

sustainable
HEROES
green leaders in focus



Shami Nissan

Emerging Markets

María Victoria Zingoni

A Path to Net Zero

Chris Leslie

Investing for a Better Future

Badri Kothandaraman

Customer First

Dr. Wal van Lierop

Nuclear Fusion

NOMURA
greentech

Optimism, Tenacity, and Empathy

Having profiled 34 Sustainable Heroes, including the five in this issue, I was recently asked, “What are the common traits among the leaders who are Sustainable Heroes?” Here are my thoughts on the top three.

Optimism: The daunting scale of the challenges of creating lower carbon and more resource efficient infrastructure systems intimidates many, with the result that only relentless optimists choose to stake their professional careers on sustainability. They believe that a healthy planet is an essential requirement for economic prosperity, and that, together, we can create high growth sustainable technology and infrastructure industries that employ millions and create both environmental and business value.

Tenacity: The myth of the overnight success Sustainable Hero is just that - a myth. Almost all Sustainable Heroes have been developing their expertise as a business leader, a policymaker, or investment professional, over several decades. The sustainable technology and infrastructure industries have faced severe headwinds, volatile markets, and entrenched high carbon and inefficient and wasteful incumbent competition with significant political power. It has not been an easy road. The perseverance and staying power of the Sustainable Heroes is consistent across them all.

Empathy: Sustainable Heroes are motivated by a deep love of humanity and an ethos of “service over self.” Aware of their fundamental goodness, Sustainable Heroes attract loyal and dedicated followers. As a result, they are effective leaders and communicators and inspire their teams to high performance.

The five Sustainable Heroes in this issue demonstrate these qualities in abundance.

María Victoria Zingoni is the Executive Managing Director of Client and Low-Carbon Generation at Repsol, which is the first and most committed international oil company to set a net zero emissions goal.

At Macquarie Asset Management as the Global Head of Sustainability, **Chris Leslie** is shifting the culture to bring sustainability into everything they do.

As CEO at energy technology company Enphase, **Badri Kothandaraman** is striving to make the world's best home energy management systems. The technology is delivering Enphase's vision of better economics, clean energy, and energy independence.

For **Shami Nissan**, Head of Responsible Investment at the global emerging markets investment firm, Actis, sustainability has been the driving force throughout her career, beginning at the United Nations before it was a mainstream topic within the investment industry.

Wal van Lierop, Founder and Managing Partner at Chrysalix Venture Capital, believes in the potential of nuclear fusion to power the future of clean energy around the world.

We at Nomura Greentech are empowering sustainable technology and driving change for a better world. We are inspired by the many Sustainable Heroes we meet and work with on a daily basis!



A handwritten signature in black ink that reads "Jeff McDermott".

Jeff McDermott
Head of Nomura Greentech

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Emerging Markets

For Shami Nissan, Head of Responsible Investment at the global emerging markets investment firm, Actis, sustainability has been the driving force throughout her career, beginning at the United Nations before it was a mainstream topic within the investment industry.

Shami Nissan, Head of Responsible Investment, Actis



Shami Nissan

How did you first become interested in sustainability?

Sustainability has been at the forefront throughout the entirety of my education and professional life. I received my undergraduate degree in Biology and did a Master's in Environmental Technology. During my career I worked at the United Nations in Central America working on sustainability projects. I also worked as a sustainability consultant at PWC for 10 years. When I joined that team in London, we were 10 people. When I left in 2014, we were a hundred. During that time period, the field of sustainability was really gathering pace. People now coming out of university can have a professional future in the sustainability sector but it was not necessarily a career that many were aware of about 20 years ago.

What does your role as Head of Responsible Investment at Actis entail?

I look at and take part in the investment decision-making process. For every deal that we look at, we undertake a systematic due diligence process to understand which environmental, social, or governance risks might be material. Sitting on the investment committees, my team advises on the level of risk and also whether the mitigation actions we can take would lower that risk to within our acceptable tolerance limits. We also advise on what the value creation tasks would look like during our ownership period. What are the types of work streams that we would seek to put into place? What is part of the hundred-day plan?

As a member of the executive committee, I also consider sustainability from a strategic point of view and how it impacts Actis, and how Actis can make meaningful contributions to the UN Sustainable Development Goals through our investments. Macro-trends such as climate change demand analysis of risks to ensure our investment strategies and decisions do not expose our businesses to near or long term risks. Such analysis is nuanced as sectors are rarely 'sustainable' or 'unsustainable'. For example, in the digital infrastructure sector there's a huge explosion of demand for data centers.



Image credit: Actis

Data centers provide critical digital infrastructure which enables economic growth, but on the other hand, is a very high energy intensive sector (due to high energy demands). So, part of my role is to examine such tradeoffs and come to an Actis view on whether or not a sector or an investment supports our sustainability objectives.

What themes or trends in sustainability are you most excited about over the next five to 10 years?

One of the largest issues in the world today by far is the climate crisis and the need to fast-track the energy transition to a low carbon future. Therefore, for investors and for Actis specifically, this area represents is a really exciting opportunity. Actis is a significant investor in renewable power-generation companies and there is a huge demand for green power infrastructure globally and certainly in growth markets. I think any investor, whether you have sustainability goals or not, needs to be thinking about climate risk and opportunity, as it has huge implications for investments, risks and return. Digital infrastructure, as we have discussed, is also a significant growth opportunity and a sector which contributes to our ability to deliver against the UN SDGs.

Another emerging sustainability theme for this year and beyond is a focus on biodiversity. There's a lot going on in terms of natural capital and protecting ecosystems. A seminal report was issued in February in the U.K. called the Dasgupta Review,

which looks at the economic impact of biodiversity loss. Biodiversity is declining faster than at any other time in human history and extinction rates are unprecedented. The COVID-19 pandemic is increasingly being linked to biodiversity loss and natural habitat degradation in the sense that it is the encroachment by and proximity of humans to wild regions that has enabled the virus to jump across the species barrier. Finally, biodiversity loss of course links to climate change, so for all of those reasons, I think biodiversity is going to get a lot more attention from investors in the next few years.

There's a lot going on in terms of natural capital and protecting ecosystems.

How does Actis integrate ESG principles into its portfolio?

Actis has always integrated ESG principles into the portfolio since inception in 2004. We are very systematized and have five policies in the area of sustainability: Environmental, Climate Change, Health and Safety, Business Integrity, Social.

