greentech capital advisors

sustainable HEROES

green leaders in focus

LYNN JURICH
Empowering Homes

BRYAN MARTIN
Catching the First Wind

LARRY BURNS
EVolving Mobility

MINDY LUBBER
Climate Warrior for Good

VICTORIEN ERUSSARD
Floating on H_20

Contents

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Take action... Make it count

While not everyone qualifies to be a hero, we believe that all of us have the capacity to become one. In this edition of *Sustainable Heroes*, we continue our journey as fellow travelers, striving to make a positive impact in our communities, our environment, and our global economy.

Sustainable Heroes is an opportunity for us to highlight some of the leaders, visionaries, and doers, whose impact we consider noteworthy and inspirational. While environmental issues, such as water scarcity and associated societal challenges, remain a potent threat, we also view these challenges as commercial opportunities since businesses exist to solve problems. And while we have a collective responsibility and opportunity to create a more resilient world, our actions today will determine our future.

In this issue we interview **Lynn Jurich**, co-founder and CEO of Sunrun. Lynn leads through inspiration and passion with one mission – to create a planet run by the sun – and through Sunrun, she is making this happen.

We speak to **Bryan Martin**, founder and CEO of DESRI (D.E. Shaw's Renewable Investment business) and the catalyst for offshore wind investments in North America. He shared his views on the U.S. energy market and how wind power is instrumental in the thermal power plant replacement cycle we are currently living through.

We speak to **Larry Burns**, one of the most knowledgeable and experienced transportation and mobility experts. He started off as a leader at an incumbent (with over 30 years at General Motors), and is now an influencer and innovator. Larry has been in the driver's seat of the automotive industry transformation – supporting electrification and autonomous technology innovation.

We interview **Mindy Lubber**, with a 36-year career in sustainability and now the CEO of Ceres, Mindy is instrumental in accelerating capital into sustainable activities, working with the most influential investors and corporations to tackle some of the world's biggest sustainability challenges.

Finally, we interview **Victorien Erussard** the founder and developer of Energy Observer, the first hydrogen vessel on a scientific mission around the world. It's testing the limits of innovative energy architecture, and proving that it is possible to reduce our impact on the environment without reducing our comfort, through traveling around the world on a vessel solely powered by renewable energy sources (sun, wind and hydrogen).

Greentech is at the forefront, enabling industry transformation, connecting investors, incumbents and innovators – empowering individuals and corporations to make a positive impact. Remember, we will be held accountable by future generations as to how and to what extent we address current challenges. Through the power of the human spirit and collective ingenuity of our global community, we can make sustainable change happen. We encourage you on your own quest to innovate, drive change, embrace sustainability, and do the right thing. Become a heroine or hero to others and help us together solve the problems threatening our very survival.

As fellow travelers on this journey, we strive together to enable a greener future.

It can be done!

Managing Partner
On behalf of the entire Greentech family

P.S. We welcome nominations for people you'd like to see featured in future editions. Please send your nominations and other comments to anikolausson@greentechcapital.com

Putting the I in Team

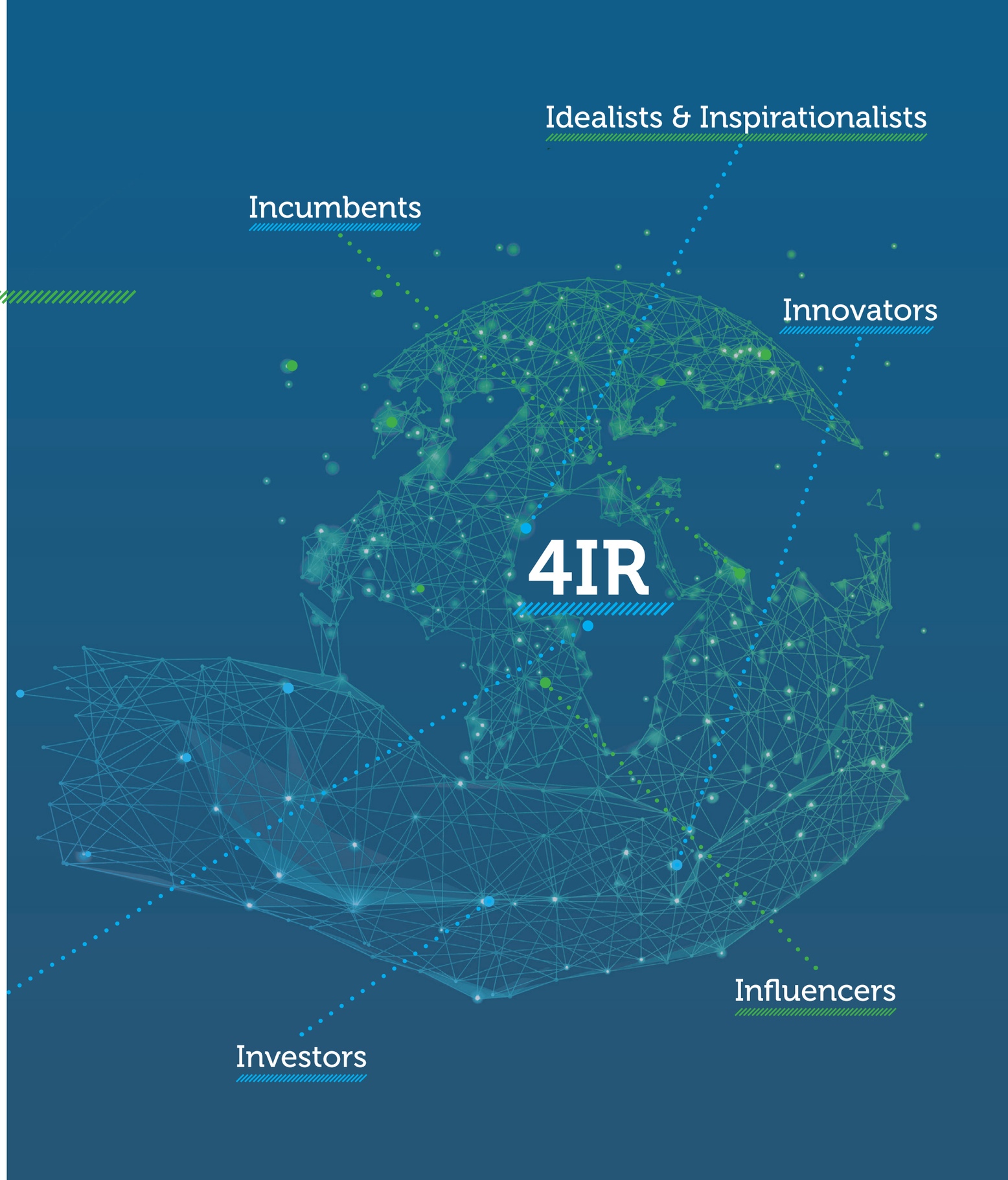
Investors, Incumbents, Innovators, Influencers, Idealists and Inspirationalists all strive towards the same goal – to make a positive Impact. These sustainable heroes come from across the globe, together they can bring hope and prosperity to our society.

