BIO BOOK

COHORT 1, 2, & 3

Breakthrough Energy Fellows

TABLE OF CONTENTS

ABOUT THE PROGRAM

03 The Problem

Our Solution

04 Technology Focus Areas

Who are our Fellows?

PROJECT OVERVIEWS

05 2022 Cohort

26 2023 Cohort

FELLOWS BIOS

40 2022 Cohort

88 2023 Cohort

ALUMNI

118 Project Overviews

127 Fellows Bios

ABOUT THE PROGRAM

THE CHALLENGE

To avoid the worst impacts of climate change, we must reach net-zero greenhouse gas emissions by no later than 2050. This will require innovation and unprecedented technological transformations across all sectors of our economy. Right now, early-stage climate technology innovation faces unique barriers:

- **Capital intensive:** Climate "hard technology" has world-changing potential but requires different types of support and resources than asset-light technologies like software.
- **High-risk:** Many ideas and projects will fail before leaving the lab. This makes them unappealing for potential investors and customers.
- **Long-term:** Discovery and development requires time — while acceleration is possible and necessary, climate technology projects may not appeal to those who seek quick returns.
- **Lack of incentives:** Established industry is conservative and lacks incentives to take risks on early or emerging technologies.

OUR SOLUTION

The Fellows program is **designed to tackle early-stage barriers to climate technology innovation, accelerating discovery and increasing the number of projects and companies working toward commercialization**. By providing scientists, innovators, and entrepreneurs with research funding, hands-on support and community, our program ensures projects have the resources they need to advance to the next stages of development.

Over the course of the program, our Fellows have access to:

- **Funding** for research, development, and technology de-risking.
- **Active technology project management** alongside our team of experts to reduce failure-risk, and speed progress.
- **Access to Breakthrough Energy's world class network of partners** and experts across business, policy, government, technology, and finance.
- **Curriculum and 1:1 mentorship** designed to support skills acquisition across key areas like product-market fit, techno-economic modeling, customer discovery, and responsible leadership.

TECHNOLOGY FOCUS AREAS

The program is focused on technologies that have the potential, at scale, **to reduce greenhouse gases by at least 500 million tons per year.** Breakthrough Energy analyzes potential new technology areas at the frontier of scientific research and engineering and narrows to ones that have the highest potential for scaled climate impact.

Technologies Areas Supported to Date Include:

- Cement
- Steel
- Hydrogen
- Energy Storage
- Advanced Materials
- Food and Agriculture
- Carbon dioxide capture, storage, and sequestration
- Renewables
- Heating & Cooling
- Circularity
- Fuels and Chemicals
- Nuclear Fusion

WHO ARE OUR FELLOWS?

Our Fellows come from around the world, and are selected through a riforous vetting and selection process. We have two categories of Breakthrough Energy Fellows:

Innovator Fellows are world-leading scientists, engineers and innovators who enter the program with critical climate technology to commercialize.

Business Fellows are experienced professionals with tech commercialization skills who support the Innovator Fellows in accelerating their path to market.

2022 COHORT

PROJECT OVERVIEWS

AIKIDO TECHNOLOGIES

TECHNOLOGY AREA

Renewables

SUMMARY

Aikido Technologies has designed a self-erecting platform for floating, offshore wind turbines to overcome key barriers to increasing offshore wind energy production.

TEAM

BINGBIN YU

Innovator

San Francisco, California

JAMES REEVES

Innovator

Milton Keynes, United Kingdom

SAM KANNER

Innovator

San Francisco, California

About the Project

Thanks to technological advances and policy incentives, the costs of onshore wind and solar photovoltaic (PV) energy have declined by 75% and 74% respectively since 2008. However, offshore wind – despite being stronger and more consistent than onshore wind – remains more expensive.

To bring floating offshore wind closer to cost parity with other forms of renewables, Aikido Technologies is developing three game-changing technologies to cut the levelized cost of electricity of floating wind: the Aikido Turbine, Controller, and Platform. The Controller can be added on to existing, conventional wind turbines to reduce installation time and vessel requirements; the Aikido Platform streamlines the logistics of assembling, transporting, and deploying large, floating wind units. Aikido's novel system integrates the platform and turbine into a fully assembled unit that can be transported horizontally to enable floating offshore wind turbines to be deployed from 80% of ports in the U.S -- even those blocked by bridges. Once in place, a simple water ballasting procedure upends the platform into its operational configuration. During the Fellows program, Aikido will focus on piloting the Aikido Controller and Platform using a 2MW conventional turbine.

Aikido Technologies' approach reduces the air draft, transit draft, and width required for transport. This is critical to leveraging existing maritime infrastructure and ensuring that local manufacturing sites can be used to build these large, steel structures for projects in the U.S. and abroad.

ALUMINIO

TECHNOLOGY AREA

Renewables

SUMMARY

Aluminio is developing a new approach to using aluminum to replace the silver used on solar cells, reducing the costs and accelerating adoption of more efficient cell designs.

TEAM

BRIAN HARDIN

Innovator

San Carlos, California

DAVID VEYSSET

Innovator

San Carlos, California

About the Project

Silver materials used in solar cells are both scarce and costly – accounting for 10% of the world's annual silver supply and 10% of the cost of solar materials. This material limitation has slowed the adoption of the most efficient solar cells around the world, as consumers and manufacturers worry about long-term panel price increases.

Aluminio is developing a new approach to replace over 90% of the silver in solar cells with aluminum, a less expensive and more abundant material. To aid with implementation, they also have designed a high-speed, high-precision process, which can be used to increase the output of existing production lines. Together, these approaches will make it easier and more affordable to scale solar energy technology.

CEMVISION AB

TECHNOLOGY AREA

Cement

SUMMARY

CemVision AB combines three different technologies into one process to reduce carbon emissions from cement and concrete production.

TEAM

CLAES KOLLBERG

Innovator

Nybro, Sweden

PAUL SANDBERG

Innovator

Nokomis, Florida

About the Project

Concrete is the most widely used resource in the world after water, and the production of cement — the main component of concrete — is one of the biggest polluters on the planet responsible for over 7% of global CO_2 emissions.

CemVision is using an algorithmic approach to cement production to reduce CO_2 emissions of our most important building material. CemVision's approach replaces fossil limestone with waste materials and switches fuels such as plastic and coal for green thermal energy. CemVision creates a non-traditional cement type that has not only superior product properties compared to traditional Portland cement but also a lower carbon footprint due to the reduced need for limestone. CemVision's low-carbon cement resembles specialty cements that were previously too expensive to use in general construction. In addition to reducing CO_2 emissions, CemVision's novel cement technology makes concrete construction faster and more resource efficient.

CemVision's technology aims at pushing cement and concrete construction toward net-zero emissions. Through the Fellows program, CemVision AB will develop the technology and intellectual property in order to scale their solution for meaningful production.

CERT SYSTEMS INC.

TECHNOLOGY AREA

Fuels and Chemicals

SUMMARY

CERT Systems Inc. has developed an electrochemical process that uses only water and electricity to convert captured carbon dioxide into basic chemicals that can be used to make everyday products including green chemicals, fuels, and plastics.

TEAM

ALEX IP

Innovator

Toronto, Canada

CHRISTINE GABARDO

Innovator

Toronto, Canada

About the Project

Fossil fuels and petrochemicals are the foundation of everyday plastics and chemicals. Replacing them with electrofuels – made from electricity, recycled carbon dioxide, and water – to produce these products can reduce our reliance on fossil fuels and help reach net zero by 2050.

CERT Systems Inc. has developed an electrochemical process that converts captured carbon dioxide into basic chemicals. Unlike many carbon utilization approaches which require highly-purified CO_2 gas, CERT Systems' process can directly use the CO_2 captured in liquid media, eliminating the majority of energy costs associated with direct air capture. CERT Systems directly converts carbon emissions into molecules that are chemically identical to those typically derived from fossil fuels and are the building blocks of everyday products, like plastics.

CERT Systems' current focus is on transforming CO_2 into ethylene, which can then be used for a broad range of applications including plastics, textiles, and sustainable aviation fuels. Once fully developed, their process could reduce annual emissions by one gigaton.

CHEMFINITY TECHNOLOGIES

TECHNOLOGY AREA

Circularity

SUMMARY

ChemFinity Technologies is developing new porous membrane materials to reduce the energy needed to purify salt water and recover valuable metals.

TEAM

ADAM ULIANA

Innovator

Brooklyn, New York

EVER VELASQUEZ

Innovator

Brooklyn, New York

About the Project

Desalination – the process of removing salts, minerals, and contaminants from salt water – is an energy-intensive process that increases our dependence on fossil fuels and, in turn, increases our carbon emissions. Desalination and other water purification processes, however, are critical – not only for clean drinking water but also for low-footprint resource recovery and other industrial processes.

ChemFinity Technologies aims to reduce the energy needed for desalination and water purification. Their materials technology leverages new chemical design methods to create specialized, highly-selective adsorbents and membranes that avoid energy-intensive water treatment processes, reduce brine waste volumes and toxicity, and efficiently recover valuable metals.

By increasing the efficiency of separation and purification, ChemFinity's membrane materials have the potential to accelerate energy-efficient desalination across sectors.

CONDUIT TECH

TECHNOLOGY AREA

Heating and Cooling

SUMMARY

Conduit Tech develops tools that make it easier for heating, ventilation, and air conditioning (HVAC) contractors to install and maintain low-emissions residential heating and cooling technologies.

TEAM

MARISA REDDY

Innovator

Somerville, Massachusetts

SHELBY BREGER

Innovator

Fort Lauderdale, Florida

About the Project

Heating and cooling homes is a significant driver of carbon emissions. But technologies such as heat pumps exist to electrify homes and push residential energy systems to net-zero emissions. Adopting newer technologies faces many obstacles, such as increased installation difficulty, a need to take a whole-home approach, and long payback periods.

Conduit Tech aims to solve these issues by developing technology platforms that enable HVAC professionals to benefit from broad-scale efficiency and electrification. This starts with more easily identifying homeowners that are good candidates for electrification and supporting them through the product lifecycle – design, installation, and maintenance. Conduit aims to support contractors in growing their business with residential electrification and energy efficiency.

Overall, residential energy use is responsible for around 20% of greenhouse gas emissions in the United States. Conduit Tech's platforms will increase the adoption of energy-efficient HVAC systems, enabling contractors to play a crucial role in decarbonizing the whole home.

GENCORES

TECHNOLOGY AREA

Materials

SUMMARY

Gencores produces high-performance and ultra-light composite metamaterials enabling radical improvement in vehicle efficiency.

FELLOW

JULES THIERY

Innovator

Boston,
Massachusetts

About the Project

Getting transportation to net zero will require a complete transformation of the way people and goods move from place to place. In addition to changing energy sourcing, increasing the efficiency of vehicles will accelerate decarbonization and reduce the overall energy consumption of the transportation industry.

Gencores leverages advanced material science and robotics to produce ultra-light composite metamaterials. Their manufacturing process directly integrates today's molding infrastructure to mass manufacture these novel composites for the automotive industry.

At scale, Gencores' metamaterials will be highly competitive with metal components and compatible with current automotive requirements. Broad adoption of ultra-light composite metamaterials in automobiles can reduce vehicular weight by up to 50 percent, drastically increasing the efficiency and the range of passenger cars.

HGEN

TECHNOLOGY AREA

Hydrogen

SUMMARY

Hgen enables cheaper and more efficient clean hydrogen production that seamlessly integrates with renewable energy systems.

TEAM

COLIN HO

Innovator

Los Angeles, California

MOLLY YANG

Innovator

Los Angeles, California

About the Project

Hydrogen has the potential to reduce emissions across hard-to-abate sectors – from steel and ammonia production to ocean freight and long-duration energy storage. However, incumbent electrolyzer technology for generating hydrogen is not compatible with production from variable renewable energy sources, preventing the scale-up of truly clean hydrogen production.

Hgen's electrolysis technology allows clean hydrogen to be generated from solar and wind, solving for the performance challenges introduced by intermittent power losses (when the sun doesn't shine or wind doesn't blow). Their innovative solution prevents the problems associated with power loss – like performance degradation and gas impurity – allowing clean hydrogen production to better integrate with today's renewable energy system.

Hgen's technology leverages a vertically integrated, modular design to enable mass production and cost efficiencies. Through a higher-efficiency and lower-cost architecture, Hgen enables cheaper $/kg clean hydrogen production.

Clean hydrogen can be used to reduce up to 25% of carbon emissions in hard-to-abate industries, and Hgen's inventive, scalable technology will play an important role in reaching this goal.

HOLOCENE

TECHNOLOGY AREA

Carbon Removal

SUMMARY

Holocene is developing a direct air carbon capture system that utilizes organic chemical compounds to increase capture efficiencies and reduce energy consumption by lowering regeneration temperatures.

TEAM

ANCA TIMOFTE

Innovator

Knoxville,
Tennessee

About the Project

Removing carbon dioxide already in the atmosphere is essential to achieving net-zero global emissions by 2050. Large-scale solutions to capture and permanently store carbon are needed to supplement natural, ecological processes like photosynthesis that store CO_2 in trees and soil.

Holocene is developing a regenerative direct air capture system that employs two novel organic chemistry compounds: one to increase the absorption capacity of water for carbon dioxide and one to remove the carbon dioxide through precipitation. The concentrated CO_2 is to be stored underground or aboveground in alkaline wastes. Both chemical compounds are fully recycled through the process and can be integrated with traditional chemical engineering processes and widely available equipment. By using low-temperature regeneration of the compounds used in the direct air capture process, Holocene's solution requires less energy than current technologies, has the advantages of solution-based continuous processes, and can be operated with renewable energy power sources.

Holocene can provide low-cost and easily-scalable carbon removal from the atmosphere.

LITHERM TECHNOLOGIES

TECHNOLOGY AREA

Cement

SUMMARY

Litherm Technologies GmbH is electrifying key processes in lime and cement production to eliminate fossil fuel-generated CO_2 emissions – and capturing remaining emissions for storage.

FELLOW

FELIX NELLES

Innovator

Krefeld, Germany

About the Project

Concrete is the most widely used resource in the world after water, and the production of cement — the main component of concrete — is one of the biggest polluters on the planet.