ESG issues are integrated into the investment decision making processes, and into the actual investment committee (IC) papers at all stages from screening to final IC. I or someone from my team is always present at the IC meetings, so at Actis



Image credit: Actis

ESG is not input from the sidelines but woven into the process. We are there to discuss the ESG issues and advise the IC members. We are involved in the due diligence, including undertaking site visits. Quite often we use a panel of preferred providers for our ESG due-diligence needs.

We gather ESG KPIs from our companies regularly through a template, and monitor progress against key work streams. These could be work streams on anti-corruption, health and safety, community engagement, resource efficiency and improving diversity.

We set KPIs and we make sure that we're delivering against them. Our colleagues on the investment side are good at bringing us in very early to understand what's needed and how to look at the risk and reward sides of the deal from a sustainability perspective.

As a leading investor in growth markets across Africa, Asia, and Latin America, which regions do you think present the most exciting opportunities for sustainable infrastructure investment?

All of those markets represent opportunities for investment because there is a deficit of infrastructure. When we think about infrastructure, we think about providing core services, whether it's power generation, electricity distribution, transportation or digital infrastructure.

There are large opportunities in Latin America, Asia and Africa. That is why Actis is in each of these markets.

“Around a hundred trillion dollars of infrastructure is needed for the next two decades to provide power and keep the lights on in many emerging economies.”

Do you still see unmet funding needs, despite the abundance of investors seeking to deploy capital in the broader sustainability space?

Infrastructure is hugely underfunded. Around a hundred trillion dollars of infrastructure is needed for the next two decades to provide power and keep the lights on in many emerging economies. Putting sustainability aside, we need another planet of power plants to meet the needs of the growing population across the globe. The scale of infrastructure investment needed is huge. In developing countries, there is a high correlation between power generation and GDP, the provision of incremental power is absolutely linked to economic development and of course provides jobs, supports SMEs, industry and grows local and domestic supply chains.

It's a resilient, defensive sector. And if you do have sustainability objectives, it's a fantastic way to meet those because you're investing directly to support the energy transition. We think the returns and the sustainability outcomes are intertwined really really well in sectors like renewables.

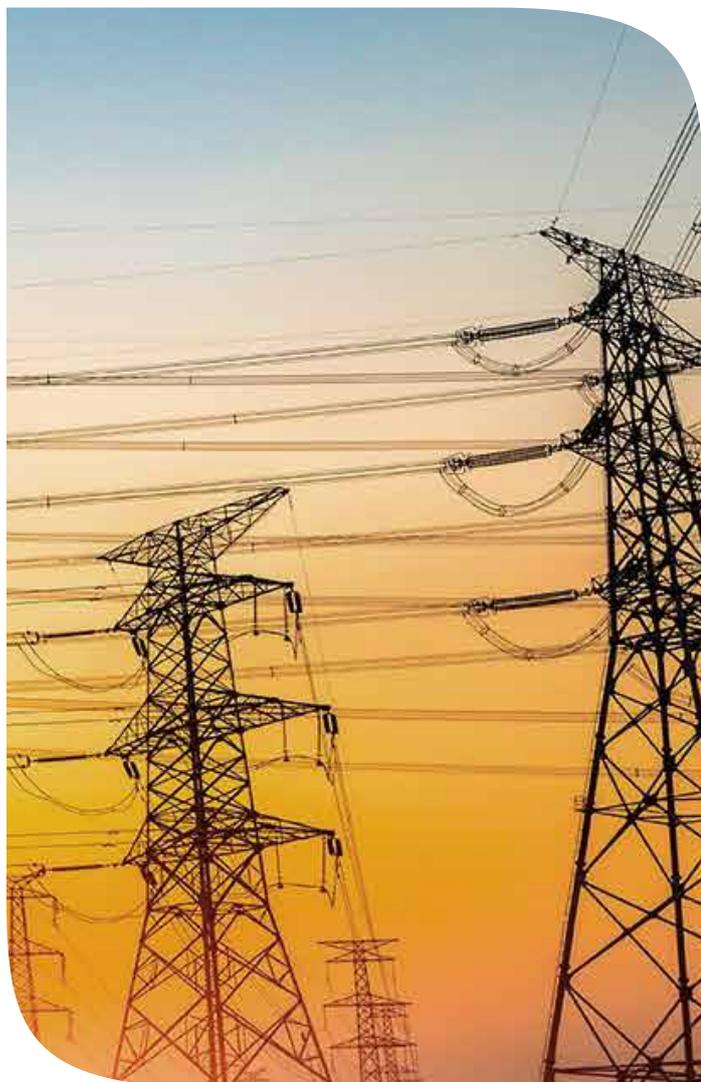


Image credit: Actis

What are the most significant threats to the overall energy transition?

Whether it is asset owners or corporates, there's a huge movement in the race to net zero and supporting the energy transition. Each week there is a new announcement about a net zero commitment. Over 1,200 companies have made net zero commitments. Asset owners are collaborating via the Net-Zero Asset Owner Alliance (AOA), co-founded in part by Allianz, the largest insurer group in the world.

Where we are seeing the slower pace is government policy makers failing to make commitments that are Paris-aligned or failing to meet the commitments that they've already made, not putting in place the right framework to enable the transition, and

not proactively thinking about carbon tax regime. That is what's mainly putting the brakes on the energy transition economy.

You are a Steering Committee member of the Emerging Markets Private Equity Association's Sustainability Working Group. Prior to that, you were on the Sounding Board of the World Bank/IFC's Operating Principles for Impact Management. What would be your hint for investors seeking to make their first investment in the sustainable industry in emerging markets?

It's easy to overestimate investments risk associated with emerging markets for those who are not deeply familiar with these markets. The reason that Actis has been successful over the years is because we're not located in the West and investing in emerging markets from there. The majority of our offices, and colleagues, are based in our markets.

We have offices in Sao Paulo, Beijing, Delhi, Nairobi, South Africa, and Cairo, to name a few. My colleagues in those offices are from those markets, and being located there they are much better able to originate and to appraise investment opportunities. They absolutely understand the context of the industry and the policy backdrop of those countries.

I think that it's very difficult to successfully invest in these markets if you're not really rooted in them. If you are rooted in them and you understand them, then you have the toolkit and the knowhow to manage and mitigate those risks. And then of course you are rewarded with higher returns if you're able to successfully do that.

What advice would you give your 22 year old self?

I would say go for it. Be bold. Believe in what's important to you. I was passionate about sustainability before it became a mainstream topic of interest for the investment industry. I'm really delighted to see that this has drawn attention from more and more people, especially the younger generations.

Who is your sustainable hero and why?

Greta Thunberg. She has brought climate change into the mindset of a new generation and mainstream society in such a short space of time, and she's "only" a school girl. I don't think any one individual has made such a remarkable contribution in such a short space of time as she has in raising awareness to the urgency and scale of the climate crisis.