People are naturally attracted to the sparkling energy and unimaginable success of a pioneer: a hero in the eyes of many. Greentech actively seeks heroes who are focused on sustainability and transforming our current energy, transportation, food, water and waste infrastructure systems. Heroes are individuals who execute on opportunities, apply innovation and disruptive ideas to every business decision, and stand strong in a time of change. They all have qualities that allow them to excel individually in so many ways.

Together, as a community, they have the power to drive profound change. They all play an important role in our ecosystem:

- **Investors** – individuals applying sustainable impact principles to every investment decision and allocating capital to corporations that meet their requirements
- **Incumbents** – individuals in leadership positions at large corporations, accelerating growth and innovation through investments in R&D and improving business models
- **Innovators** – individuals leap-frogging ideas, pushing and testing technological innovation, thriving on the unknown and being seen at the forefront of industry transformation
- **Influencers** – individuals consulted and respected as thought-leaders, with an ability to influence decision-makers and drive policy change
- **Idealists & Inspirationalists** – individuals who drive change through their ideas, passion and inspiration

Together, as a team, these heroes have the power to drive industry-scale change and contribute to the **4th Industrial Revolution**. In a time with uncertain policy environments, these qualities are needed more than ever in order to make a notable impact and accelerate our transition to a more sustainable future.



Empowering Homes

Photo Credit: Sunrun

Lynn Jurich is the co-founder and CEO of Sunrun, one of the leading home solar companies in the U.S. She followed her passion for preserving the environment and invented the business model "solar as a service". Lynn thrives on the mission to create a planet run by the sun, and making solar power accessible to everyone.

Lynn Jurich

- How did you end up in solar?

Nature has always been important to me; important to humanity. I grew up in the Pacific Northwest, appreciating fresh air and trees, and want to contribute toward preserving them. I completed an undergraduate degree with a focus on Science, Technology and Society at Stanford, followed by a career in venture capital.

I spent some time in China, where I witnessed the impact of air pollution firsthand. After having been exposed to the digital and information industries in Silicon Valley, it made me realize the infrastructure problems we have, and compelled me to think about ways to use our resources more efficiently.

I decided that this was what I wanted to dedicate my business skills to. I'm good at creating value from really messy problems. We came up with the idea of solar-as-a-service to provide households clean, affordable solar power from their roof without any upfront cost or maintenance concerns. That idea changed the way Americans are able to participate in a clean energy future. Since founding Sunrun in 2009, our business model has evolved, but the underlying vision is still there.

- How do we get to 100% renewable energy?

The world knows we need to move to 100% renewables as fast as we can. My view is that this is what society wants and it can be both a huge economic and social opportunity.

Rooftop solar and home batteries will get us to 100% renewables faster. If we were to use all the available rooftop solar panels in the U.S., we could serve 40% of the energy needs of this country. Adding the battery to the solar equation, we see two value opportunities:

1. C*onsumers want control and are willing to pay for it:* Home batteries can help solve the issues with power outages and extreme weather conditions. The value has shifted from purely, "I like that it's environmentally-friendly", or "I can save money", to "I can also now protect my family with increased resiliency".

2. *We can now solve the intermittence issue:* Home batteries can help with replacing traditional infrastructure by better balancing the grid. Creating energy where it is used is more efficient, resilient and affordable, and partnerships between grid operators, private companies and households can help us get to a fully renewable energy future. Distributed assets have real advantages and are at the core of the renewable future.

Behind-the-meter storage has come with the advantages that many customers can and are willing to pay for backup to control their energy supply. It also allows us to aggregate individual systems when there is energy congestion on the larger electricity grid.

To me, there's never been a more exciting time for clean energy. The rooftop solar market is very much underpenetrated. We are a sizable and cash-flow-positive business, yet we are still not even scratching the surface. Home batteries are what really is going to help the renewable energy revolution.

Photo Credit: Sunrun

What role do utilities play in this 100% renewable transition?

At over 100 years old, our traditional energy infrastructure is dated and rates are rising. It would cost trillions to upgrade our existing infrastructure. Rather than doing that, we should work to evolve the utility business model and deliver what people want.

Let's not do it the old way where we rely solely on a centralized model. Let's plan the system and create opportunities for distributed energy assets to exist at the edges, which will deliver a better, more balanced grid. A strong, resilient grid is one where distributed energy assets can respond in real time to the needs of the overall electricity grid. This gives us more optionality, which leads to a more flexible, responsive system. Distributed and centralized power can work hand-in-hand when done right. This will allow for utilities to get involved, work with customers, and through technology advancements make the infrastructure system more efficient overall.

Utilities know how the grid operates and where the congestion is, so they're important in this transition. At Sunrun, we are currently evaluating the right business model to interface with utilities as a consumer-centered company, and have partnered with National Grid to explore this. We need the utility business model to evolve with consumers.

Where are we in the maturity of energy storage, and what will it take to deploy it at scale?

I don't think there's a lot more required for energy storage to be deployed at scale; the technology is there. We will continue to march down the cost curve, as with solar 10 years ago – batteries are seeing similar cost improvements. During the past decade, the cost of installed solar panels came down 65% and the cost of batteries came down 84%, and market research predicts that these trends will continue. Many predict batteries will become at least 50-60% cheaper over the next few years, but are already cost-effective in many markets. And when you add the benefits of backup power, they'll become competitive in almost all markets within a short time.

What about new technologies, like blockchain?

Technology over-delivers even on our positive expectations. It would be very helpful if information related to grid operations was more publicly available (e.g. about congestion and areas of anticipated load growth). That would allow innovative solutions to be developed where they're needed the most. Everyone recognizes the energy industry as it stands is hugely inefficient, and transactive technologies like blockchain will help make it more efficient.

How long do you think California will need to become 100% renewable?

That's a difficult question to answer, but I'll go with 2045. With more and more advancements in renewable energy like battery storage, we can speed this transition even further.

Who is your sustainable hero and why?

Dr. Paul Romer, who was recently awarded the Nobel Prize in Economic Sciences. I'm fortunate to have had him as a professor in business school. He speaks about the importance of optimism as a motivating force for people in the face of great challenges. According to his theory of endogenous behavior, protecting the environment is one of those big challenges that's so daunting it can have a dispiriting effect – people want to ignore it or deny its existence. We need to tackle the great challenges of our time head-on, and I'm often reminded of the importance of optimism that Dr. Romer speaks of.

I believe we can solve the problems facing our environment with clean, renewable energy. We have the solutions today, with home solar and batteries that can get us to 100% clean energy faster and for everyone. This optimism has motivated me personally and helped Sunrun grow to the leading home solar, storage and energy services company in the U.S. We can create a planet run by the sun, and we're already doing it.

Photo Credit: Sunrun

Catching the **First Wind**

Bryan Martin is the Founder and CEO of D.E. Shaw Renewable Investments (DESRI), which owns and operates renewable energy facilities in North America, and Head of the D.E. Shaw group's US Private Equity business, where he helped found and lead Deepwater Wind.