Litherm Technologies GmbH is developing an electric heated reactor to replace conventional fossil fuel fired kilns. The patented process uses clean energy sources and eliminates CO_2 emissions from fossil fuels in lime and cement production. In addition, Litherm's approach uses indirect heating which concentrates the CO_2 byproducts for capture and storage.

Cement production accounts for nearly 8% of global CO_2 emissions. Electrifying lime and cement production with clean energy sources has the potential to eliminate hundreds of millions of tons of CO_2 emissions by 2050.

MANTEL CAPTURE, INC.

TECHNOLOGY AREA

Carbon Removal

SUMMARY

Mantel is developing the first high-temperature liquid-phase carbon capture materials for use in industrial processes that could substantially reduce costs and energy losses relative to incumbent technologies.

TEAM

CAMERON HALLIDAY

Innovator

Cambridge, Massachusetts

DANIELLE COLSON

Innovator

Cambridge, Massachusetts

SEAN ROBERTSON

Innovator

Cambridge, Massachusetts

About the Project

Capturing carbon dioxide is essential to achieving net-zero global emissions by 2050. Carbon capture is especially important in the hard-to-abate industrial sectors, like steel making.

Mantel is developing the first liquid-phase, molten salt-based carbon capture process that is compatible with the high temperatures found inside boilers, kilns, and furnaces. Most existing carbon capture technologies require low temperatures to operate, which leads to high levels of thermal loss (i.e., wasted energy) and results in reduced efficiency and increased operating costs.

By operating at high temperatures and using liquid materials, Mantel is able to take advantage of the heat generated from the capture process to produce additional useful energy. Mantel's solution is tailored to meet the needs of heavy-polluting industrial processes that are extremely difficult to decarbonize and help the global economy reach net-zero.

MARS MATERIALS

TECHNOLOGY AREA

Carbon Removal

SUMMARY

Mars Materials is commercializing a technique that transforms captured CO_2 emissions into a compound used to produce low-cost, low-carbon materials for industrial use.

TEAM

AARON FITZGERALD

Innovator

Oakland, California

KRISTIAN GUBSCH

Innovator

Oakland, California

About the Project

Removing carbon dioxide already in the atmosphere is essential to achieving net-zero global emissions by 2050. Beyond permanent storage, sequestering captured CO_2 in everyday materials and products is a promising solution to reducing the concentration of atmospheric carbon and minimizing greenhouse gas emissions.

Mars Materials is using a technique called nitrilation to transform captured CO_2 into acrylonitrile (ACN), an organic chemical compound that is the main building block in carbon fiber, a material used in hundreds of everyday products from textiles to electronics. Mars Materials' chemistry relies on a heat-absorbing reaction, enabling the use of renewable energy and allowing for smaller production plants. In addition, while conventional methods for producing ACN result in toxic byproducts, the only byproducts associated with Mars Materials' nitrilation process are water and non-toxic alcohols.

Compared to existing approaches, nitrilation plants are less than half as expensive to build and have one-third less process emissions. At scale, Mars Materials' solution will enable the widespread use of carbon fiber in new industrial markets like the vehicle sector. Ultimately, the potential use cases associated with nitrilation's ACN are estimated to have a cumulative greenhouse gas emissions reduction impact at the gigaton scale.

MOLTEN INDUSTRIES

TECHNOLOGY AREA

Hydrogen

SUMMARY

Molten Industries is developing a process to create low-cost hydrogen that avoids carbon emissions while consuming seven times less renewable electricity.

TEAM

CALEB BOYD
Innovator
Oakland, California

KEVIN BUSH
Innovator
Oakland, California

About the Project

Today, the world produces nearly 100 million tons of hydrogen by leveraging steam to break down methane. Hydrogen has the potential to be an invaluable part of our global energy mix due to its versatility, and the ability to increase storage capacity for renewables and decarbonize hard-to-abate industries. Yet, the current methane production process is responsible for about 10 tons of carbon emissions per ton of hydrogen produced. Similarly, while clean methods of hydrogen production exist – like electrolysis – they rely on large amounts of renewable wind and solar energy.

Molten Industries is developing a simple process using methane pyrolysis technology to thermally decompose methane into solid carbon particles and hydrogen gas, avoiding gaseous carbon emissions that can leak into the atmosphere. Their solution is less energy intensive – using seven times less electricity than electrolysis – and can use existing natural gas networks to produce clean hydrogen at points of consumption.

Hydrogen's versatility and potential to decarbonize heavy industries makes it essential to reaching net zero. Molten Industries hydrogen production solution provides an energy-efficient alternative to producing scalable clean energy.

PHASE BIOLABS

TECHNOLOGY AREA

Fuels and Chemicals

SUMMARY

Phase Biolabs leverages modified microorganisms to recycle carbon dioxide more efficiently into cost-competitive carbon-negative chemicals and carbon-neutral electrofuels.

FELLOW

DAVID ORTEGA

Innovator

Nottingham,
United Kingdom

About the Project

Industrial and chemical production processes are one of the largest emitters of carbon dioxide. Decarbonizing these activities and repurposing their carbon emissions will reduce greenhouse gas emissions and could lead to opportunities for new revenue streams through the development of cost-competitive fuels and chemicals.

Phase Biolabs engineers microorganisms that are six times more efficient and 100 times faster at converting CO_2 into electrofuels than typical plants or algae. Using a fermentation process similar to how beer and wine are made, the novel approach uses the modified microorganisms and clean hydrogen to convert CO_2 into ethanol and other fuels that are cost-competitive with fossil fuels and petrochemicals.

Industrial emitters of CO_2 can leverage this process to recycle their emissions into new revenue streams, offering a new tool to incentivize and facilitate emission reductions. By 2050, Phase Biolabs hopes to capture and recycle one gigaton of CO_2 every year.

PHYCOBLOOM

TECHNOLOGY AREA

Fuels and Chemicals

SUMMARY

Phycobloom has developed modified algae that produces an oil that can be used for biofuels while also capturing carbon.

TEAM

IAN
HU
Innovator

London,
United Kingdom

JOHN
WAITE
Innovator

London,
United Kingdom

About the Project

Transportation is one of the largest emitters of carbon dioxide. In long-haul transportation sectors such as aviation and maritime travel, the distance between refueling opportunities makes today's batteries impractical. In these cases, low-carbon liquid fuels such as advanced biofuels are essential.

Phycobloom has genetically modified algae to create fatty acids that are directly released by the plant, eliminating the traditional harvesting process that can damage the algae. Phycobloom's novel approach allows for the continuous production and harvesting of algae oil made from nothing more than air, water, and sunlight, removing the need for drying and processing, dramatically improving productivity and enabling continuous harvesting. That oil can then be used in a variety of sustainable fuels while also facilitating the algae's natural carbon capture system.

Once scaled, Phycobloom hopes to reduce costs and increase productivity of algae oil by 70% in comparison to current processes. This revolutionary innovation will provide a new sustainable biofuel without the carbon-intensive current solutions.

QUEENS CARBON

TECHNOLOGY AREA

Cement

SUMMARY

Queens Carbon is developing a hydrothermal processing technology to significantly reduce the energy consumption and cost for both carbon capture and carbon-neutral cement production.

FELLOW

DANIEL KOPP

Innovator

Pine Brook,
New Jersey

About the Project

Manufacturing large-volume products, such as cement, results in billions of tons of CO_2 emissions annually. Carbonation, the forming of carbonate materials, helps solve this problem by capturing CO_2 in minerals such as limestone. However, substantial amounts of heat and energy are typically required to release the carbon captured in these materials through a step called calcination. A low-energy and -cost process for this reaction would solve a plethora of environmental challenges, including enabling large-scale, commercially viable carbon capture and carbon-neutral cement production.

Queens Carbon's patented approach leverages hydrothermal technology to reduce the temperature of carbonate mineral processing to less than 1000 F compared with typical calcination temperatures of greater than 1800 F. Furthermore, this game-changing technology is also capable of producing carbon-neutral cement at less than 1000 F, which is substantially lower than typical cement production temperatures of over 2700 F. Ultimately, this temperature reduction enables the use of renewable energy technologies and decreases the energy and cost requirements for carbon emissions avoidance and capture.

Once adopted on a global scale, Queens Carbon's technology will enable a billions of tons-scale decarbonization and defossilization of the chemical industry without compromising on cost or product performance.

RENEWCO2

TECHNOLOGY AREA

Fuels and Chemicals

SUMMARY

RenewCO$_2$ is commercializing a proprietary catalyst and one-step process to convert CO$_2$ into cost-competitive carbon-negative monomers, chemicals, and fuels.

TEAM

ANDERS LAURSEN

Innovator

Piscataway,
New Jersey

KARIN CALVINHO

Innovator

Piscataway,
New Jersey

About the Project

Petrochemical processes used to make everyday plastics and chemicals emit 920 million tons of CO$_2$ per year, aggravating climate change. Chemical production can be decarbonized by replacing fossil-based materials with chemicals made from recycled CO$_2$, water, and electricity.

The RenewCO$_2$ team has developed a proprietary catalyst that enables a one-step, low-temperature process for converting CO$_2$ into carbon-negative chemicals. Inspired by nature, their new technology accelerates the CO$_2$ conversion with high-selectivity and low-energy requirements. This efficient system can produce carbon-negative monomers and chemicals that are cost-competitive with conventional fossil-fuel-based products.

RenewCO$_2$ is currently focused on monoethylene glycol, a monomer for polyester, and plans to expand into formic acid, which can be used as a stable liquid hydrogen carrier. When scaled, these chemicals could eliminate CO$_2$ emissions on the order of gigatons per year by 2050.

RENEWABLE IRON FUEL TECHNOLOGY (RIFT)

TECHNOLOGY AREA

Storage

SUMMARY

RIFT is leveraging hydrogen and the rusting properties of iron to produce carbon-neutral energy for heat-intensive industries.

TEAM

LEX SCHEEPERS

Innovator

Eindhoven, Netherlands

MARK VERHAGEN

Innovator

Eindhoven, Netherlands

VINCENT SEIJGER

Innovator

Eindhoven, Netherlands

About the Project

More than 40% of global CO2 emissions originate from energy-intensive industries. Businesses in district heating, industrial processing, and electricity generation are experiencing increasing pressure to become net-zero, but cannot do so as there is no suitable technology available.

Renewable Iron Fuel Technology (RIFT) is creating systems that produce carbon-free heat for energy-intensive industries by rusting and unrusting iron. Rusting, or combustion, of iron fuel yields zero-carbon heat that can be turned into hot water or steam and fed to energy-intensive industries. The resulting iron oxide can be easily stored and transported, then turned back into iron powder through a chemical reaction with hydrogen and reused.

Using existing infrastructure for energy distribution, RIFT's technology has the potential to decarbonize district heating, industrial processes, and electricity plants.

TAKACHAR

TECHNOLOGY AREA

Food and Agriculture

SUMMARY

Takachar is developing the first portable device for converting post-harvest crop and forest residues into bioproducts that can be used by even the most hard-to-access and underserved rural agricultural communities.

TEAM

KEVIN KUNG

Innovator

Vancouver, Canada

VIDYUT MOHAN

Innovator

New Delhi, India

About the Project

Crop and forest residues—which we call biomass—can be converted into valuable bioproducts, including sustainable biofuels, fertilizers, and other chemicals. Most existing technologies to create biofuels and other bioproducts are large-scale, centralized, and capital-intensive. Because collecting and transporting natural waste is difficult and expensive, many rural communities have no choice but to burn their natural waste in open air.

Takachar is developing a portable device that will attach to the back of tractors and pick-up trucks and convert crop and forest waste into biofuels, fertilizers, and other valuable products onsite. By eliminating the need to transport loose and bulky biomass – or resulting products – over long distances, this small-scale, low-cost portable system will increase efficiency of biomass conversion and enable rural communities to create customizable bioproducts in local, distributed networks.

With this affordable, mobile solution, Takachar will enable rural communities to participate in the emerging bioproduct economy and avoid burning their debris, which causes billions of dollars in economic loss, significant air pollution, and increased wildfire risk. Once scaled, Takachar's solution will help create a network of self-sufficient rural communities that can produce sustainable farming materials for their local use and transition away from traditional carbon-intensive chemical products.

UNEMIT

TECHNOLOGY AREA

Carbon Removal

SUMMARY

Unemit's direct air capture technology is scalable to gigatons, swift in its path there, and sustainable.

FELLOW

CHRISTIAN HAAKONSEN

Innovator

Richmond, California

About the Project

Direct air capture (DAC) of atmospheric CO_2 is one of few ways to address historical emissions and residual hard-to-abate emissions.

Unemit's DAC technology is designed from the ground up to be scalable to gigatons, swift in its path there, and sustainable. Each aspect of the technology is being tailored to steer clear of potential bottlenecks by relying on existing supply chains already operating at massive scale. Carbon dioxide is captured from air in contactors that are modular and factory-assembled, which simplifies deployment and enables rapid learning to bring down cost. Extracting CO_2 from the chemical sorbent is accomplished with low-temperature heat, and is done centrally in an energy-efficient way rather than in the air contactors themselves. Once extracted, the CO_2can be permanently stored underground or via industrial applications to achieve net removal from the atmosphere.

With low-temperature heat as its primary energy input, Unemit's technology can be powered by simple and cheap concentrated solar or any other form of renewable energy. This is key both to ensuring net negative lifecycle emissions and to making it compatible with becoming a major part of the world's energy system in order to remove hundreds of gigatons of CO_2 from the atmosphere this century.

2023 COHORT

PROJECT OVERVIEWS

ARCULUS SOLUTIONS

TECHNOLOGY AREA

Hydrogen

SUMMARY

Arculus Solutions is future-proofing current natural gas transmission pipelines to safely transport hydrogen.

TEAM

GIANLUCA ROSCIOLI

Innovator

Washington, DC

About the Project

Clean hydrogen produced at scale from geologic sources or using renewable energy and water can reduce emissions across hard-to-abate sectors like shipping, fertilizer and steel production, and airplanes. However, inadequate hydrogen transportation infrastructure is a recurring challenge. Leveraging pipelines currently used for natural gas would be the simplest solution, but hydrogen can make the steel pipes brittle and cause catastrophic failures. Replacing or deploying new infrastructure is prohibitively expensive and time-consuming.