A Path to *Net Zero*

María Victoria Zingoni is the Executive Managing Director of Client and Low-Carbon Generation at Repsol, which is the first and most committed international oil company to set a net zero emissions goal.

María Victoria Zingoni, Executive Managing Director of Client and Low-Carbon Generation, Repsol



María Victoria
Zingoni

How did you first become interested in sustainability?

I've spent almost my entire career in the energy sector. When you work with energy, sustainability is always there, and it plays a large role in my life.

Energy is what makes societies work. It's a basic need. It's my job to supply that in the most efficient and sustainable way as possible. Discovering sustainable sources to produce energy is very important to me.

I've been with Repsol for 22 years and I have seen how sustainability has grown to become an important part of our strategy. From 2008 to 2012 I managed the company's investor relations and was responsible for building up the ESG initiative. I'm proud to see that 30,2% of our current institutional investor shareholders are now behind the ESG criteria and support our pioneering strategy to become a net zero emissions company by 2050.

What does your role as Executive Managing Director of Client and Low-Carbon Generation at Repsol entail?

In our last strategic plan that we presented to the market in November of last year, we split the organization and the businesses into four main pillars: the upstream, traditional industrial businesses, and the two business lines that I am responsible for: the client and the low-carbon generation businesses.

The low-carbon generation business is quite new for Repsol and very important in terms of the strategy that we are pursuing. When it comes to the customer side of our businesses, our vision is that we want to be a multi-energy customer-oriented digital company.

So, we started this journey some years ago when we began selling power and gas



Image credit: Repsol

to the end customer. The way that we see it, the end customer needs different types of energy across the day, seasons, and usages. Therefore, we are creating smart, personalized energy solutions that are tailored to meet those needs of each individual customer. This includes not only electric mobility solutions, but also future synthetic fuels as well as power and gas for homes and businesses. Not only that, but also the smart energy solutions that allow our customers to benefit from distributed generation solutions like the ones that we have for rooftops or as part of solar communities.

The idea is to put the customers in the center and provide all the energy they require in the most sustainable way. It is important to help the customers in the energy transition. They need to take part in the journey as well. As part of this approach, we are the first company in Spain to offer CO2 emissions compensation at our service stations; the only big Spanish retail company with an “A Label” that certifies the renewable origin of the power we supply; and we have just launched the so called “Your Power Origin” solution where a customer can choose a solar or a wind farm as a “personal supplier” and based on a digital tool we provide ideas about energy efficiency linked to that particular generation mode. For example, if your solar panel is generating power, this is the right moment to use the washing machine.

For the low-carbon generation business line that I am responsible for at Repsol, doing that is also part of our future.

We have made a commitment to grow these parts of the business. Our goal is to have 15 GW of low-carbon generation by 2030, half of it by the middle of the decade. Repsol is developing a very solid portfolio of renewables assets in Spain. At the end of last year, we started our first wind farm in Spain with 335 MW, and we recently started our first solar farm, also in Spain. With some capacity already producing in Chile and projects under construction and development in both countries, we are advancing at a good pace.

We start with our belief that sustainability and the energy transition are a business opportunity.

How does Repsol set its sustainability objectives?

We start with our belief that sustainability and the energy transition are a business opportunity. We have long viewed decarbonization as a business opportunity whose merits should be maximized.

Once you understand sustainability as a financial and business-oriented model as well as an environmental one, you can develop efficiency and circular economy initiatives that address the largest issue that we have right now: the decarbonization of the economy as a whole.

Repsol has a long track record on such thinking. This is not new for us. We were not only the first traditional oil and gas company to set a net zero emissions goal, but also the first one to support the Kyoto Protocol almost 20 years ago when we created our first climate unit back in 2003. We launched our first carbon plan back in 2005, and the first emissions reduction plan in this company was in 2006. We are comfortable with the track record that we have, and also in setting the strategy around that.

We issued the industry's first green bond in 2017. In our new strategic plan, we are dedicating a significant portion of our CapEx to low carbon growth so almost 40% of the total CapEx in the next five years will be devoted to low carbon.

At Repsol, since 2006 we have reduced CO2 emissions by more than 5.5 million tons, and we are accelerating our efforts.

Last year we reduced the carbon intensity indicator by 5% in comparison to 2016. And this year in 2021, we have the target to do an additional 3%. Continuing to lower CO2 emissions is our most important commitment.

We are applying the best-in-class digitalization technologies and data analytics to do so and are setting an internal carbon price to make decisions and to stay on track.

Repsol maintains an open and constant dialogue with the ESG investor universe, which is really important. We are adapting to the constant changes in energy usage and consumer habits. It's important to understand what the customers want and how they are going to be part of this energy transition journey.

Repsol set a 2050 goal to attain net-zero emissions. What strategies are in place to achieve that goal?

We are on track. As an integrated multi-energy company Repsol is very well positioned to lead the energy transition. Not only because we are significantly funding our new renewable portfolio assets, but, also, because we are very committed to develop and transform our current core businesses to support our sustainability goals.

It is true that we need to invest in renewable energy and renewable hydrogen at a faster pace, but also in advanced biofuels and synthetic fuels and in applying the circular economy in all the processes that we have.

I am a firm believer in technological neutrality to boost the energy transition. We cannot foresee the future and we need to consider all the energy sources and technological developments

ahead to achieve success in the fight against climate change.

We need all types of energy to be more sustainable. That is how Repsol likes to think about it. All forms of decarbonization, in the way that we see it, are valid and complimentary, so we need to incentivize them so that all forms of energy can contribute, without exception. That is what is going to help us as a society as a whole to accelerate the progress of the energy transition. The challenge is to commit to those energies that contribute to reaching our goals in the most cost effective way.

Repsol is tracking its progress to facilitate the net zero targets that we have by 2050. In our strategic plan, in comparison to other companies, we have a long-term goal, but we have also set intermediate targets for reducing carbon emissions.

We are aiming for a 12% reduction by 2025, 25% by 2030, and 50% by 2040 to be able to reach zero net emissions in 2050. At this moment, we believe that it is possible to achieve at least 80% of that ambitious target with the technology that we can currently foresee.

Technology is continuing to evolve, not least with respect to carbon capture, use, and storage. And if that is not enough, we will apply alternatives to offset the rest of the emissions.

Being in 2021 and having a net zero target almost 30 years from now and knowing how to achieve 80% of it says a lot about our strategy. We truly believe that we will achieve it.