Photo Credit: Joan Sullivan

You started investing in renewable energy projects for the D.E. Shaw group back in 2005, and since then have been a very successful investor in renewable energy. What's your investment thesis?

My overarching theme has always been technology change. I started my career investing in public oil and gas companies at Fidelity. At the time, 3-D seismic was changing the way smaller entrepreneurial companies could find oil and gas and compete against the major oil companies. New desktop computing allowed you to see what's underneath the earth's crust and visualize it. This was a time of significant technology change in the industry, which fundamentally shifted the economics of finding oil and gas. What we're seeing in renewables is very similar – a technology shift in which renewables have become cheaper than large centralized thermal power plants. Big utilities have had to embrace new technologies to stay competitive. Since 2005, we've focused on investing in renewables.

A replacement cycle is going on in North America. Many of the power plants in the U.S. were built in the 1950s, '60s and '70s, with a 40-year expected life. These now have to be replaced, and renewable power is an excellent, cost-competitive alternative even to nuclear power. In certain markets, renewables have been the cheapest power, even going back to 2005. For example, when we started investing in Hawaii that year, wind was much cheaper than coal or natural gas. We also started working on offshore wind in certain East Coast markets. In each market, our strategy has been to identify the appropriate and cheapest technology to replace the power source that is going offline.

Bryan Martin

Is renewable investing by big oil and gas companies just green marketing or are we seeing a real shift in their diversification strategies?

The large oil and gas companies have struggled because they seek scale and speed at the same time. Offshore wind does offer scale, and their interest there is genuine. To be effective and competitive in renewables they need to learn more about project financing and be open to utilizing it. The major oil companies have not had to use cheap financing very often because they have such big balance sheets. But at the heart of driving power prices down is driving capital cost down, and the cheapest capital you can get is often project finance. Without that it's very hard. The oil companies have not been very tolerant of building their projects in a way that supports project financing. Therefore I don't think it is greenwashing, but a genuine learning curve they're going through that many independent power producers have already mastered.

You were instrumental in the success of Deepwater Wind, the catalyst for offshore wind to take off in the U.S. What did you learn about managing stakeholders - governmental and advocacy constituents, as well as private sector opponents?

Stakeholder management and permitting matter! And the biggest factor driving success is paying attention to the needs of the markets that we're serving. We were fortunate to be early in the development of the offshore business in the U.S., thereby solving for the replacement cycle needs. New England had some of the oldest power plants in the country, and some of the hardest power plants to replace because of population density. The only way to solve for demand in these markets was to utilize offshore wind.

Our strategy was to build as far from shore as possible to serve our stakeholders. The reality is that people don't want to see the wind farms, and the good thing is that the economics are roughly the same building them close to shore or farther out. Block Island was a bit different; the siting decision there was driven by permitting. It is much easier to permit an offshore wind farm in state waters than in federal waters. Block Island happened to be more than 10 miles offshore, and still in state waters. Unfortunately, it still had to be built much closer to shore than we would like, hence we made it as small as possible and worked closely with the community to gain their support. We achieved 80% local approval, which is huge. But that was

a unique situation; in the future the industry should refrain from building wind farms that close to shore.

Offshore wind in Europe is a relatively mature market and Europeans have been trying for years to build projects in the U.S. Yet Deepwater continues to be one of a very few that has won multiple U.S. contracts. What has been their competitive advantage?

The U.S. and Europe are completely different markets. The European market tends to benefit more from central planning, so a country can mandate that a project will get built and make sure all the resources required will be there to support the company. Much of their offshore business got built when the technology was less mature, and they needed large utilities to be successful.

The U.S. is much more cost-sensitive, and here the renewable market is actually very large, mature, and more successful than any market in the world in driving down the cost of power. To succeed, one needs to embrace all the local stakeholders, meet the requirement to be cost-competitive, and avoid the tendency to believe that engineering is the most important part. Here, often a better project for the customers is a smaller project that doesn't require the utility or state to buy more power than they need – even though this costs slightly more and isn't the optimal engineering solution. In Europe, one would choose the larger, optimally engineered project.

The sale of Deepwater to Ørsted sought to accomplish the best of both worlds: applying Ørsted's engineering expertise and capability in getting projects built to smaller projects that have been so successful in offshore U.S. development.

I can't stress the importance of stakeholder groups enough. In the U.S., the fishermen, or the local permitting authority, or coastal zone management can stop a project. That doesn't happen in Europe. To us, stakeholder management is central to the way we do business, which is why we've been successful on complex projects. For example, we are hyperfocused on the types of grass we plant at solar projects, and doing innovative things beyond what's required, to make sure that we don't have storm water runoff to our neighbors' soil. And because we've tried to take that approach for many years, we're finding more people come to us because they believe that our projects will get done.

What are the similarities to onshore wind?

The onshore renewable business takes more time because you need to learn to work in 30-35 different submarkets and states. But they all share several things: price matters; selling the power and the size the utility wants matters; and active stakeholder management, whether it's neighbors, birds, or bats, matters. And project delays make your customers unhappy because producing the power that was promised is critical to utilities: they need it for their replacement cycle.

So if you go back to 2005, did the future pan out the way you expected back then?

It has taken a lot longer, and there were definitely more ups and downs than I expected. But the thesis we wrote up in 2005 is remarkably close to what happened: the first offshore wind farms are happening in states that we identified then. Their size is roughly consistent with what we thought, and stakeholders we thought we'd need to be sensitive to are actually the most concerned. Most importantly, our fundamental belief – that good projects do end up getting built – came to pass.

GTM predicts that 2 GW of offshore wind will be built over the next five years in the U.S. Is that a good estimate?

It's very hard to predict the timing, but I think there's potential to double that capacity number. It could get close to 5GW. I do not believe that a lot of offshore wind will be built elsewhere in the U.S. It will be highly concentrated in the Northeast.

What is the biggest impediment for offshore wind growth in the Northeast?

The biggest impediment is cheaper renewable energy alternatives, but they can never achieve the scale that is needed in the Northeast. In the Southeast, you can settle for other alternatives that are easier to implement and far lower cost, so you don't need to go offshore. The only place in the U.S. you really need to go offshore is New England, and parts of the West Coast; however, from a regulatory standpoint, that's a very difficult place.

Photo Credit: Joan Sullivan

Do you see floating offshore playing a big role in places like California and Japan, with dense populations but deep continental shelves, where drilling and traditional turbines are cost-prohibitive?

Ironically, floating offshore wind technology could become popular in shallower waters but current technology doesn't allow that yet. One of the things that would make offshore wind cheaper is to reduce the cost of foundations, so I'm very hopeful. But within current leases, floating doesn't work now. In the East, we can build an awful lot within about 30 miles of shore and fairly shallow water. In California, you get two miles offshore and you're in much deeper water, which is why floating wind works great out there. They also don't have a lot of hurricanes.