Arculus Solutions is developing a hydrogen-barrier coating and application process that will enable existing steel-based natural gas pipelines and other infrastructure to safely transport clean hydrogen. This coating will prevent hydrogen from reaching the steel and enable safe transportation through existing infrastructure, accelerating the adoption of hydrogen as a clean fuel across industries.

Arculus Solutions's technology would allow today's pipeline infrastructure to decarbonize at scale without expensive replacement or retrofit. Because the hydrogen-barrier coating can also work with pure hydrogen, its implementation can allow the transition from natural gas to pure hydrogen and decarbonize traditional fossil fuel networks.

ASPIRING MATERIALS

TECHNOLOGY AREA

Carbon Removal

SUMMARY

Aspiring Materials is tackling industrial CO2 emissions from two angles – what goes in and what comes out. And we're using commonly found rocks to do it.

TEAM

ALLAN SCOTT

Innovator

Christchurch,
New Zealand

CHRIS OZE

Innovator

Christchurch,
New Zealand

About the Project

Heavy industry is a major part of society today, but it also is a significant contributor of CO2 emissions each year. Removing carbon dioxide already in the atmosphere is essential to achieving net-zero global emissions by 2050, and we need scalable solutions to reduce and capture emissions in the sector.

Aspiring Materials has developed a globally scalable process that can mineralize atmospheric or industrial CO2. The closed-loop, no-waste, zero emission process transforms magnesium-rich rocks into high purity materials that will rapidly and safely offset or capture CO2. One such product is magnesium hydroxide, which directly and rapidly mineralizes atmospheric and industrial CO2. The technology can also help to decarbonize inputs to cement, fertilizers, electric vehicle batteries, refractories, and water treatment and steel industries.

Their unique process allows for the generation of credible, high-quality carbon offsets that are easily verified by direct observation and measurement. Aspiring Materials has the potential to turn off some of biggest CO2 emissions taps, making massive strides towards a net-zero emissions world.

CALION

TECHNOLOGY AREA

Heating and Cooling

SUMMARY

Calion is reshaping the cooling and heating landscape by replacing harmful refrigerants with salt and water — the world's two safest and most abundant materials.

TEAM

DREW LILLEY

Innovator

Berkeley, California

About the Project

Vapor-compression technology has dominated cooling and heat pumping for over 100 years by using refrigerants. By 2050, refrigerant emissions are expected to account for a sizable fraction of equivalent global CO2 emissions, and scientists have yet to identify a viable alternative.

Calion's refrigeration technology eliminates these refrigerants by using salt and water — the world's two safest and most abundant materials. Calion uses a new thermodynamic cycle that is more efficient to reduce cooling costs. By modulating the ion concentration in a liquid mixture, Calion's technology cools without forming harmful vapors and eliminates the need for refrigerants.

By unleashing the power of this new thermodynamic cycle, Calion aims to achieve non-toxic, non-hazardous, non-flammable, and zero-emission refrigeration and heat pumping that can operate as efficiently and over larger temperature spans than vapor compression.

CLIMATECROP

TECHNOLOGY AREA

Food and Agriculture

SUMMARY

ClimateCrop enhances plants' genetics using non-GM techniques to increase yield per unit area with less inputs, resulting in a lower carbon footprint.

TEAM

EREZ ELIYAHU
Innovator
Israel

VIVEKANAND TIWARI
Innovator
Israel

YEHUDA BORENSTEIN
Innovator
Israel

About the Project

The production of plant-based food, feed, and other products significantly contributes to climate change, and meeting the rising demand for increased crop yield to feed the growing world population is difficult due to changing climate conditions. These conditions threaten crop productivity and food security.

Plant growth, yield, and survival depend on their stored energy, including transitory starch. ClimateCrop increases the daily starch storage in plant leaves using a simple, non-GMO, precisely targeted gene edit. This improves photosynthetic efficiency and results in better yields, improved tolerance to drought and heat waves, and reduced carbon footprints.

Over the next few decades, using ClimateCrop technology in major crops will help to meet the increasing demand for food and ensure sustainable agriculture in a changing environment. It will increase crop yields without increasing the need for water or chemical fertilizers, farming techniques, or land use, preventing massive amounts of CO_2 equivalents from being released.

FERRUM TECHNOLOGIES

TECHNOLOGY AREA

Steel

SUMMARY

Ferrum is leveraging their unique hydrogen-plasma technology to produce carbon-free steel.

TEAM

ANDREAS CARL WEBER

Innovator

Vienna,
Austria

About the Project

Steel is foundational to global society. Yet, the industry emits 7-9% of Global CO2 emissions. There is no technology in today's market that processes low-quality iron ore – steel's main input – with no or low CO2 emissions.

Ferrum uses low-temperature hydrogen plasma to process low-quality ore in the most energy-efficient way possible and with close to zero CO2 emissions. This process also allows steel companies to co-locate the energy intensive first step of steel production (iron making, reduction of iron ore) in areas with cheap renewable energy, while keeping the second step (melting and refining) in existing

Ferrum has the potential to provide low-to-zero-carbon technology in the steel industry and maintain cost-competitiveness with carbon-based technologies. This would be a massive incentive for steel companies to adopt the technology and could significantly accelerate decarbonization of global steel production.

GET LIT TECHNOLOGIES

TECHNOLOGY AREA

Electrification

SUMMARY

Get Lit Technologies is decarbonizing lithium production by using renewable electricity to convert saltwater into battery grade lithium chemicals.

TEAM

ERIC MCSHANE

Innovator

Menlo Park, California

EVAN GARDNER

Innovator

Menlo Park, California

About the Project

Lithium is a critical mineral used in many applications—from electrified transportation to grid-scale energy storage—that will drive our sustainable energy future. However, existing methods of lithium sourcing are costly, carbon-intensive, and can be applied only to a few anomalously lithium-rich resources.

Get Lit Technologies is developing a proprietary electrochemical process that uses lithium-selective electrodes to convert saltwater brines into lithium chemicals for batteries. Their process eliminates the need for excessive chemical reagents for purification and offers high scalability with a modular cell stack design.

Get Lit's technology will unlock new sources of lithium resources to alleviate lithium supply concerns and ensure they do not affect our progress towards net-zero emissions. Along the way, their technology has the potential to reduce carbon emissions and land and water usage substantially compared to traditional lithium sourcing approaches.

HOOFPRINT BIOME

TECHNOLOGY AREA

Food and Agriculture

SUMMARY

Hoofprint Biome is developing probiotics that improve cattle health and digestive efficiency while eliminating methane production.

TEAM

KATHRYN POLKOFF

Innovator

Raleigh,
North Carolina

SCOTT COLLINS

Innovator

Raleigh,
North Carolina

About the Project

Cattle are responsible for nearly one-third of global anthropogenic methane emissions – a greenhouse gas that's both potent and fast-acting. This methane predominantly originates from microorganisms in the cow's stomach and is expelled through burping. Although cattle have positive roles – such as preserving rangelands and soil health through regenerative grazing or upcycling agricultural waste into nutrients for humans – their methane emissions pose a significant climate challenge.

Hoofprint has discovered novel enzymes that naturally prevent methane production. They are developing a probiotic that releases these enzymes in the cow's stomach to cut methane emissions while also improving animal health and nutrition. By using a probiotic yeast, Hoofprint can offer a product that is scalable, affordable, and increases farm profitability.

Feeding cows just a mouthful of Hoofprint's probiotic yeast could help prevent methane emissions and make cattle farming a part of the climate solution.

MACROCYCLE TECHNOLOGIES

TECHNOLOGY AREA

Circularity

SUMMARY

MacroCycle seeks to decarbonize the plastics industry by upcycling low quality waste plastics into high quality plastic products through a novel low-energy chemical process.

TEAM

JAN-GEORG ROSENBOOM

Innovator

Cambridge, Massachusetts

STWART PEÑA FELIZ

Innovator

Cambridge, Massachusetts

About the Project

The plastics industry accounts for nearly 5% of global CO2 emissions. A small fraction of plastic waste is recycled globally, while the United States recycles plastic at a rate lower than the global average. On top of that, much of the plastic sent for recycling today ends up in landfills, in oceans, or it gets incinerated, adding to CO2 and particulate emissions. Better recycling processes could significantly improve these statistics.

MacroCycle believes that chemistry holds the key to enabling fully circular plastics. With their patented technology, Macrocycle synthesizes plastic waste into virgin-grade recycled plastic. Their process uses substantially less energy than traditional plastic recycling processes and can be powered with renewable energy to achieve zero carbon emissions.

By closing the supply chain gap between waste collectors and plastic using brands, MacroCycle's technology has the potential to substantially reduce or eliminate Scope 3 emissions from plastics, plastic disposal into the environment, and the use of fossil fuels for plastic production.

MARATHON FUSION

TECHNOLOGY AREA

Fusion

SUMMARY

Marathon Fusion designs, engineers, and scales next-generation fuel-processing technologies to enable the deployment and scale-up of fusion power plants.

TEAM

ADAM RUTKOWSKI

Innovator

San Francisco, California

ADRIEN BENUSIGLIO

Innovator

San Francisco, California

KYLE SCHILLER

Innovator

San Francisco, California

About the Project

Fusion energy has the potential to decarbonize a huge segment of the global electricity market over the next few decades, but only if it can be deployed quickly and economically. To do this, fusion power plants must be able to recycle fuel rapidly and reliably, but right now, the technology to do this only exists at lab-scale.

Marathon Fusion is working to commercialize a fuel processing component using the concept of hydrogen superpermeation – the ability of hydrogen atoms or similar isotopes to move though certain materials at a significantly higher rate. Their fuel processing technology – metal foil pumps – could help accelerate fusion systems into pilot plants within a decade. Compared to conventional technologies, Marathon's approach enables a dramatic reduction in tritium inventory and fuel processing cost while easing engineering requirements on other critical systems.

By identifying key gaps in fusion fuel cycle technologies and advancing research and development on commercially relevant timelines, Marathon Fusion will help enable the safe and scalable deployment of fusion energy.

NITROVOLT

TECHNOLOGY AREA

Food and Agriculture

SUMMARY

NitroVolt is decarbonizing nitrogen-based fertilizer production and making the agricultural sector more resilient with a novel production process.

TEAM

MATTIA SACCOCCIO

Innovator

Copenhagen, Denmark

SUZANNE ZAMANY ANDERSEN

Innovator

Copenhagen, Denmark

About the Project

Commercial ammonia production supports 40-50% of the agricultural industry as a nitrogen-based fertilizer. But current ammonia production is not sustainable, releasing over 1% of global greenhouse gas emissions during production facilities and further emissions during transportation to the end user, farmers.

NitroVolt offers a local ammonia production solution that gives farmers the ability to produce their own nitrogen-based fertilizer. The only inputs required by NitroVolt's container-sized systems are air, water, and electricity, enabling production of sustainable ammonia directly at farms. NitroVolt's patented electrochemical Nitrolyzer unit can make ammonia on-demand with intermittent renewable energy sources.

With their technology, NitroVolt aims to decarbonize nitrogen-based fertilizer production one farm at a time, cut the logistic costs of distributing fertilizer, and make the agricultural sector more resilient to external factors.

NOVEL FARMS

TECHNOLOGY AREA

Food and Agriculture

SUMMARY

Novel Farms is developing a scaffolding platform designed to enable the cost-effective production of whole cuts of cultivated meat at large-scale, accelerating the widespread adoption of this sustainable source of animal protein.

TEAM

MICHELLE LU

Innovator

Berkeley, California

NIEVES MARTINEZ MARSHALL

Innovator

Berkeley, California

About the Project

Meat produced through traditional industrial animal farming processes is accountable for approximately 15% of global greenhouse gas emissions. Cultivated meat production, on the other hand, has the potential to yield a marginal carbon footprint while providing sustainable and cruelty-free animal protein. Currently, the prohibitively high cost of animal cell culture media is the primary barrier to the economic viability of producing cultivated meat products.

Novel Farms leverages a novel microbial fermentation approach to develop a scaffolding platform that can significantly reduce production costs while providing an ideal surface to produce structured cultivated meat products. Their proprietary technology enables the incorporation of growth factors into the scaffolding as fixed features, thus eliminating the need for expensive animal cell culture media.

Developing cost-efficient methods for cultivated meat production will be vital in satisfying the growing demand for animal protein while avoiding the deforestation, carbon emissions, and biodiversity loss from industrial animal farming.

OLOKUN MINERALS

TECHNOLOGY AREA

Electrification

SUMMARY

Olokun Minerals uses a mineral recovery process to provide mineral-based products sustainably sourced for a variety of industries.

TEAM

LACEY REDDIX

Innovator

Los Angeles, California

PILANDA WATKINS-CURRY

Innovator

Chesterfield, Virginia

About the Project

Clean energy technology production and adoption are accelerating fast to get to net zero emissions by 2050 – this requires significant amounts of critical minerals, which have potential supply risks and are currently mined using carbon intensive methods. Olokun Minerals is developing a new way to extract multiple minerals, like lithium and magnesium, from brines without the use of harsh chemicals to create products than can be used in concrete, fertilizers, and batteries.

Olokun uses a mineral recovery process that includes a separation step, leveraging a novel resin to recover minerals from salty wastewaters with a reduced chemical footprint. This process produces cleaner water that can be reclaimed, while creating metal salts that can then be converted into compounds used for batteries.

Ultimately, this approach allows for multiple minerals to be recovered simultaneously, providing a more efficient and cost-effective way to source the metals needed for renewable energy technologies with a smaller environmental footprint.

SILICATE

TECHNOLOGY AREA

Carbon Removal

SUMMARY

Silicate permanently removes excess carbon dioxide from the atmosphere via the acceleration of a natural geochemical process — mineral weathering.

TEAM

MAURICE BRYSON

Innovator

Dublin, Ireland

About the Project

Removing carbon dioxide already in the atmosphere is essential to limiting global temperature increase to 1.5˚C. Solutions that can reliably and safely scale permanent carbon removal are essential to achieving our climate goals.