When we talk about net zero, it is an absolute commitment, and we want get there as quickly as possible. It's a challenge, but Repsol is committed to achieving it.

...since 2006 we have reduced CO2 emissions by more than 5.5 million tons, and we are accelerating our efforts.

As a diversified energy distributor, how do you see Repsol should be positioned in 10 years' time?

I'd like Repsol to be considered by our customers and shareholders as a sustainable multi-energy company with a diverse and personalized offering of products and services. When I say multi-energy, I mean energy for the home, for enterprises, and for mobility. We understand that customers are going to be more and more conscious about the energy they consume and how it is produced. And I see Repsol playing an integrated

role across the whole value chain.

Electrification will, no doubt, play an important role in the energy transition, but renewable energy and electrification alone will not be enough to decarbonize the economy as a whole. There are still large heavy industrial sectors and chunks of transportation: long haul, maritime, aviation, etc. that need other solutions.



Image credit: Repsol

I see a lot of potential for renewable hydrogen, advanced biofuels, and synthetic fuels. I hope to see those technologies pick up speed in the next five to 10 years. We will see a different world than the one that we are seeing today. The circular economy is also starting to gather speed. Not only on an individual level with people recycling in their homes, but also through recycling and reuse of materials in our industrial facilities. We have today more than 200 circular economy initiatives company-wide that allow us to produce even more sustainable products. This needs to be an important part of the end products and services that we produce and supply to society.

What advice would you give your 22-year-old self in terms of building a successful corporate career?

Surround yourself with people that support and challenge you.

Things are not easy and there will always be obstacles, but believe in yourself and keep on going. Fighting to overcome challenges gives you the opportunity to change things. Keep on studying, develop your curiosity, and always try to be the least smart person in the room; that will make you better.

You need to have an internal discussion with yourself. Do you want to make a difference? The same goes for sustainability. So, my advice is to accept the challenges. They require someone who is willing to take the lead and make it happen. It's not easy, but it's a good feeling to look back at a challenge and say that you were part of the solution and change that helps society move forward.

Fighting to overcome challenges gives you the opportunity to change things.

Who is your sustainable hero and why?

It's difficult to choose one. There are a lot of people doing a lot of important things, but there are also a lot of people that do much of it because they like to be on the front page of the news. To me the real heroes are all the men and women that make everyday decisions and change their behaviors in their homes, workplaces, and communities to help our economies become more sustainable – and never appear on the front pages for it. That is where the real changes are coming from.

Investing for a Better Future

At Macquarie Asset Management as the Global Head of Sustainability, Chris Leslie is shifting the culture to bring sustainability into everything they do.

Chris Leslie, Global Head of Sustainability, Macquarie Asset Management

How did you first become interested in sustainability?

By way of background, I've been with Macquarie for almost 29 years and have been fortunate enough to work in various parts of the world. I have spent much of my time at Macquarie focused on our infrastructure asset management business. I was the Chief Executive Officer of Macquarie Infrastructure Partners for a number of years before becoming Executive Chairman of our business in the Americas and taking on my current role as Global Head of Sustainability for Macquarie Asset Management.

I mention this as my background is very much in infrastructure asset management and I am by no means a longstanding climate activist or sustainability champion.

I first became actively interested in Sustainability in 2018 after reading Steven Pinker's book *Enlightenment Now*. The book catalogs various aspects of human progress and generally concludes that the world is largely better off than it was a hundred years ago (e.g. hunger and infant mortality are receding). There are two things the book highlights that are not getting better. One is cybersecurity and the other is climate change.

Around the same time, I read the U.S. Federal Government's Fourth National Climate Assessment report and it struck me just how serious and urgent the problem is. The more I learned the more real and personal it became for me. At that time ESG was very much a compliance and risk management discipline and we had a very strong, existing approach across our business. I saw an opportunity to add value to our investments through sustainability. As the world's largest infrastructure asset manager, given the global scale of our portfolio, I believed we could make a real and significant impact with respect to decarbonization.