Who is your sustainable hero and why?

The first would be Gov. Gina Raimondo in Rhode Island, who embraced the benefits to a local economy of innovating a very large-scale industry, and provided leadership when there were a number of other states better situated to be first movers. She was a real catalyst for launching the whole industry, and it's hard to find that kind of leadership in politics.

The second one is George W. Bush as governor of Texas, who rarely gets credit for starting the first successful state renewable energy credit system. It was the Texas wind boom that kicked off falling power prices. And his motivator wasn't necessarily green energy. He was way ahead of his time in understanding that renewable energy drives down the price of power in a market. Texas has some of the lowest power prices in the country, and it's due to the work he initiated in the late 1990s.

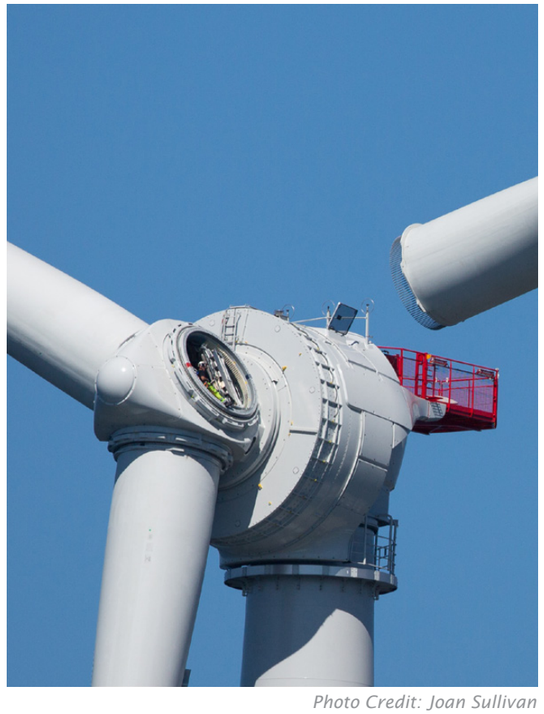


Photo Credit: Joan Sullivan

EVolving Mobility

Larry Burns is a transportation & mobility expert, former General Motors Corporate Vice President of Research & Development and Planning, Waymo Advisor, and author of ***Autonomy: The Quest to Build the Driverless Car and How it Will Reshape Our World.***

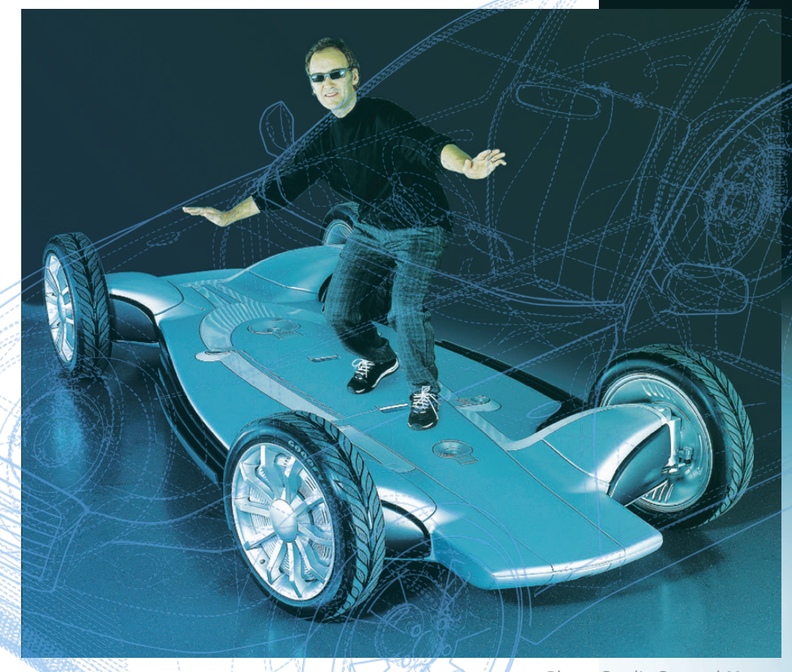


Photo Credit:General Motors

Photo Credit:General Motors

You have traversed from the upper echelons of a global icon like General Motors ("GM"), where you worked from 1978 to 2009, to been involved with leading advanced mobility companies like Waymo. What do you think about the disruption occurring in transportation?

I think it is very exciting and inevitable. For the first time since Karl Benz invented the automobile in 1886, we've seen a convergence of technology and business models that promise better mobility experiences with radically lower consumer and societal cost. Autonomous electric vehicles used in transportation services give rise to the "age of automobility". This once-in-a-century transformation will eliminate over 90% of roadway fatalities, provide better access to people who cannot otherwise drive, improve the walkability of cities, and lead to sustainable mobility. The biggest risk lies in not realizing its full potential as soon as possible.

Incumbent auto OEMs are playing catch-up on driverless car technologies to compete with Waymo, on EVs to compete with Tesla, and on transportation services to compete with Uber. Many have increased investment in innovation and industry partnerships. Do you think they're equipped to succeed?

Auto companies face some big challenges. They have to generate enough cash to keep their legacy businesses vibrant and also position for a future based on driverless electric vehicles used in transportation services. This future is very different from developing, manufacturing and selling human driven combustion vehicles through dealer networks. It requires new capabilities that are not

Larry Burns

core to traditional auto companies and obsoletes much of their installed base. The vehicle itself will be commoditized and the value creating experience will be in the autonomous driving system and the capabilities of the transportation service companies.

Autonomy focuses on the "quest" to build the driverless car, not the "race". A quest is a long and arduous journey. Transitioning to the "age of automobility" is like running a marathon, not a sprint, and we are still far from the finish line. So, it's hard to predict which auto companies will have the ability to stay in the quest. With that said, new mobility players like Alphabet, Apple and Amazon have market caps approaching $1tn whereas the market caps of auto companies range from $50bn to $200bn. And, the tech companies do not have legacy costs tied to the historical auto industry. Auto companies simply don't have the same firepower as the new players.

How will the "age of automobility" impact auto jobs?

Shedding unnecessary plants and resources will be necessary to stay in the game. GM's recent announced plant idlings and staff reductions are the mere tip of the iceberg. Within five years, all the forces that spell the demise of the auto industry as we know it today could converge and start to scale rapidly. Many more thousands of existing auto job cuts could result.

New transportation service companies will focus on minimizing their fleet vehicles' operating cost per mile. Trading human drivers for autonomous software reduces operating costs. Similarly, electric vehicles are cheaper to operate than their gas-powered counterparts. And because 80% of the car trips Americans make have only one or two occupants, the vehicles can be tailored to be much smaller and lighter. All of these factors together mean transportation service vehicles will have far fewer parts and be much simpler to develop and build. Consequently, the OEMs will require far fewer salaried and hourly workers, and plants. The jobs impact is further compounded by the fact that transportation service vehicles will likely last twice as long (in miles) as today's vehicles, reducing the number required to serve America's travel needs.