Silicate harnesses a natural geochemical process, mineral weathering, to permanently and safely remove excess carbon dioxide from the atmosphere. Silicate's material is applied to agricultural land as a soil pH amendment. As it weathers, it can boost crop productivity, reduce the need for pesticides and fertilizers, and permanently remove excess carbon dioxide from the atmosphere.

Silicate's pioneering work in terrestrial enhanced weathering could allow a promising carbon removal pathway to become an effective, verifiable, and rapidly scalable climate solution.

FELLOW BIOS

2022 Cohort

CALEB BOYD

He/Him

Chief Technology Officer, Molten Industries

Caleb joins Breakthrough Energy's Innovator Fellows from Molten Industries in Stanford, California. He is an expert in designing and using breakthrough materials to make energy production and industrial processes more sustainable and efficient. At Molten Industries, Caleb and his team are working to produce low-cost, carbon-neutral hydrogen using methane pyrolysis technology, which has the potential to be more energy efficient and scalable than existing approaches to hydrogen production.

The Molten Industries solution uses seven times less energy than electrolysis and can benefit from the existing natural gas distribution network to produce clean hydrogen at points of consumption. The clean hydrogen produced will be used to decarbonize critical, yet hard-to-decarbonize industries such as cement and steel production, aviation, long-haul trucking, and shipping. Through the Fellows program, Caleb will work to scale his technology to commercial readiness and begin working with commercial partners as quickly as possible.

Caleb grew up on a small ranch in California and holds a Master of Science in Materials Science and Engineering from the University of California, Berkeley as well as a Doctor of Philosophy in Materials Science and Engineering from Stanford University. While obtaining his Doctor of Philosophy, Caleb split time between Stanford and the National Renewable Energy Lab where he developed some of the world's highest-efficiency perovskite-silicon tandem solar cells. Previously, he worked on a team in Kolkata, India developing affordable air purifiers and at a European deep-tech venture capital fund investing in early-stage climate tech startups.

SHELBY BREGER

She/Her

Co-Founder, Conduit Tech

Shelby joins Breakthrough Energy's Innovator Fellows program from Conduit Tech in Fort Lauderdale, Florida. She brings her experience in helping scale other climate tech companies to Conduit Tech, which builds software and hardware tools that support residential heating and cooling electrification and efficiency.

Conduit Tech focuses on building tools for contractors that make it easier to install and maintain energy-efficient and electric heating, cooling, and air conditioning (HVAC) systems. This equipment is often higher-end, more expensive, and more complicated to install, but vital to dramatically cut energy use and emissions of building heating and cooling. Through the Fellows program, Conduit Tech hopes to test and scale technologies that can further its mission to decarbonize the whole home.

Shelby started her career at McKinsey & Company, working on economic initiatives to create inclusive, high-value employment. Her passion for tech-enabled impact led her to focus on climate tech, including managing finance and operations at Via Separations, which works to decarbonize chemical separations. Shelby received her Bachelor of Arts in Economics and Master of Arts in Sociology at Stanford University, as well as her Master of Business Administration at Stanford Graduate School of Business.

KRISTIN BRIEF

She/Her

Business Fellow

Kristin Brief joins Breakthrough Energy's Business Fellows program from Boston, Massachusetts. A business generalist by training, Kristin is passionate about building and developing high-performing teams. As a Business Fellow, Kristin is excited to use her experience and business skills to help Innovator Fellows commercialize solutions that mitigate emissions and climate change.

Kristin has spent her 19-year career in entrepreneurial roles at early-stage energy and technology companies, working both in-house and as a consultant. She has extensive experience in the clean energy sector and helped raise more than $50 million in series B and C funding for a single long-duration energy storage company. She has expertise in raising capital, project finance, developing market-entry strategies, conducting customer and market research, and forming partnerships to accelerate clean tech startups to market. Most recently, Kristin co-founded a medical diagnostics biotechnology company that raised more than one million dollars in grant and seed capital and was acquired by a publicly traded pharmaceutical company within 16 months of company formation.

In her free time, Kristin enjoys hanging out with her family, getting outside (running, hiking, skiing!), and traveling to new places. She holds a Bachelor of Arts in Economics from Dartmouth College.

EDOUARD BULTEAU

He/Him

Business Fellow

Edouard Bulteau joins Breakthrough Energy's Business Fellow program from Paris, France. Edouard brings expertise across various clean energy technologies and markets, including renewable energy production, energy storage, energy access, smart grids, and clean mobility. As a Business Fellow, he will help Innovator Fellows take their climate technology ideas from the lab to the market.

Edouard has more than a decade of experience working in clean technologies and clean energy startups. Most recently, he worked as a corporate venture Investment Director for TotalEnergies, one of the largest multi-energy companies in the world. There Edouard helped the company's decarbonization efforts by investing in and supporting a diverse portfolio of international low-carbon technologies startups. He developed the company's venture activity in the U.S., opening its local office in San Francisco and more recently participated to launch TotalEnergies' startup accelerator in Paris, TotalEnergies On.

In his free time, Edouard enjoys running, being on the water, and playing the guitar. He holds a Master of Science in Civil and Environmental Engineering from the University of California, Berkeley and a Master of Science with a specialization in Applied Mathematics to Ecology and Economics from the Ecole Polytechnique near Paris, France.

KEVIN BUSH

He/Him

Chief Executive Officer and Co-founder, Molten Industries

Kevin joins Breakthrough Energy's Innovator Fellows from Molten Industries in Oakland, California. He is a climate technology enthusiast with a background in materials science and engineering. At Molten Industries, Kevin and his team are working to produce low-cost, carbon-neutral hydrogen using methane pyrolysis technology, which has the potential to be more energy efficient and scalable than existing approaches to hydrogen production.

The Molten Industries solution uses seven times less energy than electrolysis and can benefit from the existing natural gas pipelines to produce clean hydrogen at points of consumption. The clean hydrogen produced will be used to decarbonize critical, yet hard-to-decarbonize industries such as cement and steel production, aviation, long-haul trucking, and shipping. Through the Fellows program, Kevin will work to scale his technology to commercial readiness and begin working with commercial partners as quickly as possible.

Kevin grew up in the Pacific Northwest as an environmentalist and aspiring inventor. He has always enjoyed tinkering and building systems, and believes that low-cost, carbon-neutral hydrogen production is key to decarbonizing heavy industrial sectors. Kevin earned a Bachelor of Engineering in Mechanical Engineering from Vanderbilt University and a Doctor of Philosophy in Materials Science and Engineering from Stanford University. Kevin's dissertation focused on developing high-efficiency perovskite solar cells.

KARIN CALVINHO

She/Her

Chief Technology Officer, RenewCO$_2$

Karin Calvinho joins Breakthrough Energy's Innovator Fellows program from RenewCO$_2$ in Cranford, New Jersey. With nearly a decade of experience in electrochemistry and renewable energy conversion, Karin believes new catalysts that can accelerate reactions are the key to making industrial processes more sustainable. At RenewCO$_2$, Karin and her team are developing an electrocatalytic process to convert carbon dioxide and water into carbon-negative monomers, chemicals, and fuels.

The RenewCO$_2$ team has developed a proprietary catalyst that enables a one-step, low-temperature process for converting CO_2 into carbon-negative chemicals. Inspired by nature, their new technology accelerates CO_2 reduction with high-selectivity and low-energy requirements. This efficient system can produce carbon-negative monomers and chemicals that are cost-competitive with conventional fossil-fuel-based products. Through the Fellows program, RenewCO$_2$ plans to scale its technology for a pilot plant to demonstrate feasibility at a commercial scale.

Karin holds a Bachelor of Science in Chemistry from the Federal University of Technology – Parana in Brazil. She earned a Doctor of Philosophy in Inorganic Chemistry from Rutgers University in New Jersey. She is motivated by the challenge of developing new catalysts that lead to more efficient and sustainable chemistries essential in every process used to make materials.

DANIELLE COLSON

She/Her

Chief Operating Officer, Mantel Capture, Inc.

Danielle joins Breakthrough Energy's Innovator Fellows program from Mantel Capture, Inc. in Boston, Massachusetts. Her interests lie at the intersection of energy and engineering, and she uses her expertise in operations to bring the organization's many moving business and development pieces together. At Mantel, Danielle and her colleagues are working to revolutionize carbon capture and storage with molten borates, a patented new material that has the potential to substantially reduce costs and energy losses relative to incumbent technologies.

Mantel's patented solution is designed to operate at the high temperatures found inside boilers, kilns, and furnaces. The approach captures carbon dioxide at high temperatures, increasing efficiency by recovering heat in the carbon capture process. Once scaled, this process can be used in any high temperature industrial process—such as cement and steel production—to help hard-to-abate sectors achieve net-zero emissions. Through the program, she hopes to advance Mantel's technology to a stage where they are ready to scale commercially.

Danielle is based in Florida and holds a Master of Business Administration from Harvard Business School as well as a Bachelor of Science in Mechanical Engineering from Duke University. Prior to business school, she spent five years managing operations and maintenance at natural gas power plants for NextEra Energy.

AARON FITZGERALD

He/Him

Chief Executive Officer & Co-Founder, Mars Materials

Aaron joins Breakthrough Energy's Innovator Fellows program from Mars Materials in Oakland, California. Aaron began his career working in government before becoming an entrepreneur focusing on carbon removal, technology transfer and venture capital. At Mars Materials, Aaron and his team are commercializing a technique, nitrilation, that transforms captured CO_2 emissions into a compound that is used to produce low-cost, low-carbon materials for industrial use.

Mars Materials' nitrilation solution transforms captured CO_2 into acrylonitrile (ACN)—the main building block in carbon fiber, a material used in hundreds of everyday products from textiles to electronics. While conventional methods for ACN production result in toxic byproducts, water and non-toxic alcohols are the only byproducts of Mars Materials' technology. Additionally, nitrilation plants are 57% cheaper to build and have 31% less process emissions compared to existing approaches. At scale, this solution will enable widespread use of carbon fiber in new industrial markets like the vehicle sector. Through the Fellows program, Mars Materials will optimize its technology in preparation for building a first-of-its-kind demonstration plant.

Aaron holds a Bachelor of Arts in Business Administration, with a concentration in International Business from Rhodes College. He completed entrepreneur in residence fellowships with Carbon180, the National Renewable Energy Laboratory's LabStart, and Prime Coalition.

CHRISTINE GABARDO

She/Her

Chief Technology Officer and Chief Operating Officer, CERT Systems Inc.

Christine Gabardo joins Breakthrough Energy's Innovator Fellows program from CERT Systems Inc. in Toronto, Canada. An expert in electrochemistry, Christine has focused her career on electrochemical device engineering and carbon dioxide utilization technologies. At CERT Systems Inc., Christine and her team are working on a system to convert captured CO_2 into green chemicals, fuels, and plastics.

CERT Systems Inc. has developed an electrochemical process that uses only water and electricity to convert CO_2-rich solutions from capture systems, eliminating the energy-intensive purification process and the majority of energy costs associated with direct air capture. CERT Systems is currently transforming carbon dioxide into ethylene, which can then be used for a broad range of applications including plastics, textiles, and sustainable aviation fuels. As part of the Fellows program, CERT Systems Inc. intends to scale their lab model into a pilot to demonstrate the process from air to ethylene.

Christine earned a Bachelor of Engineering in Electrical and Biomedical Engineering and a Doctor of Philosophy in Biomedical Engineering from McMaster University. After completing her degrees, she spent four years as a Postdoctoral Fellow of Mechanical Engineering at University of Toronto, focused on developing and scaling electrochemical CO_2 reduction devices.

KRISTIAN GUBSCH

He/Him

Vice President of Feedstock Development & Co-Founder, Mars Materials

Kristian joins Breakthrough Energy's Innovator Fellows program from Mars Materials (Mars) in Oakland, California. He has been passionate about mitigating climate change since high school and focused his studies in chemical engineering and entrepreneurship on developing and deploying technologies aimed at removing greenhouse gases from the atmosphere. At Mars Materials, Kristian, Aaron and their team are commercializing a technique, nitrilation, that transforms captured CO_2 emissions into a compound that is used to produce low-cost, low-carbon materials for industrial use.

Mars Materials' nitrilation solution transforms captured CO_2 into acrylonitrile (ACN)—the main building block in carbon fiber, a material used in hundreds of everyday products from textiles to electronics. While conventional methods for ACN production result in toxic byproducts, water and non-toxic alcohols are the only byproducts of Mars Materials' technology. Additionally, nitrilation plants are 57% cheaper to build and have 31% less process emissions compared to existing approaches. At scale, this solution will enable widespread use of carbon fiber in new industrial markets like the vehicle sector. Through the Fellows program, Mars Materials will optimize its technology in preparation for building a first-of-its-kind demonstration plant.

Kristian holds a Bachelor of Science in Chemical Engineering from Washington State University. He also earned a Master of Science in Environmental and Energy Engineering from The University of Sheffield, and a Master of Science in Innovation, Entrepreneurship, and Management from the Imperial College Business School.

CHRISTIAN HAAKONSEN

He/Him

Founder, Unemit

Christian joins Breakthrough Energy's Innovator Fellows program from Unemit in the San Francisco Bay Area, California. He combines his background in nuclear science and engineering with his professional business experience to tackle climate change with solutions that are both technically innovative and optimized to swiftly gain traction for maximal impact. At Unemit, Christian and his team are leveraging readily available materials and supply chains to build cheaper, more scalable direct air capture (DAC) technology.

Unemit's solution captures atmospheric CO_2 in modular air contactors, and then extracts it from the chemical sorbent with low-temperature renewable heat in a centralized and energy-efficient way. The extracted carbon dioxide can then be permanently stored underground or via industrial applications to achieve net removal from the atmosphere. Through the Fellows program, Christian aims to mature his team's DAC solution so that it can be demonstrated in a pilot facility and then swiftly scaled to gigaton-per-year capacity by mid-century.

Having grown up in Norway, Christian thoroughly enjoys the outdoors in any season. That and the injustice of climate change drives his passion for mitigating it, whether through his work at MIT, Boston Consulting Group, or Unemit. He holds a Bachelor of Science in Mathematics and Physics and a Master of Science in Astrophysics from McGill University; as well as a Master of Science and a Doctor of Philosophy in Nuclear Science and Engineering from the Massachusetts Institute of Technology (MIT).