Chris Leslie

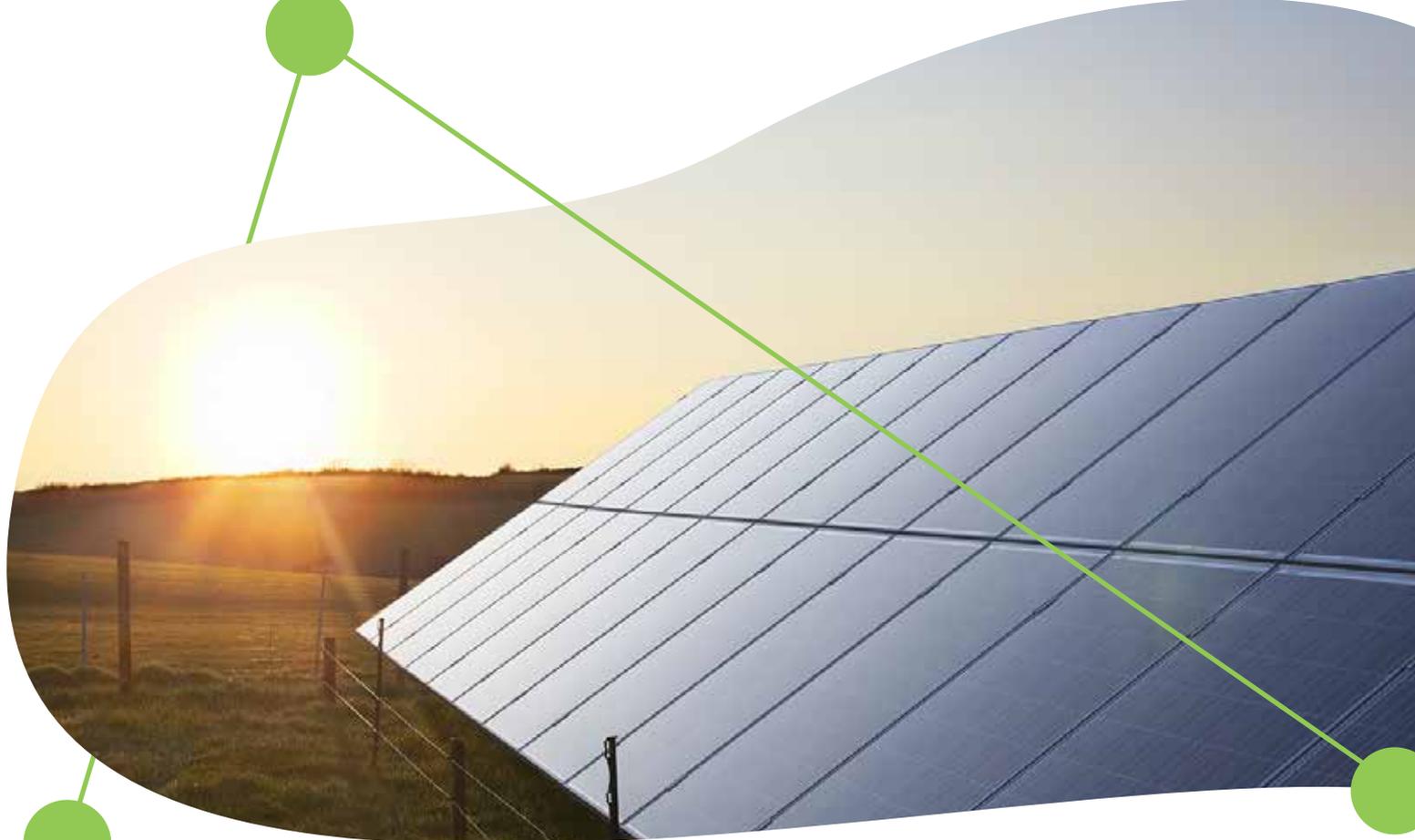


Image credit: Getty Images

What does your role as Global Head of Sustainability for Macquarie Asset Management involve?

Across our business, we have always had a very strong ESG emphasis in our practice from a risk management point of view. Environmental risks and safety in particular have been a deep area of focus for us for many years.

The opportunity that I saw as the Global Head of Sustainability took a different perspective, which was really this: how do we transform the companies we invest in and make them more sustainable investments for the benefit of our clients and the people our assets serve?

My role is focused primarily on the opportunities presented by acquiring and managing sustainable investments, the corresponding creation of value for our LPs and the cultural and organizational changes necessary to educate our people and to transform the way we do business around the world. My team also supports the broader organization in all aspects of sustainable asset management, fund raising and new product development. We advocated for MAM's Net Zero 2040 commitment and are orchestrating all aspects of knowledge transfer and sustainability reporting.

As you might expect, we gave early thought to setting up a dedicated sustainable infrastructure fund, but we decided against that as a first step and instead embarked on transforming our

existing business to be more sustainable and to put sustainability at the heart of everything we do. That is authentic change. Of course, now that is underway, we are also giving active consideration to new products in response to opportunities and investor demand.

Environmental risks and safety in particular have been a deep area of focus for us for many years.

What themes or trends in sustainability are you most excited about over the next 5 - 10 years? With a longer-term perspective, perhaps through the second half of the century, what macro changes and drivers do you anticipate?

I think over the next 5 - 10 years, decarbonization and the energy transition are going to be enormous sources of opportunity and positive change.

New technologies like batteries, hydrogen, and carbon sequestration are exciting and have huge potential.

Another interesting area is ironing out some of the issues resulting from this change. Renewables still have grid reliability issues. The sun isn't always shining. The wind isn't always blowing. Batteries potentially fill that gap, but today renewables

are approaching a scale that, despite all the good they are doing, they are creating challenges in the economic design of short-run marginal cost power markets that need to be addressed if the energy transition is to succeed. Either via technical solutions to improve capacity and reliability or via market re-design, or both.

More broadly, from the safety and community aspects of our work - especially in the context of COVID-19 and global social unrest - we are more acutely tuned into interactions with the communities we serve, the essential service nature of many of our assets and the need to make these services increasingly resilient to physical and economic disruptions so that they can continue to deliver affordable, reliable services, even when under extreme duress.

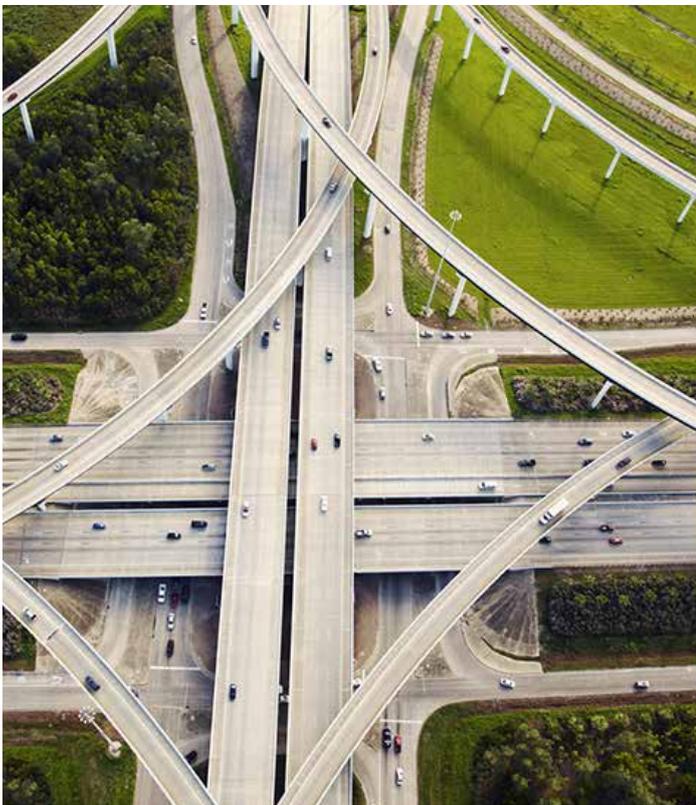


Image credit: Getty Images

With climate risks, it's important to consider mitigation, resilience and adaptation. Today, resilience is more about recognizing the interdependencies of networks – as we saw recently with the pressures on global supply chains. We are not yet at the stage of widespread building walls to defend against sea level rise, but we might design a new bridge or a new road differently knowing that the climate is changing, and it is going to change over the period of our ownership. That idea is built in designs today but will be more prevalent in future practices.

As the world's largest infrastructure manager, how does MAM integrate sustainability principles into its portfolio?

We have committed to being the leader in sustainable real asset management. And by that we don't mean being at the top of a league table. We want to lead by example, drive change across our industry, and share our learnings with others as we go on this journey.

I think the old axiom that you can't manage what you don't measure is very true. We've been measuring greenhouse gas emissions and energy use around the world, and most notably, last December, we set a Net Zero target for 2040. It is a complex journey, but a simple target that everybody can keep clearly in mind and it has proven to be an incredibly powerful way of communicating our strategy and clarifying direction for a diverse range of businesses.

As we have steadily shifted the culture of the organization towards sustainability, it is heartening to find that we are pushing on an open door. People across Macquarie and throughout our portfolio companies are personally passionate about sustainability. By clearly communicating our shift in strategy, we have released incredible human energy throughout our portfolios to take action for transformative change.

