.

Yeah. Wow. Like 112.0 metric tons per person.

Wow.

Yeah. So part of it is I drive a lot and also a lot of coal. Now somebody did bring up to me and I said, wait a minute, are you sure? And we're going to have to have referees. So this is why when you make it a national pastime, it gets really serious. We're going to have a competition committee that really works out the details.

Let me ask you, this is a perfect world where everybody was supporting fusion and we were getting results. What would that look like? What would that sort of feel like?

That's a great question. Well, that would be a very relaxed world. It would be a world where a lot of physicists wouldn't have to worry and they would be able to really focus on their work. It would be, maybe a lot more open. We would hear a lot about different breakthroughs and the people who will be supporting that would be kind of showing how cool this is, and oh this one didn't work, but they would have sufficient reliable funding and I don't even think it's going to be a lot of money and then we would kind of let it roll and be patient.

Okay. So we're at the end of the interview. Is there anything else you want to talk about?  
Whatever you want to say.

Yeah. The most important message of fusion is the optimism. I think people have tried to shame people who are into fusion. They haven't achieved it, so let's mock your optimism. We've really embraced that and also spread that. This optimism is exportable and I really love being part of fusion because it is at its core, very optimist.

Wonderful. That's a perfect way to end that.

Okay, well goodnight. Thanks so much. Alright, goodnight.