How would you explain the success of Tesla?

Tesla has done a great job using new technology and design innovation to create a compelling

experience for its targeted customers. The Model S is an outstanding premium car in terms of technology, styling and interior packaging. And Tesla owners love the experience they have with the brand. Tesla truly hit the sweet spot with the Model S for luxury buyers who are passionate about the environment and have the means to act on this passion. Tesla's success will continue if it can translate this formula to the Model 3 sedan at a much lower price point in a market that has trended toward crossover SUVs. Elon Musk's unmatched marketing prowess also helps a lot.

Are the OEMs all-in on electrification, or are they managing investors?

Both. OEMs must be strongly committed to an EV future and several are committing significant resources to EV platforms and portfolios. But, to say auto OEMs are all-in on electrification is unrealistic.

Fundamentally, an electric vehicle (EV) is just easier to design and engineer. That's what is driving this tipping point. One might like to believe that the auto companies are committing to EVs because of their concern about climate change, oil dependence and air pollution. While there may be some truth to this, it is becoming easier to design, engineer and manufacture EVs than combustion vehicles with mechanical drive, exhaust systems and transmissions. Einstein said "the best design is the simplest one that works", and that is what we've landed on now that batteries and fuel cells are becoming commercially viable for automobiles.

The profit driver of the U.S. auto industry has been large pick-ups and SUVs. To convince yourself that these vehicles will all be electric is still a bit of a stretch, despite Rivian's, a Michigan-based electric pick-up company, impressive concept. It's really hard to displace a combustion engine when it comes to the duty cycle of these larger vehicles.

Bloomberg New Energy Finance (BNEF) predicts half of global auto sales will be EVs within 20 years. Will one technology rule, or do you still see life in the parallel development of alternative propulsion sources, such as hydrogen fuel cells?

"Fuel cell" makes people think of something quite different than a battery. In fact, it's just a hydrogen battery. Yes, it requires a different supply system than electricity, but the internal workings of the vehicle are very similar. In addition, hydrogen can be made from electricity and vice versa, so they are synergistic energy carriers. Germany is now running trains on hydrogen using fuel cells and Anheuser-Busch has placed an order for 800 hydrogen-powered semi-trucks for beer delivery. I'll drink to that!

Hydrogen will play well when you need much longer range or much faster refueling, and it can be made from several different sources, many of them renewable.

What is driving consumer interest in EVs?

The experience. It's no secret that they're fun to drive (instantaneous torque), quiet and allow better overall vehicle design.

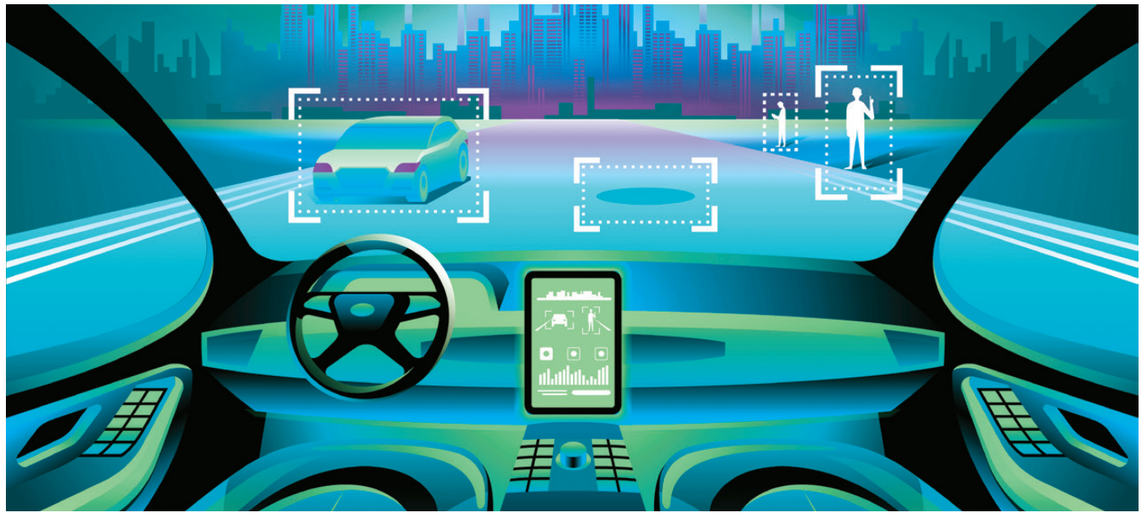
When you marry EVs with autonomous vehicles (AVs) in transportation services, the negatives of owning and operating a car can be eliminated. For over a century, the auto industry has assumed people are willing to shop for a car, purchase financing and insurance, spend their time driving, look for parking, stop to pump and buy gas and maintain their car. Why would I put up with all of these hassles if there was a better and more affordable way to get from Point A to Point B, and I could use my time as I please when I'm in the vehicle?

What is China doing, and who's ahead in autonomous network technology?

Given the rate at which China's economy is growing and the corresponding urbanization, air pollution, and mixing of cars with pedestrians and bicycles, China should lead the mobility revolution, and they are positioning to do just that. By the nature of their government, they can set targets and drive the transformation in a much more top-down way.

The last vehicle concept I worked on in China, the EN-V, was featured at the World Expo in Shanghai in 2010. Our analysis found that if things continued the way they had for the previous 10 years, 80% of the land in Shanghai would wind up covered in cars by 2030.

Right now, the U.S. leads with AV and EV technology. But China definitely could sprint ahead with deployment.



The fundamentals of car design remain the same in current EVs, except for the drivetrain. Are they the endgame or merely a step in the right direction?

When you get to a world of autonomous electric vehicles and you're providing a transportation service, you can tailor-design the vehicle around the trips people make. On one extreme, vehicles can be much smaller and lighter for typical everyday trips. On another extreme, vehicles could become driverless hotel rooms that takes us between cities at night for a business meeting the next day.

We'll see a wide range of design innovation. It won't be cars as we know them, just with a different propulsion system. Tesla took an important step by using a "skateboard" platform.

There has never been a more exciting time for experience designers focused on the "age of automobility".

In your book, you portray these bold innovators. Yet, small-scale commercial launches of autonomous cars are just beginning in a handful of markets, and driving is such a deeply ingrained habit. How do you see the challenges being resolved?

Autonomous driving will have big impacts on a lot of people in industries closely related to the conventional roadway system. I wrote ***Autonomy*** for a mainstream audience to create collective will which comes from common understanding. If we can get to the end goal even one day sooner, we can save 3,000 lives. The biggest risk in my mind is not getting there soon enough.

One of the biggest challenges is people reaching premature judgment about the technology. When you get a chance to ride in in an autonomous vehicle, your whole view changes.

I also worry about the players who have a strong vested interest in the century-old transportation system. The wealth of some nations, like Saudi Arabia, will depend a lot on the long-term price of a barrel of oil. They'll find a way to push back. It could also come from unions, trying to push back on jobs. However, there are enormous societal and consumer benefits and business opportunities tied to the "age of automobility". Hopefully the pushback from vested interests won't slow us down much, because the benefits and opportunities are so profound.