With climate risks, it's important to consider mitigation, resilience and adaptation.

In 2020, MAM introduced carbon and energy reporting for its fund portfolio companies. How will the increasing practice of carbon and sustainability reporting affect the finance industry in the future?

Non-financial metrics are a huge shift that we should not underestimate. They will quickly build in significance and likely become as important a part of investment decision making as financial metrics. The view will be much more holistic when it comes to making investment decisions and allocations. As artificial intelligence is increasingly used to screen investment managers and opportunities, managers will need robust frameworks for these non-financial metrics or risk being excluded from investment allocations and the management of global savings. Non-financial metrics will need to be audited and investment grade.

MAM has a truly global team and coverage – which regions do you think present the most exciting opportunity for sustainable infrastructure investments?

It is interesting that a lot of developing economies are jumping

straight into state-of-the-art technology. We saw that with mobile phones for example as developing economies embraced mobile technology and bypassed wireline. That is something to watch. In China, in particular, if you look at the EV charging station rollout, they can install in a month what the U.S. installs in a year. They have a huge commitment to the electrification of their transit and bus fleet in particular.

While a lot of developing economies can jump straight into new technology, I think it is less about regions and more about sectors. This is a fairly broad trend around the world. One of the advantages of our global position is that we see what's happening in a sector in one part of the world and we can apply those lessons quickly in other parts of the world. The energy transition, for example, is a fascinating case study where legacy market designs and electricity regulatory frameworks are coming under pressure due to the rapid pace of renewables implementation. Pricing signals and investment signals are getting turned on their heads. Europe has been a leader, the Scandinavians in particular, in showing us the way, but the rest of the world is catching up and there's a very dynamic global marketplace for energy transformation.

MAM clearly has a sustainability-leaning emphasis given its investment focus. How does broader Macquarie view sustainability and its ambitions in that regard?

Climate change and the energy transition is a focus across our whole business and has brought out the best in group-wide collaboration for Macquarie. But it is important to remember that there are four broad groups in Macquarie that are very different by design and they need to tackle these challenges in their own way. Each of the businesses is very focused on their own clients each with a distinct problem set.

Macquarie Group recently made a commitment to align its financing activity with the global goal of net zero emissions by 2050. The 2050 commitment provides an overarching framework for the businesses and recognizes that different parts of Macquarie will have different paths to net zero based on their client and business needs.

In MAM we were able to commit to 2040 as our business and industry have benefited from early action and thinking across the asset management industry. We are well on the path to meeting our 2040 commitment.

Despite the abundance of investors seeking to deploy capital in the broader sustainability space, do you still see unmet funding needs? In which infrastructure sectors or areas? If not capital allocation, what are the most significant threats to the overall energy transition?

There continues to be significant appetite for infrastructure investments around the world. But a number of these opportunities are not necessarily “infrastructure” yet (by which I mean they are in the venture, growth or private equity stage). Hydrogen, carbon sequestration, and batteries are not quite yet infrastructure grade, but the expectation is that they will be in due course. We expect infrastructure capital to be a tremendous source of funding for their widespread deployment. In the meantime, infrastructure investors are nurturing these technologies within broader platforms of existing portfolio companies, such as electric and gas utilities.

It is interesting to see the evolution of wind and solar. Governments had a role to play in supporting those investments while they got cheaper and we need to see the same thing happen with hydrogen and batteries. Governments around the world have played a transformative role in subsidizing wind and solar. They now need to subsidize more of the other energy transition technologies too.

ESG stocks are outperforming during recent market volatility. Do you see the public equity markets reemerging as a prominent source of capital for low carbon infrastructure?

The short answer is yes. We are seeing a huge focus on SPACs at the moment with SPACs funding a lot of new technology that will mature. As the technology develops, public markets will become a main source of funding. Ultimately, you hope everything becomes low carbon and we stop needing the distinction for everything else.

What advice would you give your 22-year-old self?

I would tell my 22-year-old self to find problems that interest them and try to solve them, and hopefully someone will pay you for it. I would also encourage everybody to watch Tim Minchin's “9 Life Lessons”, which was an address he gave at the University of Western Australia. He's an Australian comedian, but his nine life lessons are absolutely on the money and well worth watching.

Who is your sustainable hero and why?

Obviously, my team are my heroes, but also John Elkington, who came up with the triple bottom line – people, planet and prosperity. It remains a very good framework for how to think about sustainability. Elkington is now focused on going beyond sustainability into a more regenerative model. He is ahead of his time, incredibly smart, practical, and humble.

Equally praiseworthy are Christiana Figueres and Tom Rivett-Carnac for their dedication to wrangling the Paris Agreement into existence back in 2015.

Customer First

As CEO at energy technology company Enphase, Badri Kothandaraman is striving to make the world's best home energy management systems. The technology is delivering Enphase's vision of better economics, clean energy, and energy independence.

Badri Kothandaraman, CEO, Enphase

Tell us about your career leading up to Enphase. How did you first become interested in sustainability?

I was born and raised in India in a middle-class family. My parents placed enormous emphasis on education. I attended the best schools in India and completed my bachelor's degree in technology at the Indian Institute of Technology, Madras. After that, I came to UC Berkeley in 1993 for my master's degree in materials science. I subsequently joined Cypress Semiconductor in 1995 and for the next 21 years of my career, I worked on semiconductor process technology, chip design, and eventually moved into managing businesses within the company. The chip industry is a fascinating one and I learnt tremendously during my career at Cypress Semiconductor. However, I always felt that I was one step removed from the end application.

During the early 2000s, SunPower Corporation was a subsidiary, operating as part of Cypress Semiconductor. SunPower's solar technology was wonderful and far ahead of most in the industry. Although I did not appreciate the intricacies of the business, I found its growth to be astronomical and impressive. Much of the valuation of Cypress came from SunPower. In 2008, Cypress spun off SunPower as a separate company. I continued watching SunPower over the next few years and started understanding its technology. Meanwhile, I felt the overarching urge to create products that directly touched the end consumer versus making chips which would go into someone else's product, so I left Cypress in September 2016.

After I left Cypress, I dabbled in a startup creating consumer accessories with USB-C technology. I didn't seriously contemplate going into the solar industry until early 2017, when I had the chance to meet with Enphase. I still remember it vividly. I came to talk to Enphase and the first thing that struck me was the company's beautiful and sleek IQ 6 microinverter – a product which could last for 25 years, had 300 internal components, and cost around \$50. IQ 6 microinverters were able to generate clean energy and save money for the homeowner, but Enphase was struggling with operational issues.