CAMERON HALLIDAY

He/Him

Co-Founder and CEO, Mantel Capture, Inc.

Cameron joins Breakthrough Energy's Innovator Fellows program from Mantel Capture, Inc. in Boston, Massachusetts. With a background in engineering and over five years working in the carbon capture space, he combines his passion for science with a determination to use technology to tackle the toughest challenges facing the world today. At Mantel, Cameron and his colleagues are working to revolutionize carbon capture and storage with molten borates, a patented new material that has the potential to substantially reduce costs and energy losses relative to incumbent technologies.

Mantel's patented solution is designed to operate at the high temperatures found inside boilers, kilns, and furnaces. The approach captures carbon dioxide at high temperatures, increasing efficiency by recovering heat in the carbon capture process. Once scaled, this process can be used in any high-temperature industrial process—such as cement and steel production—to help hard-to-abate sectors achieve net-zero emissions. Through the program, he hopes to advance Mantel's technology to a stage where they are ready to scale commercially.

Cameron is originally from the United Kingdom and holds multiple degrees from the Massachusetts Institute of Technology: Master of Business Administration, Master of Science in Chemical Engineering, and a Doctor of Philosophy in Chemical Engineering. Additionally, he earned a Master of Engineering in Chemical Engineering with Management from Loughborough University in England. Cameron focused his studies on clean energy, separations, and carbon capture.

BRIAN HARDIN

He/Him

CEO and Co-founder, Aluminio

Brian joins Breakthrough Energy's Innovator Fellows program from Aluminio in the San Francisco Bay Area, California. He has extensive experience in solar technologies, having worked on solar projects at universities and within the startup space. As Chief Executive Officer of Aluminio, he focuses on metallization, characterization, and solar cell manufacturing integration with customers.

Today, silver used on solar cells is both scarce and costly – accounting for 10% of the world's annual silver supply and 10% of the cost of solar modules. To accelerate the global adoption of solar technologies, Aluminio is developing a new approach to replace over 90% of the silver in solar cells with aluminum, a less expensive and more abundant material. Through the Fellows program, Aluminio seeks to finalize their prototype and demonstrate their metallization technology's manufacturing processes with customers.

Brian has long been interested in solar power – in high school he built a portable solar-powered air conditioner for his car – and has worked on solar projects at both U.S. and European universities. After his studies, Brian co-founded his first startup, PLANT PV, which developed a metallization paste that increased the power conversion efficiency and manufacturability of silicon solar cells. Brian earned a Bachelor of Science in Electrical Engineering at the University of Texas at Austin, was a Gilman Scholar at St. Edmund Hall College (University of Oxford), a Fulbright Scholar in Chemistry at École Polytechnique Fédérale de Lausanne, and received a Master's of Science and Doctor of Philosophy in Materials Science and Engineering at Stanford.

ALICE HAVILL

She/Her

Business Fellow

Alice Havill joins Breakthrough Energy's Business Fellows program from the Denver, Colorado area. Alice has a passion for developing teams, businesses, and technologies that transform emerging social and environmental needs into market-based opportunities. In joining the Fellows program, Alice is excited to work with other Innovator Fellows and accelerate commercialization of novel technologies that are poised to bring economic, social, and environmental value, by integrating business diligence with technical innovation.

Throughout her career, Alice has held a variety of roles focused on novel technology development and climate tech commercialization. She has worked in all stages of the innovation and business lifecycle, from early-stage research and development to design, manufacturing, and technology piloting. Companies she has worked with include LanzaTech Inc. and Vartega Inc. She also has experience in fundraising, team growth, capital management, and corporate strategic planning. More recently, Alice spent time in venture capital with the Colorado Impact Fund, where she gained skills in business due diligence, investment deployment and corporate governance. Alice combines her technical aptitude, business acumen, and transformative leadership experience to support the development, scale, and commercialization of climate technologies.

A native of New Zealand, Alice enjoys visiting new countries, experiencing new cultures, and being active outdoors, including running, skiing, climbing, and biking. She holds a Bachelor of Engineering in Chemical and Materials from the University of Auckland and a Master of Business Administration with a concentration in Corporate Finance from the University of Denver. In addition, she earned a certificate in Corporate Social Responsibility and Global Business from the University of Denver and a certificate in Project Management for Professionals from Northwestern University.

COLIN HO

He/Him

Chief Technology Officer and Co-founder, Hgen

Colin joins Breakthrough Energy's Innovator Fellows program from Hgen in Los Angeles, California. His work focuses on complex electromechanical system design and development – the intersection of mechanical, electrical, and manufacturing engineering. As Chief Technology Officer, he guides the research and development of the hydrogen electrolysis technologies at Hgen.

Hgen's technology uses renewable electricity to break water into clean hydrogen energy at higher efficiency with lower costs. Hgen's system is uniquely designed for renewables integration, and will help overcome current technical limitations – notably the intermittent power losses – that hinder clean hydrogen production. Through the Fellows program, Hgen will leverage their integrated, modular design to focus on reducing costs and scaling their technology.

Colin has previous experience leading large-scale engineering projects. At OpenROV, he helped scale a drone startup into the highest volume, underwater robot manufacturer in the world. Then, at SpaceX, his team was a critical part of the crew that developed the first fully reusable space launch vehicle. Colin earned a Bachelor of Science in Mechanical Engineering from Arizona State University as well as a Master of Science in Mechanical Engineering from the University of California, Berkeley.

IAN HU

He/Him

Chief Technology Officer, Phycobloom

Ian Hu joins Breakthrough Energy's Innovator Fellows program from Phycobloom in London, United Kingdom. With a background in biology and a passion for capitalizing on algae, he is driven to develop technologies that can help mankind overcome the climate crisis. Ian and his team at Phycobloom are working on engineering algae that can continuously produce biofuels and capture carbon.

Phycobloom has genetically engineered algae that continuously captures carbon dioxide while secreting an oil that can be used in sustainable biofuels. Phycobloom's process eliminates the traditional carbon-intensive harvesting process that can damage algae and will reduce costs by up to 70%. During the Fellows program, they hope to demonstrate their algae performance at scale.

Ian completed his Bachelor of Science in Chemistry Plant Pathology and Microbiology at the National Taiwan University. He holds a Doctor of Philosophy in Biochemistry from the University of Cambridge.

ALEX IP

He/Him

Chief Executive Officer, CERT Systems Inc.

Alex Ip joins Breakthrough Energy's Innovator Fellows program from CERT Systems Inc. in Toronto, Canada. Alex has always been interested in the fundamentals of how the world works and is passionate about applying cutting-edge research to improve our energy system and drive climate solutions. With previous experience working on greenhouse gas emission solutions, Alex and his team are working on a system to convert captured liquid CO_2 into green chemicals, fuels, and plastics.

CERT Systems Inc. has developed an electrochemical process that uses only water and electricity to convert CO_2-rich solutions from capture systems, eliminating the energy-intensive purification process and the majority of energy costs associated with direct air capture. CERT Systems is currently transforming carbon dioxide into ethylene, which can then be used for a broad range of applications including plastics, textiles, and sustainable aviation fuels. As part of the Fellows program, CERT Systems Inc. intends to scale their lab model into a pilot to demonstrate the process from air to ethylene.

Alex completed his Bachelor of Science in Engineering Physics at Queen's University in Kingston, Ontario. He attained a Doctor of Philosophy in Electrical and Computer Engineering at the University of Toronto. After completing his degrees, he spent four years competing in the Carbon XPRIZE.

SAM KANNER

He/Him

Chief Executive Officer, Aikido Technologies

Sam Kanner joins Breakthrough Energy's Innovator Fellows program from Aikido Technologies in San Francisco, California. He has been interested in ocean renewable energy since high school and has spent his career working in early-stage wind technology and innovation. At Aikido Technologies, Sam and his team are developing a self-erecting platform for floating, offshore wind turbines to overcome key barriers to increasing offshore wind energy production.

Aikido Technologies has designed a self-erecting platform for floating, offshore wind turbines. Their novel system integrates the platform and turbine into a fully assembled unit that can be transported horizontally and is narrow enough to access 80% of ports in the U.S. Once in place, a simple ballasting procedure upends the platform into operational configuration. Through the Fellows program, Aikido Technologies hopes to deploy their first open ocean pilot project.

Sam completed his Bachelor of Arts in Physics and Geology at Carleton College in Northfield, Minnesota. He earned a Master of Science and a Doctor of Philosophy in Mechanical and Ocean Engineering from the University of California, Berkeley.

CLAES KOLLBERG

He/Him

Chief Technology Officer, CemVision AB

Claes joins Breakthrough Energy's Innovator Fellows program from CemVision AB, based in Nybro, Sweden. Claes is an engineer and entrepreneur with more than 18 years of experience renovating, building, and managing cement production plants in Africa and Europe. As the Chief Technology Officer, Claes is responsible for developing the production process and optimizing the raw materials, energy production, and heat transfer components of CemVision's new cement production process.

CemVision is reinventing cement by replacing fossil limestone with waste materials and switching fuels such as plastic and coal for green thermal energy. CemVision creates non-traditional cement that has not only superior product properties compared to traditional Portland cement but also a lower carbon footprint due to reduced need for limestone. In addition to reducing CO_2 emissions, CemVision's novel cement technology makes concrete construction faster and more resource efficient. Through the Fellows program, Claes and Paul will develop the technology and intellectual property in order to scale their solution for meaningful production, aiming at > 90% reduction of CO_2 emissions compared to traditional cement.

Claes studied Energy Technology at University of Cape Town in South Africa through an exchange program at INSA de Lyon, France and earned a Master of Science in Mechanical Engineering from the Royal Institute of Technology in Stockholm. Claes has been lecturer in Strategic Sustainable Development and Corporate Social Responsibility at Uppsala University in Sweden.

DANIEL KOPP

He/Him

Co-Founder and Chief Executive Officer/Chief Technology Officer, Queens Carbon

Daniel joins Breakthrough Energy's Innovator Fellows program from Queens Carbon, Inc. in Pine Brook, New Jersey. He brings expertise in hydrothermal chemistry, CO_2 intensive processes and utilization, and cementitious materials. As the father of two young children, he is determined to reduce the massive carbon footprint of industrial processes and thus help ensure a livable planet for future generations. At Queens Carbon, Daniel and his team are developing a novel technique that leverages hydrothermal processing to enable low-energy, low-cost solutions for carbonate decomposition reactions, specifically those needed for carbon capture and cement.

Calcination processes produce reactive oxides as feedstocks in industrial manufacturing processes, such as cement and glass. These processes use high temperatures to decompose carbonate minerals, releasing carbon dioxide from the carbonate mineral and the fossil fuel used to heat the calciner. Capturing or eliminating these emissions is essential to achieving net-zero targets by 2050, but existing technologies consume additional energy and add between 75-140% to the cost of production. Queens Carbon's patented technology aims to reduce the temperature of carbonate processing to less than 1000 F, compared with over 1800 F and over 2700 F processes for cycling carbonate capture media and cement production, respectively. This temperature reduction diminishes the energy and cost of the process and enables renewable energy to be used. Once adopted on a global scale, Queens Carbon's technology will enable gigatonne-scale decarbonization and defossilization of the chemical industry without compromising cost or product performance. Through the Fellows program, Daniel hopes to rapidly design, develop, and optimize the technology for commercialization.

Daniel holds a Bachelor of Science, Master of Science, and Doctor of Philosophy in Material Science and Engineering from Rutgers University. Additionally, he has served as both a Postdoctoral Associate and Research Associate in the Riman Laboratories at Rutgers where he co-led research to lower the energy and carbon footprint of industrial products including cement and concrete.

KEVIN KUNG

He/Him

Co-Founder and Chief Technology Officer, Takachar

Kevin joins Breakthrough Energy's Innovator Fellows program from Takachar in Vancouver, Canada. He combines his background in combustion engineering and physics with his professional expertise in engineering design to make bioproduct processing and consumption more affordable and efficient. At Takachar, Kevin and his team have developed the first portable device for converting natural waste into bioproducts in even the most hard-to-access and underserved rural agricultural communities.

Unlike traditional biomass process technologies that are large-scale, centralized, and capital-intensive, Takachar's low-cost, portable solution can attach to tractors and pick-up trucks to process crop and forest debris into biofuels, fertilizers, and other valuable products onsite. With the support of the Fellows program, Takachar will work to de-risk the technology and deploy field-scale prototypes with diverse communities to demonstrate usability and impact in the target markets.

Originally from Taiwan, Kevin earned a Bachelor of Arts in Physics from Princeton University and a Master of Philosophy in Physics at the University of Cambridge. He completed a Master of Science in Biological Engineering and a Doctor of Philosophy in Biofuels and Renewable Energy from the Massachusetts Institute of Technology. Prior to his studies, he spent six years conducting engineering design in resource-constrained settings, including borehole restoration in Uganda, interlocking stabilized construction materials in Ghana, and renewable energy systems in Kenya and India.

ANDERS LAURSEN

He/Him

Chief Executive Officer and President, RenewCO$_2$

Anders Laursen joins Breakthrough Energy's Innovator Fellows program from RenewCO$_2$ in Cranford, New Jersey. With expertise in electrochemistry, electrocatalysis, and nanotechnology, Anders is focused on applying his research on energy transformation to carbon utilization. At RenewCO$_2$, Anders and his team are developing an electrocatalytic process to convert carbon dioxide and water into carbon-negative monomers, chemicals, and fuels.

The RenewCO$_2$ team has developed a proprietary catalyst that enables a one-step, low-temperature process for converting CO_2 into carbon-negative chemicals. Inspired by nature, their new technology accelerates CO_2reduction with high-selectivity and low-energy requirements. This efficient system can produce carbon-negative monomers and chemicals that are cost-competitive with conventional fossil-fuel-based products. Through the Fellows program, RenewCO$_2$ plans to scale its technology for a pilot plant to demonstrate feasibility at a commercial scale.