Will ridesharing come first, since the driver is the biggest cost factor in this business model and the profitability of these companies is low to nonexistent as it is?

Two things my parents taught me growing up were don't play with matches and never get in a car with a stranger. The Uber business model is based on the latter. If Uber and Lyft truly have a pathway to the world's best autonomous driving systems, they will do very well in an autonomous future. However, it will take a while

to get to every market in the U.S., so AVs at first will be codependent on other methods of transportation.

A decade ago, you were among GM's top executives. Now you're an author, thought-leader, board member and consultant. What advice do you have for other senior executives embarking on becoming a part of the sustainable transition?

I was 58 years old when GM went bankrupt. I still had a lot of energy and wanted to continue to work. But, I was very concerned that I would be branded with a scarlet letter "B" for bankrupt executive. This proved not to be the case. In fact, one of the first people to proactively reach out to me was Jeff from Greentech. John Hess, CEO of energy company Hess Corporation, also reached out, as did Columbia University, the University of Michigan and Google Self-Driving Cars. Within a year I had eight retainer-based jobs.

Play to your strengths and commit yourself to things you're really interested in. There are great opportunities out there.

Once you clearly envision a sustainable future, you can see appalling waste in the historical roadway system: wasted lives, wasted material, wasted parts, wasted labor, wasted driver time, wasted land and wasted energy. It's unquestionably unsustainable. Fortunately, the "age of automobility" offers a sustainable and exciting mobility future…one we can scale based on natural market forces not subsidies.

- What do you see coming in the "last mile"?

Autonomous vehicles are synergistic with e-commerce. They will reduce the cost of delivering packages to your door. In fact, this could be one of the first major markets for AVs. Packages usually weigh less than a few pounds so we can tailor the design the vehicle to the size of packages. Also, delivery routes with an autonomous vehicle no longer have to be the fastest ones, as we don't have to account for labor costs. We can hence avoid driving in certain areas, like school zones.

- Who is your sustainable hero and why?

Jeff Sachs, economist, public policy analyst, and former director of the Earth Institute at Columbia University, where he holds the title of University Professor, the highest rank Columbia bestows on its faculty. Through the Earth Institute and United Nations, Jeff has worked tirelessly to help create a sustainable future. He was the catalyst for my 2010-2013 Earth Institute research on sustainable mobility and the results of this program were instrumental in framing the "age of automobility".

Photo Credit: Waymo

Climate warrior For Good

Photo Credit: CERES

Mindy Lubber is the CEO and President of Ceres, a sustainable non-profit organization working with some of the most influential investors and companies who are building a more sustainable future. With over 36 years in sustainability, Mindy has been instrumental in advocating for change and accelerating the flow of capital into sustainable activities.

Where does your passion for sustainability and sustainable investing stem from?

I have spent the better part of the past 36 years working in sustainability in one way or another: as an advocate running NGOs, as a regulator running the EPA in the six New England states during the Clinton administration, as a lawyer, and as the head of a small investment firm, Green Century Capital Management, which I started in 1990 and is still going.

When you're fighting for change and trying to move complicated systems that have a desire not to be moved, you have to do multiple things. Whether it is lobbying, litigating or using capital markets as part of the solution set, no one thing is going to change these problems; you have to look at a broader set of tactics and strategies.

When I left government and running the EPA's New England Regional Office in 2001, I took time to really think: How are we going to get climate change under control? And it became clear to me that we weren't going to win if I spent three years at a company, or four years lobbying for new regulations on cars or energy systems. That is too slow. You don't get to yes without capital markets, without the financial community and the corporate community.

So I made a decision then to spend at least a portion of my career changing capital markets systems and players. And the debate really has changed. Companies and investors no longer roll their eyes when you talk to them about climate risk or water risk. They no longer think that it's a cute topic that they will deal with in their

Mindy Lubber

foundations. They understand the need to act from a scientific, human health, environmental, as well as an economic perspective.

What trends can you share on sustainable investing? What has changed in the past couple of years and what triggered this change?

There is no doubt that there has been substantial if not radical change over the last five years. It has been extraordinary, but it is still not enough. Part of this progress has come because we can now see the problems arriving from climate change. Ten years ago people wanted to believe that it's something that is going to happen at the end of the century, but we just need to look at the tsunamis in Southeast Asia, the forest fires in California, the storms in Houston and Puerto Rico, to understand that these problems are real and that they are happening now. The data and the science is much clearer. The imperative to act is that much more urgent.

And we are seeing far much more action than we could have ever imagined. We have a project, Climate Action 100+, where 340 investors, with assets under management totaling more than $32tn, are focusing on the 100 largest emitters of carbon and as their owners, working together to prevail upon those companies to change. To bring their carbon footprint down, to disclose more, to not fight public policy, and to call upon their supply chains to do more.

Ten years ago it was the social investment funds and the religious funds, and now it is $32tn of institutional capital, including major institutional investors from every continent - Europe, Australia, Japan and the U.S. all looking at and analyzing climate risk.

Now I will tell you this: they still have money in fossil fuels. $350bn has been invested into renewable energy, and that is a good start. But we need upwards of a trillion dollars a year to reach our climate targets, hence we need more investors on this side of the equation.

At Governor Brown's Global Climate Action Summit (GCAS) this past September in California, we also released something called the Investor Agenda, an initiative established together with a number of other investor organizations and standard setters. Nearly 400 investors committed to put more money into renewable energy, clean technology and clean transportation systems, disclose more about financial risk, call on companies to bring their carbon footprint down

and stand with us on public policy.

Investors have been showing up and making the case at each round of climate talks (Paris, and most recently Poland) that investors want to see action, and they want to see action soon. They know that the scientific reasons to act are clear and the economic perils we face equally as clear, if we don't act on climate. As the National Climate Assessment recently stated, climate change stands to take a 10% bite out of the U.S. economy and of course far more globally.

Looking at the vast variety of ESG methodologies and metrics, when you speak to investors, what are the biggest challenges hindering investors from applying ESG metrics in their investment decision?

There is a lot of information out there and some of it is quite good. I am impressed with the Global Reporting Initiative (GRI), not because Ceres founded and launched it, but because under GRI 8,200 multinational companies are already disclosing on some ESG metrics.

The Sustainability Accounting Standards Board (SASB) has since worked to make those metrics more material and financial by using industry specific standards, and that is improving the reporting quality. The Task Force on Climate-related Financial Disclosures (TCFD), which requires companies to disclose their climate risk is another highly regarded design. I do think we can have more decision-useful data for investors, but I don't want to throw the baby out with the bath water. There is a lot of good data out there. Go to the Bloomberg platform that every investor uses; they are all using that ESG data, and it is being incorporated into investor decisions every day as we speak.