Badri Kothandaraman



Image credit: Enphase

At that time, Enphase had just started working on the development of battery storage. It was clear to me that batteries added an important dimension to the solution. I thought it would be a massive opportunity if Enphase could provide homeowners with clean energy that would give them energy independence, and so I decided to join the company. I thought it would be interesting if I could get involved in making high quality, innovative products with a focus on operational excellence, delighting customers, producing clean energy with independence, and helping to save money. I jumped in and it has been a great ride. For the first couple of years from 2017 to 2019, my focus was on operational excellence, but now we are spending the right amount of time with equal priority on both top line growth and operational excellence.

If we want consumers to change their thinking about energy, we need to give them a solution that both saves money and is good for the planet.

We get even more excited every day about what we are doing. We just introduced our battery storage system for North America in July 2020. We are now making products that are fully delivering on our vision of better economics, clean energy, and energy independence for the homeowner. We are doing well financially because our products are differentiated, high quality, and most importantly, because we care deeply about customer

experience. In addition, it is important that we make money in this process because it helps us further our purpose of “Advancing a sustainable future for all.”

You’re increasingly moving to be a consumer-facing brand. How important is sustainability to the average consumer making the decision to buy your product, and how do you think that will change over time?

Sustainability awareness is becoming more prevalent. Millennials are incredibly conscious of the environment and that is a great trend. However, there is still a gap between sustainability and cost savings. If we want consumers to change their thinking about energy, we need to give them a solution that both saves money and is good for the planet. Consumers need to see clear financial benefits before they take the leap. Today a solar system costs around \$20,000, which is a lot of money. A storage system will add on another \$15,000. I can’t blame consumers for looking at savings before sustainability.

We have seen the situations with the California blackouts and the recent Texas power shutdowns. It all comes back to one thing – we have freedom of choice in most of the things we do. However, when it comes to the energy that we consume, we still have our limitations and there is more work to done, particularly with the regulators. We don’t even know what freedom looks like in this respect. The concept of an energy system that allows homeowners to produce their own energy, store their energy,

and consume energy whenever they want is very appealing. However, the penetration of solar in the U.S. is only 3% and this needs to change rapidly with help from technology providers such as Enphase, policy makers and the utilities.



Image credit: Enphase

Let's look at Australia where one in every three homes is solar-powered. The cost of solar in Australia is almost a third of the United States. Australia, and Europe have embraced solar in a big way and the U.S. needs to catch up. There needs to be both a financial component and a sustainability component. Anything that the policy makers can do, like tax credits, is critical. The government has to do its part. Technology providers like Enphase have to innovate and reduce costs. Installers have to do their part by streamlining installations, finding better ways to do things, and spending less on customer acquisition costs. The local authorities under jurisdiction (AHJ) also have to do their part by streamlining permitting paperwork for such installations. Once these efforts happen, sustainability will dominate in the U.S.

What do you see as Enphase's role in the sustainable economy in 10 years? In 25 years?

Enphase is a global energy management technology company, and we want to make the world's best home energy management systems. When people think about their energy needs, we want them to think about Enphase. We want to be their trusted energy partner. Our goal is to provide a seamless experience for homeowners, which starts with building great products.

We are also working on a digital platform for installers and homeowners which will keep Enphase, homeowners, and installers continuously connected. The focus is on reducing friction for the installers by providing them a one-stop-shop for all the services they need to run their business and serve customers. In addition, we want to take care of the homeowners all the way, from cradle to grave.

We want to make the world's best home energy management systems.

What do you see as the biggest obstacles to having a hundred percent renewable energy economy in the U.S. economy?

We talked about this earlier. The customers have to see clear savings before they commit large amounts of money. Everything in the chain has to become more economical and that's possible through innovation – product and panel innovation, battery innovation, financing, and simplified permitting through digital means.

Technology companies need to innovate, policy makers need to keep the tax credits going, and programs like net-metering must not go away.

What are some of the most important lessons that you would share with entrepreneurs trying to build zero carbon energy systems that are young and coming into the sector wanting to make a difference?

The advice I always give is to focus on the long term, understand the customer experience well, and ensure that your actions are going to significantly make their lives better. Put customers at the center and make decisions from their point of view versus your own. Don't be afraid to go back to the drawing board and make things right because it is far worse to go to market with a product that provides a poor customer



Image credit: Enphase

experience. Putting yourself in your customer's shoes is very hard to do in practice, but we get paid to do hard things, right?

Next, every decision you make in R&D has to also be viewed from a quality perspective. What kind of components are used in the design? What kind of margin do I leave in the design? How do I design my power electronics? How is the homeowner going to use it? How should I take care of thermal performance? We need to ask these questions and it requires enormous empathy for the customer. Power electronics on the roof and on the side of a home are susceptible to failures. The companies that win in this industry are the companies that focus on the long-term with a maniacal focus on customer experience and quality. They are

the companies who will be successful.

Who is your sustainable hero and why?

There are many people who are my sustainable heroes. They are the people who pioneered the industry a long time before I came. They include all of the solar installers worldwide who decided to get into the business as they saw a mission to making the world a better place, in addition to making money. Next, many of our employees are heroes as they came to Enphase to achieve a purpose and not just do a job. And of course the homeowners who see a possibility, take a leap of faith, and drive change. They are my sustainable heroes!

Nuclear Fusion

Wal van Lierop, Founder and Managing Partner at Chrysalix Venture Capital, believes in the potential of nuclear fusion to power the future of clean energy around the world.

Dr. Wal van Lierop, Founder & Managing Partner, Chrysalix Venture Capital

When did you first become interested in sustainability?

It started a long time ago when I was at university studying Economics. There were two things that really caught my interest: cost and system dynamics in the environment. If you innovate one small part in a system, what impact will that have on the overall ecosystem?

My interest in system dynamics was driven by the fact that I lived in the Netherlands, though I moved to Canada in 1995. When you live in a country like the Netherlands, you start to appreciate what it takes to run an integrated environmental system. Part of The Netherlands lies below sea level and requires a delicate system of dikes and water pumps to prevent the country from disappearing into the sea.

Now that sea levels are rising, planning for increasingly higher dikes requires the community to work collectively more than ever because it is impossible to build dikes around everybody's individual homes. You need to find the right balance between public and private initiatives to be successful. The important lessons from how the Dutch tackle their water-level threats can be applied to how we should fight climate change all over the world.

While I was intrigued by system dynamics very early on, I really got up to speed in the late 1970s to early 1980s. I spent quite a bit of time at the International Institute for Systems Analysis (IIASA) in Vienna, where a number of people from the Club of Rome were doing all kinds of system dynamics studies.