Anders earned his Bachelor of Science and Master of Science in Engineering degrees in Chemistry, and a Doctor of Philosophy in Physics from the Technical University of Denmark. He first developed an interest in chemistry during middle school and focused his career on the intersection of electrochemistry and clean energy.

JESSE LOU

He/Him

Business Fellow

Jesse Lou joins Breakthrough Energy's Business Fellow program from Boston, Massachusetts. His expertise and interests span the lifecycle of company development – from helping translate scientific innovations into real-world solutions and conceptualizing early business plans, to launching new products and working with potential investors. As a Business Fellow, he's excited to support Innovator Fellows in accelerating their work to decarbonize the world.

Jesse brings experience across early-stage startups, product management, and digital technologies. While at McKinsey & Company, he served clients in the energy, agriculture, and mining industries, with a focus on plant operations. He later led teams of engineers, data scientists, and go-to-market folks to develop and sell novel AI-based risk models to some of the world's largest insurance providers. Most recently, Jesse partnered with scientists at Harvard and the Massachusetts Institute of Technology to co-found PicoGreens, an agricultural technology startup genetically engineering novel strains of microalgae to produce scalable and sustainable sources of food and materials.

In his free time, Jesse enjoys singing and picking up random hobbies on YouTube like woodworking. He is most at home when he's foraging shellfish along a rocky Pacific coastline or checking on his windowsill vegetable garden. He holds a Bachelor of Science in Industrial Engineering and Operations Research from Columbia University and a Master of Business Administration from Harvard Business School.

BENJAMIN (BEN) MARGOLIS

He/Him

Business Fellow

Ben Margolis joins Breakthrough Energy's Business Fellow program from Silver Spring, Maryland. An engineer turned entrepreneur, Ben has both founded and mentored several climate technology companies. Through the Business Fellows program, he is eager to learn about the latest, groundbreaking innovations in climate technology and help innovators bring them to market.

Ben started his career in the solar industry before founding a company offering energy efficiency services and co-founding a company providing EV services. He brings critical expertise in project finance and financial modeling as well as business development, marketing, and sales. As a consultant, he supported early-stage companies with go-to-market strategies and business insights. He also supported the launch of the Maryland Energy Innovation Accelerator (MEIA), where he designed an innovative commercialization program to support Maryland's clean-energy and climate goals.

In his free time, Ben likes to bike, go to concerts, and spend time with his wife, three children, and dog. He received a Bachelor of Science in Environmental Engineering from the University of Maryland and a Master of Business Administration from the University of Virginia. Along with his climate-focused endeavors, he's passionate about building productive teams and company cultures.

VIDYUT MOHAN

He/Him

Co-Founder and Chief Executive Officer, Takachar

Vidyut joins Breakthrough Energy's Innovator Fellows program from Takachar in New Delhi, India. With a background in mechanical engineering and sustainable energy technology, he applies his interest in user-centric product innovation to create impactful climate technology that meet the needs of the end-users. At Takachar, Vidyut and his team have the first portable device for converting natural waste into bioproducts in even the most hard-to-access and underserved rural agricultural communities.

Unlike traditional biomass process technologies that are large-scale, centralized, and capital-intensive, Takachar's low-cost, portable solution can attach to tractors and pick-up trucks to process crop and forest debris into biofuels, fertilizers, and other valuable products onsite. With the support of the Fellows program, Takachar will work to de-risk the technology and deploy field-scale prototypes with diverse communities to demonstrate usability and impact in the target markets.

Vidyut holds a Bachelor of Engineering in Mechanical Engineering from the R.V. College of Engineering. He earned a Master of Science in Sustainable Energy Technology with a Specialization in Biomass Technology and Cross-Cultural Entrepreneurship from the Delft University of Technology. He began his career as a senior user experience researcher with Simpa Energy, where he developed affordable solar energy systems for off-grid households and small businesses in rural India. He also co-founded a biomass to fuels company, Pirool Energy, that focused on utilizing forest fire causing pine needle waste in the Himalayas.

FELIX NELLES

He/Him

Co-Founder and Managing Director, Litherm Technologies

Felix joins Breakthrough Energy's Innovator Fellows program from Litherm Technologies GmbH in Krefeld, Germany. Felix has more than eight years of professional experience in the field of innovative energy technologies and has expertise in project development, data evaluation, and project management. At Litherm Technologies, Felix and his team are working to eliminate the need for fossil fuels in lime and cement production and capture remaining CO_2 emissions before they are released into the atmosphere.

Litherm is developing an electric heated reactor to replace conventional fossil fuel fired kilns. When powered by clean energy, the technology will remove fossil fuels – and the associated CO_2 emissions – from lime and cement production. Further, Litherm uses indirect heat which allows for capture and storage of additional CO_2 emissions from the production process. Through the Fellows program, Litherm will demonstrate the feasibility of this concept with a pilot plant.

Felix earned a Diplom-Ingenieur degree in Process and Energy Engineering from the Technical University of Berlin, Germany. He began his career working at a biomass gasification startup and was responsible for the upscaling of components within the gasification process. In his last position, he managed the group's energy efficiency strategy and energy efficiency projects.

DAVID ORTEGA

He/Him

Chief Executive Officer and Chief Technology Officer, Phase Biolabs

David Ortega joins Breakthrough Energy's Innovator Fellows program from Phase Biolabs in Nottingham, England. David is passionate about leveraging his expertise in engineering biology and industrial biotechnology to build new technology that will improve sustainability practices and accelerate decarbonization. At Phase Biolabs, David and his team are leveraging modified microbes to recycle carbon dioxide more efficiently into cost-competitive carbon negative chemicals and carbon neutral electrofuels.

Phase Biolabs has engineered microorganisms that are six times more efficient and 100 times faster at converting carbon dioxide into electrofuels than typical plants or algae. Using a fermentation process similar to how beer and wine are made, Phase Biolab's novel approach uses the modified microorganisms and clean hydrogen to convert carbon dioxide into ethanol and other fuels that are cost-competitive with fossil fuels and petrochemicals. Through the Fellows program, Phase Biolabs hopes to test and validate the technology at scale in preparation for building a demonstration facility.

David holds a Bachelor of Medical Science in Biochemistry and Molecular Biology from Western University in Ontario, Canada. David completed his Doctor of Philosophy in Industrial Biotechnology and Bioenergy at the University of Nottingham and later went on to become a QTEC BioDesign and Innovation Fellow at the University of Bristol. Through his undergraduate studies, David was exposed to the study of metabolism and its relation to designing microbes for industrial processes, which inspires his work today.

MARISA REDDY

She/Her

Co-Founder, Conduit Tech

Marisa joins Breakthrough Energy's Innovator Fellows program from Conduit Tech in Boston, Massachusetts. With a background in computer science, Marisa has a unique ability to communicate across technical and non-technical teams, which she uses to help Conduit Tech build software and hardware tools that support residential heating and cooling electrification and efficiency.

Conduit Tech focuses on building tools for contractors that make it easier to install and maintain energy-efficient and electric heating, cooling, and air conditioning (HVAC) systems. This equipment is often higher end, more expensive, and more complicated to install, but vital to dramatically cut energy use and emissions from building heating and cooling. Through the Fellows program, Conduit Tech hopes to test and scale technologies that can further its mission to decarbonize the whole home.

As a student at the University of Virginia, Marisa fell in love with nature while hiking and camping in the Blue Ridge Mountains. She combines this love of nature with her previous experience in Silicon Valley making long term, control investments in middle market businesses. Marisa holds a Bachelor of Arts in Economics and a Bachelor of Arts in Computer Science from the University of Virginia, and a Master of Business Administration from the Stanford Graduate School of Business.

JAMES REEVES

He/Him

Chief Scientist, Aikido Technologies

James Reeves joins Breakthrough Energy's Innovator Fellows program from Aikido Technologies in San Francisco, California. He is an aeronautical engineer by training and has a passion for saving our planet that led him to focus on developing new renewable energy solutions. At Aikido Technologies, James and his team are developing a self-erecting platform for floating, offshore wind turbines to overcome key barriers to increasing offshore wind energy production.

Aikido Technologies has designed a self-erecting platform for floating, offshore wind turbines. Their novel system integrates the platform and turbine into a fully assembled unit that can be transported horizontally and is narrow enough to access 80% of ports in the U.S. Once in place, a simple ballasting procedure upends the platform into operational configuration. Through the Fellows program, Aikido Technologies hopes to deploy their first open ocean pilot project.

James attained a Bachelor of Science in Aeronautical Engineering and a Master of Science in Engineering from the University of the Witwatersrand in Johannesburg, South Africa. He is motivated by developing innovative solutions and applies this passion to contribute to solving the climate crisis.

SEAN ROBERTSON

He/Him

Co-Founder and CTO, Mantel Capture, Inc.

Sean joins Breakthrough Energy's Innovator Fellows program from Mantel Capture, Inc. in Boston, Massachusetts. As a chemist turned nuclear engineer turned materials scientist, he has always been driven by a curiosity for technology and ideas that have enormous potential in the energy sector. For the last seven years, Sean has focused on molten salt material science and chemistry. At Mantel, Sean and his colleagues are working to revolutionize carbon capture and storage with molten borates, a patented new material that has the potential to substantially reduce costs and energy losses relative to incumbent technologies.

Mantel's patented solution is designed to operate at the high temperatures found inside boilers, burners, kilns, and furnaces. The approach captures carbon dioxide at high temperatures, increasing efficiency by recovering heat in the carbon capture process. Once scaled, this process can be used in any high temperature industrial process—such as cement and steel production—to help hard-to-abate sectors achieve net-zero emissions. Through the program, he hopes to advance Mantel's technology to a stage where they are ready to scale commercially.

Sean is originally from Canada and holds a Doctor of Philosophy in Nuclear Science and Engineering from the Massachusetts Institute of Technology, a Master of Science in Nuclear Reactor Physics and Engineering from the Université Paris-Saclay, and a Bachelor of Science in Chemistry from Mount Allison University. Over the course of his education and career, Sean has worked on a broad array of projects spanning new methods for solar cell material synthesis to optimizing the fuel efficiency inside a nuclear reactor. His work and research have always been linked by an ambition to overcome design and optimization challenges in the energy industry.

PAUL SANDBERG

He/Him

CemVision AB

Paul joins Breakthrough Energy's Innovator Fellows program from CemVision AB, based in Nybro, Sweden. Paul is a cement technologist, entrepreneur, and inventor with more than 12 U.S. patents. He is passionate about the environment, especially developing technologies for decarbonizing the cement and concrete industry. Paul leads the cement chemistry effort needed for CemVision to develop a low-carbon cement with unique properties that has the potential to transform the concrete industry.

CemVision is reinventing cement by replacing fossil limestone with waste materials and switching fuels such as plastic and coal for green thermal energy. CemVision creates non-traditional cement that has not only superior product properties compared to traditional Portland cement but also a lower carbon footprint due to reduced need for limestone. In addition to reducing CO_2 emissions, CemVision's novel cement technology makes concrete construction faster and more resource efficient. Through the Fellows program, Paul and Claes will develop the technology and intellectual property in order to scale their solution for meaningful production, aiming at > 90% reduction of CO_2 emissions compared to traditional cement.

Paul holds a Doctor of Philosophy in Building Materials from the Lund Institute of Technology in Sweden and spent 18 months as a guest researcher at the University of California, Berkeley.

LEX SCHEEPERS

He/Him

Co-Founder & Chief Technology Officer, Renewable Iron Fuel Technology (RIFT)

Lex Scheepers joins Breakthrough Energy's Innovator Fellows program from Renewable Iron Fuel Technology (RIFT) in North Brabant, Netherlands. An expert in energy technology, both traditional and renewable, Lex combines a passion for technology with a desire to contribute to a clean and sustainable future. At RIFT, Lex and his colleagues are leveraging hydrogen and the rusting properties of iron to produce carbon-neutral energy for heat-intensive industries.

Rusting, or combustion, of iron powder yields zero-carbon heat that can be turned into hot water or steam and fed to energy-intensive industries. The resulting iron oxide powder can be easily stored and transported, then turned back into iron powder through a chemical reaction with hydrogen and reused. Through the BE Fellows program, RIFT aims to advance their Boiler and Production Systems to a fully functional prototype to demonstrate viability of a commercial pilot plant.

Lex earned a Bachelor of Science in Mechanical Engineering and a Master of Science in Mechanical Engineering with a specialization in Energy Technology from Eindhoven University of Technology.

VINCENT SEIJGER

He/Him

Co-Founder & Chief Technology Officer, Renewable Iron Fuel Technology (RIFT)

Vincent Seijger joins Breakthrough Energy's Innovator Fellows program from Renewable Iron Fuel Technology (RIFT) in North Brabant, Netherlands. He began his career as a maritime officer working in the merchant shipping industry, which inspired him to build solutions to improve sustainability of heating and electricity. At RIFT, Vincent and his colleagues are leveraging hydrogen and the rusting properties of iron to produce carbon-neutral energy for heat-intensive industries.

Rusting, or combustion, of iron powder yields zero-carbon heat that can be turned into hot water or steam and fed to energy-intensive industries. The resulting iron oxide powder can be easily stored and transported, then turned back into iron powder through a chemical reaction with hydrogen and reused. Through the BE Fellows program, RIFT aims to advance their Boiler and Production Systems to a fully functional prototype to demonstrate viability of a commercial pilot plant.

Vincent earned a Bachelor, Maritime Officer from HZ University of Applied Science in Flushing, Netherlands. He attained his Pre-Master of Science in Mechanical Engineering and Master of Science in Sustainable Energy Technology with specialization in Power and Flow at Eindhoven University of Technology. During his Masters, he focused on the combustion of conventional and sustainable fuels and conducted an in-depth numerical study for iron fuel.

JULES THIERY

He/Him

Founder & Chief Executive Officer, Gencores, Inc.

Jules Thiery joins Breakthrough Energy's Innovator Fellows program from Gencores, Inc. in Somerville, Massachusetts. After developing novel asphalt and glass materials, Jules turned his focus to removing key technical barriers to electric vehicle adoption and decarbonizing transportation. At Gencores, Jules and his team produce high-performance, lightweight metamaterials for light-duty automobiles.