More and more financial analysts are integrating ESG data into their core assessments. We continue to work with analysts on how to analyze climate risk and water risk, for example, based on the data available. We have been pushing for the last decade for stock exchanges to mandate the disclosure of material sustainability issues, and they are just now starting to do that. We were even able to get the SEC during the Obama administration to require that climate risk and water risk be disclosed in formal SEC documents. This isn't necessarily enforced at the moment, but the skeleton still exists. It was used before and will be used again.

There are also bills in Congress. Senator Elizabeth Warren has one to require better risk disclosure in formal SEC filings. So we may be on a little detour, but we will get there, because the financial risk to thousands of companies and dozens of sectors is as real as currency risk, inflation risk, trade risk, etc.

In your report, *Turning Point* - Ceres' third assessment of corporate progress against key expectations of *The Ceres Roadmap for Sustainability*, you said "It is no longer just about raising the ceiling. It is about lifting the floor." - what more needs to be done to fight climate change and create positive environmental impacts?

We need to go faster and deeper to meet that below 2-degree standard of the Paris Agreement. We are making progress when 503 companies agree to science-based targets within their own facilities and supply chains and when several hundred companies support 100% renewables by 2025. We are seeing the kind of change that we need to see, and we will keep pushing: $350bn dollars of clean energy investments last year is great, but we have to get above $1tn, and we will. Progress, to be sure, but not nearly enough.

The projects are there. We need to make sure that the next $50bn of bonds are green bonds, and they are financing bridges, highways, schools and airports that are built in a much more sustainable manner.

And look, in this day and age, one doesn't have to lose money. Investments in sustainable projects, be it bonds or equities, are showing competitive returns. No one is suggesting you need to compromise, it is just no longer the case. The amount of money going into sustainable investing has radically changed over the last couple of years. Over the last 2 years we have gone from $8.7tn to $12tn of capital allocated to sustainable investing. That is a 38% increase and a sign that there are plenty of investment opportunities and people want to invest in sustainable companies or funds.

You said in your message to investors last year "2017 was a year of unprecedented challenges and extraordinary progress for Ceres" – can you share some insights on these challenges?

It was certainly not easy to move into a time where the federal government either didn't believe climate change was a problem, or didn't believe it was their role to stop it. It was stressful and disheartening to hear the President talk about pulling out of the Paris Agreement.

However, it was promising to see states taking direct action and as a result of the "We Are Still In" campaign, a collaborative effort between Ceres, We Mean Business, World Wildlife Fund (WWF), Bloomberg Philanthropies and many others, which launched the day after the U.S. President pulled out of COP 21. We had 2,200 signatures from companies and individual investors within weeks, saying they are still going to set goals and commit to the Paris Agreement, and keep pushing America forward so that we are an equal player even without the President's support.

That was extraordinarily heartening: overnight, thousands of people saying this problem is real, it's now, and we have to act.

What sustainable technologies interest you? What should we look out for?

Sustainable transportation is an area where we are going to see a lot of growth. I don't think that the combustion engine is going to be here in 10 or 12 years. Similar to how we didn't go from the horse and buggy to the automobile overnight, we are going to go from combustion engines to electric vehicles over the next decade.

We are also going to see growth in alternative, food options that use less chemicals, use less resources and are healthier. Fake meat that tastes like meat is already on the shelves in our markets. We are going to see radical changes in our energy systems, from fossil fuels to renewables. We will have massive developments in batteries and grid technologies, which will get us to a clean energy future. And we will see real estate being built and modified differently, because it is the third-largest source of emissions.

We might need policy changes in some instances – tax credits, state laws with renewable energy targets, but we can get there. The technology is there, we just have to move quicker.

Who is your sustainable hero and why?

Wangari Maathai, a Kenyan environmental leader, who knew that environmentalism was tied to democracy and peace – and therefore she fought for all of these values. She always took a wholistic approach to sustainable development, human and women's rights and brought a new wave of leadership to Kenya and across Africa.

Cruising on H_2O

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Victorien Erussard, the founder and captain of Energy Observer, is an innovator and explorer. Passionate about the climate and sailing, he has devoted his time to develop the first hydrogen vessel to travel around the world, powered solely by the sun, wind and hydrogen. Let's embark on his journey.

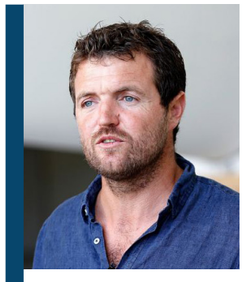
Photo Credit: Energy-Observer

What's your background - how did you develop an interest in sustainability?

I grew up in Saint-Malo where I was born, close to the sea. I have always been passionate about sailing which led me to become a merchant navy officer as well as an offshore racer. As an athlete, I was initially more into competition and winning for myself and my team. When sailing, you can see the beauty of the ocean and feel the energy provided by nature but at the same time you get to realize the damages caused by humans. It gets to a point when you cannot pretend you don't know. And once you know, you have to act.

How did you come up with the idea of creating the first hydrogen vessel to go around the world?

The real click came when I was sailing in the middle of the ocean during the Transat Jacques Vabre, and had a power failure with our generator. Despite having all these natural energy sources: wind, sun and seawater around me, I was still dependent on fossil fuels. That's when I decided to create a clean smart boat, that would be able to produce its own energy thanks to nature, without harming it and without wasting it. When I started to read and learn about existing technologies, my friend Nicolas Hulot suggested I should have a look at hydrogen. He was right, hydrogen is the key for better autonomy, lighter boats and last but not least: less pollution.



Victorien Erussard

"Zero greenhouse emissions" – tell us how it all works and how it is "a model for energy networks of the future?" How can we replicate this technology for other industries?

The problem with renewable energies is their intermittency. This is why we make them work together thanks to energy coupling and optimized storage systems. Onboard we use 3 sources of renewable energy (solar, wind, hydraulic) and 2 storage systems (batteries and hydrogen). During stopovers, when we don't need energy for propelling the vessel, we use the excess energy produced by the renewables to make hydrogen through sea water electrolysis and store it onboard. This allows us, when sailing and when the conditions aren't good enough (at night or when the weather is bad), to use hydrogen in order to extend our autonomy via a fuel cell which basically turns hydrogen into electricity, without any greenhouse gas emission. The system being tested and optimized on Energy Observer, is a miniature of the ongoing energy revolution, which is decarbonized, decentralized, and digitalized. It is crucial that the technologies tested on our vessel and the energetic system can be applicable on land. Again, we are a floating laboratory, the technologies tested are not restricted to the maritime sector.

What's the story behind the vessel and the design?

Energy Observer is a former race boat, built in 1983 in Canada, under the supervision of Mike Birch. In 1994, Sir Peter Blake won the famous Jules Verne Trophy, a circumnavigation around the world, with this legendary boat which at the time was called Enza New Zealand. We wanted to give her a new life and invest into research and development rather than in building an entirely new boat. Reusing what already existed and which has already proved its reliability is also a key point of sustainability. There is no need for always building and buying new. The proof is that despite the fact it was more complicated for our engineers to adapt a complex energetic architecture to an existing structure, it made us save 25% of the budget.