My interest was in how everything works together in complex systems – the economic impacts and the overall social and environmental elements of an intertwined system. Looking back, you could call it ESG 1.0.



Dr. Wal van Lierop



Image credit: Getty Images

As both a European, where climate change has been an important topic for at least a decade, and a North American, where it has not been as big an issue, how have you seen societal, investor and company attitudes change over the past year? Has North America woken up?

Over the past year in North America, we have seen enormous storms, floods and forest fires, most notably in California, but also in British Columbia, Alaska, and Northern Canada. North Americans have started to notice that something fundamentally different is happening to our ecosystem. They are still struggling to find the right answer, and that is understandable as societies go through cycles. More and more people in North America are starting to worry about the consequences of climate change. BlackRock's Larry Fink, Mark Carney, the former governor of the Bank of England and Canada, and many financial institutions, industrials and politicians support action.

The momentum is growing, although it is still debatable what is really driving investors at this moment in time. I am a bit cynical because we have seen this before in the early 2000s, when the bubble in Silicon Valley burst and investors started to look for the next bright, shiny thing. That was Cleantech as of 2001 until many people grew disappointed with the returns on investments in the sector and it became unfavorable about a decade later. Increasingly, however, I think there is true concern that drives environmentally focused investments. ESG investing has become very popular.

But the jury is still out on what is driving its popularity. Is it a true concern about the "E" in ESG? Or is it because funds just started to divest from oil and gas at the right moment and reinvest the capital in the Big Five tech companies from Silicon Valley? It made these funds a lot of money, but very limited funds were reinvested in new risky technologies that could contribute to our aspiration to become net-zero by 2050. I am encouraged that slowly but surely, ESG funds are starting to go beyond reallocating most of their capital in Silicon Valley. High tech alternatives are starting to show more interest in investments in industries and companies that can have a significant positive impact on the environment, such as energy efficiency software companies, electric vehicles and related infrastructure, batteries, carbon capture and re-use, hydrogen and fuel cells, clean water and even nuclear fusion.

The momentum is growing, although it is still debatable what is really driving investors at this moment in time.

How important is nuclear in the energy transition, and what other technologies are you excited about?

I personally think nuclear is very important.

We have achieved a lot with solar, wind, biomass, and batteries, but most energy executives and industry specialists now

realize that when you have achieved 50% of the energy transition, you enter the more difficult applications to achieve the remaining 50%, i.e., providing heavy industry with the high temperature steam they need or powering mega cities where there is no space for solar or wind.

I hear the same from utilities, industries and politicians all over the world. Many have, under the Paris Agreement, committed to retiring coal-fired power plants by the early 2030s and are struggling to find alternatives that can help power-heavy industry (e.g., steel making, aluminum, cement, chemicals, etc.) and the vast growing megacities in Asia and Africa. Today they do not have credible solutions.

So, it is no wonder that the interest in nuclear is gaining popularity again. People are hoping that new versions of traditional atom-splitting fission plants will become safer than before, but public resistance based on the nightmare scenarios at Chernobyl and Fukushima remains very high.

People have hoped that Advanced Small Modular Reactors (SMRs) would assuage most concerns. However, even while they are probably safer, the key issue around fission is that once you start the process you cannot really stop it, and it is extremely difficult to control. Then there are still the much-published nuclear waste and proliferation issues related to it.

Yet, what gives me hope is the advancement in nuclear fusion, the safe version of nuclear that promises to provide risk-free, clean, abundant cheap energy everywhere with hardly any waste residue. It is truly the dream scenario of clean energy. There are now about 30 privately financed fusion energy companies racing to be ready for commercialization in the early 2030s by the time many utilities will need to retire their coal-fired power plants. Central in the fusion industry is the ITER project in Europe, which is a multibillion-dollar project funded by most of the OECD countries that is building a large-scale machine scheduled to produce 500 MW net energy. From a scientific point of view, everyone close to it believes ITER will work. But, that is not feasible until 2040 at the earliest.

Many private fusion companies benefit from the science that is being demonstrated at ITER but are on an accelerated track to commercialization. Some of them are currently working on having their first demo plants operational by 2025, and their first commercial fusion plants in operation by 2030, maybe as early as 2028.

The big players in that area are Commonwealth Fusion Systems out of MIT, TAE Technologies in California, and the company I am invested in, General Fusion.

It will be an absolute game changer in the energy industry if any of these companies will be successful. Nuclear fusion will provide abundant, safe, cheap, and clean baseload power. As soon as the first fusion plant operates in a technically and economically satisfactory way, we will see an inflection point and many others will switch to fusion.

What I am seeing with nuclear fusion gives me hope. The saying was always: fusion is at least 20 years out, and it will remain 20 years out forever. However, I am much more certain today that this will happen than I was 10 years ago, and that it will breakthrough in this decade. To those who question how small fusion startups with limited funding may be able to beat large well-funded international institutions like ITER, I say that 120 years ago, there were a number of international well-funded army and government-led institutions that focused on bringing to market the big innovation of that time – the airplane – but yet it was the Wright brothers, two guys in a garage, who flew the first plane!

Nuclear fusion will provide abundant, safe, cheap, and clean baseload power.

What advice would you give your 22-year-old self?

Find what excites you, live that dream; relentlessly focus on it and its impact on our overall system. And while you do that never stop believing in yourself!

Who is your sustainable hero and why?

Frankly, there is not one individual. I do not believe in the Übermensch of Silicon Valley or the big egos to save the environment. What we need to achieve on the environment takes a community, all of us to change our systems. My sustainability heroes fall into three groups; the early stage company builder, often the engineer who has a dream, who sees something that nobody else sees and commits to make it work; the early stage investor who buys into that dream, sees the potential and takes risks that are not for the faint of heart; and finally, the early-stage customer willing to give it a try and wanting to do his or her part in building a more sustainable society.

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The Future Heroes

This magazine intends to bring our sustainable heroes and heroines to the forefront and celebrate their achievements and insights into how they are shaping our future.

nomuragreentechcommunications@nomuragreentech.com
www.nomuragreentech.com

NEW YORK

309 W 49th St
New York, NY 10019
United States
Phone: +1 212 667 9300

SAN FRANCISCO

Three Embarcadero Center, #1150
San Francisco, CA 94111
United States
Phone: +1 415 445 3800

CHICAGO

1 N Upper Wacker Dr
Chicago, IL 60606
United States
Phone: +1 312 234 9584

ZÜRICH

Bahnhofstrasse 26
8001 Zürich
Switzerland
Phone: +41 44 578 3900



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