Gencores is leveraging advanced material science and robotics to enable mass manufacturing of ultra-light composite metamaterials for the automotive industry. At scale, Gencores' components will replace metal parts and make vehicles drastically lighter and more efficient. Through the Fellows program, Gencores will further develop its technology and demonstrate the production of its metamaterials for cost-sensitive markets.

Jules holds a Master of Science in Material Science from Ecole Polytechnique & Ecole des Ponts ParisTech. He completed a Doctor of Philosophy in Applied Physics at Harvard University and Ecole des Ponts ParisTech. Through his education, Jules learned how composite materials have transformed the aerospace industry and felt inspired to develop material technology to transition composites to the automotive industry.

ANCA TIMOFTE

She/Her

Chief Executive Officer and Co-founder, Holocene

Anca joins Breakthrough Energy's Innovator Fellows program from Holocene in San Francisco, California. She has a background in chemical engineering and has worked on carbon capture technology for more than ten years, including as a process engineer to design, model, and commission some of the world's first direct air capture plants. At Holocene, Anca and her team employ organic chemistry to develop an efficient, regenerative CO_2 removal system.

Holocene's solution employs two novel organic compounds, one to enhance water's absorption capacity for carbon dioxide and the other to remove the carbon dioxide from the water-based solution through precipitation. The process concentrates and removes carbon dioxide from the atmosphere with higher efficiencies than current carbon removal technologies, recycles both compounds, and uses traditional chemical engineering processes and widely available equipment. Through the Fellows program, Holocene aims to scale the technology and design a fully automated pilot plant.

Anca is originally from Romania. She holds a Bachelor of Science in Chemical Engineering with a minor in Environmental Engineering from Washington University. She earned a Master of Science in Environmental Engineering from ETH Zurich and completed her research thesis at Stanford University. She completed a Master of Business Administration from Stanford University focused on climate technology deployment and climate finance with an emphasis on carbon dioxide removal.

ADAM ULIANA

He/Him

Chief Executive Officer and Co-founder, ChemFinity Technologies

Adam joins Breakthrough Energy's Innovator Fellows program from ChemFinity Technologies in New York, New York. He is interested in materials chemistry, water purification, and separation technologies that can help combat issues related to environmental injustice. At ChemFinity Technologies, Adam is developing new porous membrane materials to create energy-efficient desalination and water purifications systems.

Desalination — the process of removing salts, minerals, and contaminants from salt water — is an energy-intensive process that increases our dependence on fossil fuels and, in turn, increases our carbon emissions. ChemFinity's materials technology uses specialized, highly-selective adsorbents and membranes to avoid energy-intensive water treatment processes, reduce brine waste volumes and toxicity, and achieve resource recovery. Through the Fellows program, ChemFinity hopes to develop a fully scaled membrane and sorbent solution, mitigate technological risks in their processes, and receive valuable business and entrepreneurial mentorship.

Adam has always been fascinated by how the world works on a molecular level, which has inspired him to pursue chemical engineering. He sees water treatment as a way to combine his background with helping others and his interests in the environment. Prior to starting ChemFinity, Adam earned a Bachelor of Science in Chemical Engineering from Pennsylvania State University, as well as a Doctor of Philosophy in Chemical Engineering from the University of California, Berkeley.

HIRANMAYEE (HIRAN) VEDAM

She/Her

Business Fellow

Hiran Vedam joins Breakthrough Energy's Business Fellows program from Chennai, India. Hiran is an entrepreneurial leader who is passionate about developing and creating value from advanced technologies. As a Business Fellow, Hiran is excited about collaborating with experts in different areas of business and climate technology on various aspects of the lab-to-market journey.

For over two decades, Hiran has worked at the intersection of technology, business, and intellectual property, helping startups in the energy, environment, water, chemical, construction, and electronics industries. As a Senior Advisor for Innovation and Entrepreneurship at Indian Institute of Technology Tirupati, Hiran developed and taught courses around innovation, technology entrepreneurship, and product innovation. Using her expertise in technology and business development, startup financing, and IP strategy, she will support the progression of early-stage industry-transforming climate innovations towards global markets.

Hiran holds a Bachelor of Technology in Chemical Engineering from the Indian Institute of Technology, Madras. She earned a Master of Science in Chemical Engineering from Washington University in St. Louis and a Master of Business Administration from INSEAD. Hiran attained a Doctor of Philosophy in Chemical Engineering from Purdue University.

EVER VELASQUEZ

He/Him

Chief Executive Officer and Co-founder, ChemFinity Technologies

Ever joins Breakthrough Energy's Innovator Fellows program from ChemFinity Technologies in New York, New York. His area of expertise is in chemical engineering, with a focus on the development of porous materials. At ChemFinity Technologies, Ever focuses on large-scale synthesis, manufacturing, and production of new membrane materials for water purification.

Desalination — the process of removing salts, minerals, and contaminants from salt water — is an energy-intensive process that increases our dependence on fossil fuels and, in turn, increases our carbon emissions. ChemFinity's materials technology uses specialized, highly-selective adsorbents and membranes to avoid energy-intensive water treatment processes, reduce brine waste volumes and toxicity, and achieve resource recovery. Through the Fellows program, ChemFinity hopes to develop a fully scaled membrane and sorbent solution, mitigate technological risks in their processes, and receive valuable business and entrepreneurial mentorship.

Ever grew up in rural Southwest Florida, and was first exposed to science in his high school chemistry class. In college, he became passionate about research and development for sustainable energy-related materials. Ever earned a Bachelor of Science in Chemical Engineering at Florida State University and a Doctor of Philosophy in Chemical Engineering at the University of California, Berkeley. His research focused on the synthesis and characterization of porous materials for energy efficient separations and storage.

MARK VERHAGEN

He/Him

CEO,
Renewable Iron Fuel Technology (RIFT)

Mark Verhagen joins Breakthrough Energy's Innovator Fellows program from RIFT in the Netherlands. He is committed to combining his technical, business, and social skills to develop and commercially implement novel clean-energy technologies in order to decarbonize energy-intensive industries. At RIFT, Mark and his colleagues are leveraging hydrogen and the rusting properties of iron to produce carbon-neutral energy for heat-intensive industries. Especially, for situations in which hydrogen use and electrification are not an option.

Rusting, or combustion, of iron fuel with heat produced with clean hydrogen yields zero-carbon heat that can be turned into hot water, steam, or hot air and fed to energy-intensive industries. The resulting rust can be easily stored and transported, then turned back into iron fuel through a chemical reaction with hydrogen and reused. Through the BE Fellows program, RIFT aims to advance their boiler and production systems to a fully functional prototype to demonstrate viability of a commercial pilot plant.

Mark holds a Bachelor of Science in Chemical Engineering and a Bachelor of Science in Business Administration from Avans University in Hertogenbosch, Netherlands. He attained a Master of Science in Industrial Engineering from Eindhoven University of Technology.

DAVID VEYSSET

He/Him

Chief Technology Officer, Aluminio

David joins Breakthrough Energy's Innovator Fellows program from Aluminio in the San Francisco Bay Area, California. As Chief Technology Officer, he leads the development of laser processes for their solar technology, which replaces the silver used in solar cells with abundant aluminum in order to reduce solar costs and accelerate adoption.

Today, silver used on solar cells is both scarce and costly – accounting for 10% of the world's annual silver supply and 10% of the cost of solar modules. To accelerate the global adoption of solar technologies, Aluminio is developing a new approach to replace over 90% of the silver in solar cells with aluminum, a less expensive and more abundant material. Through the Fellows program, Aluminio seeks to finalize their prototype and demonstrate their metallization technology's manufacturing processes with customers.

David is an expert in optics, laser technologies, and materials science and has experience designing new laser-based processes for a variety of technological applications. He grew up in rural France where nature was a large part of his childhood, and now wants to use his expertise to help solve the climate crisis. David earned a Bachelor and Master's Degree in Optics and Optical Engineering from the Institut d'Optique in France, before receiving a Doctor of Philosophy in Physical Chemistry from the Massachusetts Institute of Technology.

JENNIFER WAGNER

She/Her

Business Fellow

Jennifer Wagner joins Breakthrough Energy's Business Fellows program from Prince Edward Island, Canada. Jennifer is a dedicated climate advocate and has a passion for leveraging science and innovation to solve the world's most complex problems. As a Business Fellow, Jennifer will apply the lessons she learned leading a high-growth carbon removal climate tech company to help Innovator Fellows build out and scale their climate technologies.

Jennifer is an experienced startup advisor, investor, thought leader, speaker, and team builder. She joined Breakthrough Energy Ventures portfolio company CarbonCure Technologies as employee number two in 2010, and eventually assumed the role of president. She was responsible for overseeing the company's operations amidst a period of rapid growth, launching the carbon removal credit business, shaping and nurturing the company's team culture, helping to recruit and retain top talent while attracting the world's most sought-after climate tech investors. She also led her team to win two major global innovation competitions: the NRG COSIA Carbon XPRIZE and Emissions Reduction Alberta's Grand Carbon Challenge. Jennifer's mission is to help launch, nurture, and scale innovative startups with massive climate change mitigation potential and to foster a more diverse, equitable, and inclusive climate tech sector.

In her free time, Jennifer enjoys exploring nature with her three young children and cooking with the food she grows in her backyard garden. Jennifer received a Bachelor of Science in Chemistry from McGill University. Jennifer earned a Master of Science in Chemistry and a Master of Business Administration from Dalhousie University. She has been named a Clean Energy Rising Star by Business Insider, one of Canada's Clean50 Emerging Leaders, one of Climate Action Summit's Climate Trailblazers, and one of 20 Women Driving the Future of Climate Tech.

JOHN WAITE

He/Him

Chief Executive Officer, Phycobloom

John Waite joins Breakthrough Energy's Innovator Fellows program from Phycobloom in London, United Kingdom. With a background in business development and materials science, he is driven to create a more sustainable world and bridge the gap between economic and technological problems to drive forward a just energy transition. John and his team at Phycobloom are working on engineering algae that can continuously produce biofuels and capture carbon.

Phycobloom has genetically engineered algae that continuously captures carbon dioxide while secreting an oil that can be used in sustainable biofuels. Phycobloom's process eliminates the traditional carbon-intensive harvesting process that can damage algae and will reduce costs by up to 70%. During the Fellows program, they hope to demonstrate their algae performance at scale.

John completed both his Master of Engineering in Materials Science and his Doctor of Philosophy in Energy Materials from the University of Oxford. He also holds a Master of Business Administration from the Quantic School of Business and Technology.

MOLLY YANG

She/Her

Chief Executive Officer, Hgen

Molly joins Breakthrough Energy's Innovator Fellows program from Hgen in Los Angeles, California. She brings to the company her expertise in scaling industrial and consumer energy products, having previously worked as an Energy Product Lead at Tesla. At Hgen, Molly is responsible for the strategy, product, and business development of their innovative hydrogen electrolysis technology.

Hgen's technology uses renewable electricity to break water into clean hydrogen energy at higher-efficiency with lower costs. Hgen's system is uniquely designed for renewables integration, and will help overcome current technical limitations – notably the intermittent power losses – that hinder clean hydrogen production. Through the Fellows program, Hgen will leverage their integrated, modular design to focus on reducing costs and scaling their technology.

Molly fell in love with remote and untouched places while traveling, which spurred her interest in natural ecosystems and climate technology. Previously, she worked in product management and venture capital, providing her with the foundation to scale technologies that enable clean and sustainable energy. Molly earned a Bachelor of Arts in Economics and a Secondary in Computer Science from Harvard University.

BINGBIN YU

She/Her

Chief Engineer, Aikido Technologies

Bingbin Yu joins Breakthrough Energy's Innovator Fellows program from Aikido Technologies in San Francisco, California. She applies a background in naval architecture and offshore engineering to making offshore wind an economic solution for the world's energy demand. At Aikido Technologies, Bingbin and her team are developing a self-erecting platform for floating, offshore wind turbines to overcome key barriers to increasing offshore wind energy production.

Aikido Technologies has designed a self-erecting platform for floating, offshore wind turbines. Their novel system integrates the platform and turbine into a fully assembled unit that can be transported horizontally and is narrow enough to access 80% of ports in the U.S. Once in place, a simple ballasting procedure upends the platform into operational configuration. Through the Fellows program, Aikido Technologies hopes to deploy their first open ocean pilot project.

Bingbin completed her Bachelor of Science in Naval Architecture and Offshore Engineering from Shanghai Jiaotong University in Shanghai, China. She earned her Master of Science and Doctor of Philosophy in Naval Architecture and Offshore Engineering at the University of Michigan. She is driven by the promising field of renewable energy and the hope to be a part of the solution to the global climate and energy crisis.

JANE ZHANG

She/Her

Business Fellow

Jane Zhang joins Breakthrough Energy's Business Fellows program from Sugar Land, Texas. Jane has a background in mechanical engineering and extensive experience working on technology and product ideation, development, and delivery in the energy industry. As a Business Fellow, she will use her expertise to help Innovator Fellows take their climate technology ideas from the lab to the market.

Jane has spent most of her 30-year career working in the energy industry and has deep knowledge of energy system fundamentals, capital project life cycles, and the decision-making process for technology investment and maturation. Most recently, she oversaw a $500-million investment fund for technology research, development, scale up, and commercialization in energy and energy transition. She understands how to bring products to market on a global scale — from energy system fundamentals and techno-economic analysis to product launch, business planning, and profit and loss management.

In her free time, Jane enjoys going swimming, doing yoga, cooking, and deep diving into diverse cultures through travel. She holds a Bachelor of Science in Mechanical Engineering from Tsinghua University in Beijing, China and a Doctor of Philosophy in Theoretical and Applied Mechanics from Cornell University. In addition to her day-to-day work in the energy sector, Jane sits on the Board of Directors for the Asian American Academy of Science and Engineering.

FELLOW BIOS

2023 Cohort

MADHAV ACHARYA

He/Him

Business Fellow

Madhav Acharya joins Breakthrough Energy's Business Fellows program from Vienna, Virginia. Madhav is committed to delivering practical solutions to the energy transition and climate crisis in a timely manner. He is eager to support Innovator Fellows with a range of activities including business and technology strategy, techno-economic analysis, organizational development, demonstration projects, marketing, and fundraising.