Tell us about the expedition - what is the end goal and what has the experience been like so far? Can you share what a day on the Vessel looks like?

We left Saint-Malo in June 2017 and since then have sailed exactly 10,326 nautical miles on hydrogen and renewables, visited 14 countries and made 33 stopovers, out of 101 planned. The goal is to sail during 6 years to test these technologies under extreme conditions and meet the pioneers finding sustainable solutions for the ecological transition. In order to inspire and prove that the ecological transition is pos-

Photo Credit: Energy-Observer

sible, we made a documentary series about the Odyssey, directed by Jérôme Delafosse, our expedition leader. In addition to this, an itinerary exhibition village follows us on some of our stopovers with the aim to educate as many people as possible, including public authorities who have the means to take real measures to protect the planet.

Onboard, with our sailors and engineers, we have a production team which includes an embedded journalist. This is why every day is different on-board Energy Observer: sometimes we have days of sailing and working exclusively on the boat (collecting data) and sometimes we have days shooting our documentary series and web series that we make from our encounters with the incredible and inspiring people who are finding sustainable solutions... We never get bored!

What's your vision of where you want the company to go?

Since the beginning of this journey, we want to open minds, to sensitize young people as well as stakeholders. On top of the village and our documentary series (8 episodes of 52mns in 2018), we have already gathered a solid cluster of partners. We have had more than 150,000 visitors in total, many ministerial visits, a lot of interviews or speeches at conferences. That's an important part of our mission. And we want to build on these successful 2 years by heading to Northern Europe, then Asia and America, until 2022. We also want to accomplish the next stages by becoming a real media resource for the energy and ecological transition, through our web series "Solutions" which will be sharing solutions for the planet through the prism of the 17 UN Sustainable Development Goals (SDGs). We are really honored to be the first French Ambassador of the SDGs and are doing our best to valorize people contributing to them.

Finally, we want to capitalize on our onboard experience to develop hydrogen technologies at sea. Energy Observer is a demonstrator and our ambition is to bring the system to a bigger scale. We are already talking about it and are gathering partners and investors to discuss the next phase.

Who is your sustainable hero and why?

My friend and mentor Nicolas Hulot. When I was a kid, he opened me to the beauty of nature through his many documentaries. Today, he inspires me because he is truly committed to doing whatever is in his power to change the world, he stands for his convictions and has a great talent for sharing them.

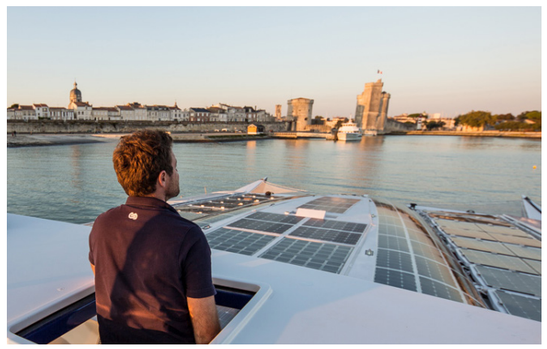


Photo Credit: Energy-Observer

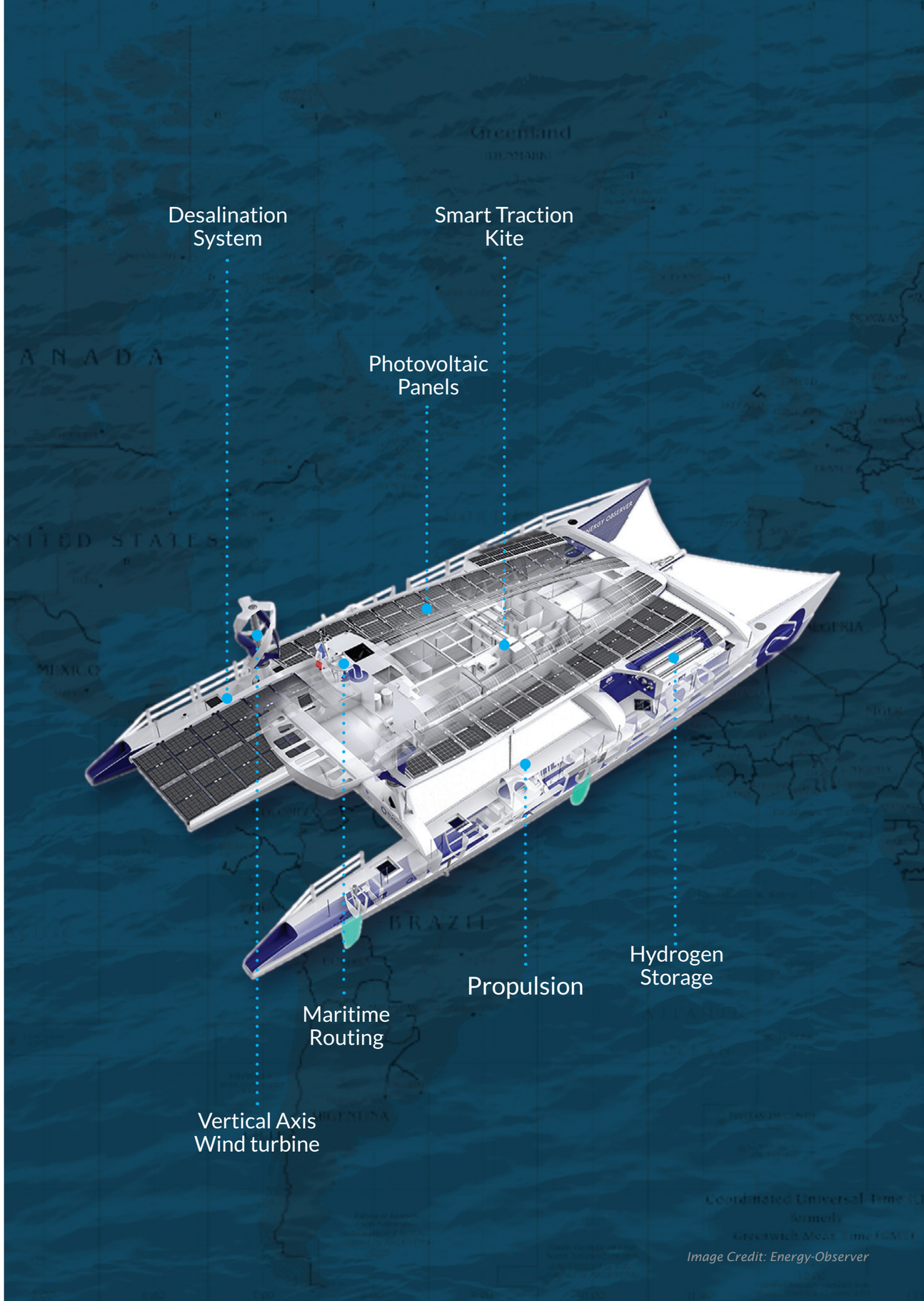


Image Credit: Energy-Observer

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.

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