Madhav has leadership experience across the private sector, government, and early-stage startups. He spent 18 years at ExxonMobil in a range of technical and business roles before becoming a T2M advisor at ARPA-E, where he co-led the first SCALEUP funding opportunity. Most recently, he was the vice president of commercialization at Syzygy Plasmonics.

He has a Bachelor of Technology from the Indian Institute of Technology Delhi and a Doctor of Philosophy in chemical engineering from the University of Delaware. His hobbies include gardening, swimming, and traveling.

SUZANNE ZAMANY ANDERSEN

She/Her

CEO, NitroVolt

Suzanne Zamany Andersen joins Breakthrough Energy's Innovator Fellows program from NitroVolt in Copenhagen, Denmark. She has worked on electrochemical ammonia synthesis for six years. As NitroVolt's founder and CEO, Suzanne brings extensive scientific experience and personal drive to commercialize their pioneering technology.

NitroVolt is revolutionizing the nitrogen-based fertilizer industry by giving control of the production to the individual farmer, instead of relying on centralized production facilities. This new method of production cuts emissions from the transportation of the fertilizer and enables farmers to produce the fertilizer they need on demand. The Fellows program will help NitroVolt scale the technology from a lab-based system to a pilot unit capable of producing 1 kg/day of green ammonia.

Suzanne completed her Bachelor of Science and Master of Science in physics and engineering as well as her Doctor of Philosophy in surface science and catalysis at the Technical University of Denmark. She was motivated to work on climate change after seeing the Icelandic glacier Sólheimajökull melting at an alarming rate during a summer hike.

ADRIEN BENUSIGLIO

He/Him

Scientist, Marathon Fusion

Adrien Benusiglio joins Breakthrough Energy's Innovator Fellows program from Marathon Fusion in San Francisco, California. Adrien has close to 10 years of experience in energy and efficiency R&D, having led ARPA-E and Department of Energy awards at Otherlab. At Marathon Fusion he oversees testing and development.

Marathon Fusion is taking the critical next step to commercialize a fuel processing component essential for fusion power plants. Compared to conventional technologies, Marathon's approach enables a dramatic reduction in tritium inventory fuel processing cost while easing engineering requirements on other critical systems. This solution is simple, robust and highly scalable to meet the challenges of commercial fusion.

Adrien is an enthusiastic cyclist and spends most of his free time in nature. He has a Master of Science in mechanics and material engineering and a Doctor of Philosophy in fluid dynamics form École Polytechnique in France.

YEHUDA BORENSTEIN

He/Him

CEO, ClimateCrop Ltd.

Yehuda Borenstein joins Breakthrough Energy's Innovator Fellows program from ClimateCrop Ltd. in Israel. Yehuda is a venture builder dedicated to initiatives with the potential for profound climate impact. He is the CEO at ClimateCrop and takes pleasure in formulating strategies and cultivating partnerships for the organization.

Meeting the increasing demand for food amidst changing climate conditions, while reducing CO2 emissions, requires innovative solutions. ClimateCrop's technology increases plant yield without increasing the use of resources like water or fertilizers, resulting in a lower carbon footprint per unit yield. Additionally, it enhances the plant's ability to tolerate abiotic stresses, ensuring agricultural sustainability in changing climate conditions. Through the Breakthrough Energy Fellows program, ClimateCrop will develop the technology, connect with potential regulatory and business partners, and accelerate product commercialization.

Yehuda is interested in science, climate, and AI, and he delves into these subjects with great curiosity. His journey began with learning practical engineering at the Israeli Air Force Academy before embarking on his military service, after which he transitioned into the engineering industry. His portfolio includes the founding of RepAir Carbon Capture, Nitrofix, Carbonade, and REEMAG.

MAURICE BRYSON

He/Him

Founder, Silicate

Maurice joins Breakthrough Energy's Innovator Fellows program from Silicate in Dublin, Ireland. His agricultural roots and carbon accounting expertise have helped the Silicate team to rapidly progress research on enhanced weathering. As Silicate's founder, Maurice is responsible for shaping the company's strategy, forging partnerships with academia and industry, and developing the team so that Silicate can achieve its ambitious carbon removal goals.

Silicate takes surplus concrete from the building industry, processes it, and applies it to agricultural land to permanently remove excess carbon dioxide from the atmosphere. Silicate's pioneering work reliably and safely scales enhanced weathering to become a genuine carbon removal solution. With the support of the Fellows program, Silicate will pursue seminal research in areas critical to scaling terrestrial enhanced weathering to climate-relevant levels of carbon removal.

Maurice has a Bachelor of Science in marine biology from the University of St Andrews and a Master of Science in carbon finance from the University of Edinburgh Business School. Maurice spent three years after his undergraduate studies working on some of the world's largest farms, shaping his passion for his current work at Silicate today.

ARSHA CAZAZIAN-CLEMENT

She/Her

Business Fellow

Arsha Cazazian-Clement joins Breakthrough Energy's Business Fellows program from New York, New York. Arsha has been a senior leader in the real estate industry for more than two decades and has extensive experience planning, designing, executing, and leading teams for both small and large-scale public and private commercial real estate projects.

Over the course of her 23-year career, Arsha has both led and supported teams for approximately 30 million square feet of development and planning around the globe. Arsha also participated in global sustainable development initiatives. From 1994 to 1996 she supported a team inside the United Nations Development Program deeply committed to identifying alternative energy solutions for industrial structures across Africa. She helped to build schools along Zambia's Copperbelt.

She holds a Bachelor of Arts from Hunter College and a Master of Architecture from Columbia University, GSAPP. Arsha also received a Diploma in Strategy & Innovation from University of Oxford, where she was one of two individuals selected as a Women's Scholar in 2019. Arsha stayed on at Oxford as an Associate Fellow with a concentration in real estate ESG and urbanization, where she continues her work mentoring students and bringing networks together for the greater good.

SCOTT COLLINS

He/Him

Chief Scientific Officer, Hoofprint Biome

Scott Collins joins Breakthrough Energy's Innovator Fellows program from Hoofprint Biome in Raleigh, North Carolina. He grew up with animal agriculture as the son of a large animal veterinarian, before engrossing himself in bioengineering, creating new technologies for biomanufacturing, gene editing, and probiotic therapies. Scott leads development of Hoofprint's anti-methane probiotics.

Cattle farming is responsible for nearly one-third of global methane emissions — a greenhouse gas that's both potent and fast-acting. Hoofprint Biome is developing a probiotic to release enzymes that inhibit methane producing bacteria. This has the potential to dramatically reduce livestock greenhouse gas emissions while also improving animal health and productivity. Feeding cows just a mouthful of Hoofprint's probiotic yeast can increase farm profitability while making cattle farming a part of the climate solution.

Scott is returning to his roots, leveraging biotechnology to make cattle farming clean, sustainable, and profitable. He earned a Bachelor of Science in chemical engineering from the University of Washington and a Doctor of Philosophy in chemical and biomolecular engineering from North Carolina State University.

EREZ ELIYAHU

He/Him

Chief Technology Officer, ClimateCrop Ltd.

Erez Eliyahu joins Breakthrough Energy's Innovator Fellows program from ClimateCrop Ltd. In Israel. Erez is a biochemist and molecular biologist, and during his academic career he studied RNA and protein localization and function and worked in different biotech and food-tech start-ups. Erez is the CTO at ClimateCrop, where he promotes the company scientifically and operationally.

Meeting the increasing demand for food amidst changing climate conditions and reducing CO2 emissions requires innovative solutions. ClimateCrop's technology increases plant yield without increasing the use of resources like water or fertilizers, resulting in a lower carbon footprint per unit yield. Additionally, it enhances the plant's ability to tolerate abiotic stresses, ensuring agricultural sustainability in changing climate conditions. Through the Breakthrough Energy Fellows program, ClimateCrop will develop the technology, connect with potential regulatory and business partners, and accelerate product commercialization.

The great versatility of organisms' adaptation and the molecular mechanisms they acquired drew Erez to study life science. He holds a Bachelor of Science from Tel Aviv University, a Master of Science from the Hebrew University of Jerusalem, a Doctor of Science from the Technion-Israel Institute of Technology, and a postdoctoral from the Weizmann Institute of Science.

EVAN GARDNER

He/Him

Co-Founder and Chief Technology Officer, Get Lit Technologies

Evan Gardner joins Breakthrough Energy's Innovator Fellows program from Get Lit Technologies in Menlo Park, CA. He is an expert in designing and synthesizing materials as well as performing a variety of chemical separations. At Get Lit Technologies, Evan serves as chief technology officer and leverages his deep chemical intuition to guide their lithium purification process design.

Get Lit Technologies is developing a proprietary electrochemical process which converts low grade saltwater brines into lithium chemicals for batteries. Their approach will unlock large swaths of North American brine resources which have conventionally been neglected due to low lithium concentrations. Through the Fellows program, Get Lit will scale-up their technology and determine its commercial readiness across a variety of natural resources.

Evan earned his Bachelor of Arts in chemistry at Boston University and a Doctor of Philosophy in bioinorganic chemistry at Georgetown University. Shaped by his childhood spent hiking, skiing, and biking around the woodlands near Portland, Maine, Evan channels his fascination for nature and conservation into developing a real-world solution to the climate crisis.

DREW LILLEY

He/Him

CEO and Co-Founder, Calion Technologies

Drew Lilley joins Breakthrough Energy's Innovator Fellows program from Calion Technologies in Berkeley, California. Drew is a thermal scientist specializing in heat transfer and thermodynamics and has extensive experience with various energy storage and non-vapor compression cooling technologies. As CEO and co-founder, he focuses on the full-R&D pipeline and product vision for the commercialization of Calion's ionocaloric cooling technology.

Refrigerants used in current cooling technologies have extremely high global warming potential. By 2050, refrigerant emissions are expected to account for a sizable fraction of equivalent global CO2 emissions, and scientists have yet to identify a viable alternative. Calion eliminates the need for refrigerants with its solid-to-liquid based cooling technology and uses non-toxic, non-hazardous, and non-flammable materials to make cooling safe, clean, and inexpensive. Through the Breakthrough Energy Fellows program, Calion seeks to complete a full-scale prototype and demonstrate that their ionocaloric cooling technology operates at higher efficiencies and lower costs than air conditioners and heat pumps on the market today.

Drew earned his Bachelor of Arts in physics, Bachelor of Science in engineering, and Master of Science in mechanical engineering from the University of Pennsylvania, and his Doctor of Philosophy in mechanical engineering from the University of California, Berkeley.

MICHELLE LU

She/Her

Chief Science Officer and Co-Founder, Novel Farms

Michelle Lu joins Breakthrough Energy's Innovator Fellows program from Novel Farms in Berkeley, California. She has spent her career focused on cell biology, synthetic biology, and protein biochemistry. At Novel Farms, she heads all research and development efforts as chief science officer.

Novel Farms has developed a unique scaffolding technology that eliminates the need for expensive cell culture components for the creation of cultivated meat. This advancement not only significantly cuts production costs but also imparts the necessary structure for producing whole cuts of meat, thereby appealing to a broader consumer base while reducing the need for carbon-intensive industrial farming. The Breakthrough Energy Fellows program will help Novel Farms take the next step towards scaling its cultivated meat production.

Michelle received her Bachelor of Arts in molecular and cell biology from the University of California, Berkeley and her Doctor of Philosophy in molecular and cell biology from the University of Oregon. She completed her postdoctoral training at her undergraduate alma mater with David Drubin.

NIEVES MARTINEZ MARSHALL, PHD

She/Her

Co-founder and Chief Executive Officer, Novel Farms

Nieves Martinez Marshall joins Breakthrough Energy's Innovator Fellows program from Novel Farms in Berkeley, CA. She has significant experience in molecular biology and has focused recently on commercializing cultivated meat. As CEO of Novel Farms, Nieves is responsible for the strategy, financing, and business development of their manufacturing process.

Novel Farms has developed a unique scaffolding technology that eliminates the need for expensive cell culture components for the creation of cultivated meat. This advancement not only significantly cuts production costs but also imparts the necessary structure for producing whole cuts of meat, thereby appealing to a broader consumer base while reducing the need for carbon-intensive industrial farming. The Breakthrough Energy Fellows program will help Novel Farms take the next step towards scaling its cultivated meat production.

Nieves obtained her Bachelor of Science in chemistry and a Master of Science in biochemistry from the University of Zaragoza in her home country of Spain. She moved to Germany to conduct research at the Max-Delbrueck Center for Molecular Medicine, and later, earned her Doctor of Philosophy in molecular and cell biology from Humboldt University of Berlin. Following her graduate studies, Nieves carried out postdoctoral work at the University of California, Berkeley.

ERIC MCSHANE

He/Him

Co-Founder and Chief Executive Officer, Get Lit Technologies

Eric McShane joins Breakthrough Energy's Innovator Fellows program from Get Lit Technologies in Menlo Park, California. He brings to the company his expertise in building electrochemical systems, having designed lithium-ion battery, nitrogen reduction, and lithium extraction systems in his graduate and postdoctoral studies. As CEO at Get Lit, Eric is responsible for cell engineering and product distribution strategy.

Get Lit Technologies is developing a proprietary electrochemical process which converts low grade saltwater brines into lithium chemicals for batteries. Their approach will unlock large swaths of North American brine resources which have conventionally been neglected due to low lithium concentrations. Through the Fellows program, Get Lit will scale-up their technology and determine its commercial readiness across a variety of natural resources.

Eric earned his Bachelor of Science in chemical engineering at Cornell University and a Doctor of Philosophy in chemical engineering at the University of California, Berkeley. He is a proud self-learner and has used online videos to learn more about the inner workings of the lithium supply chain and engineering projects, shaping his current work.

GUY MICHLIN

He/Him

Business Fellow

Guy Michlin joins Breakthrough Energy's Business program from Palo Alto, California. Guy is a serial entrepreneur who is passionate about building high performing teams and taking ideas from zero to one. He is excited to deepen his climate knowledge and share his experience building and scaling businesses with the Innovator Fellows.

Guy has more than 20 years of business and legal experience. Guy started his career as a lawyer for the State Attorney of Israel, litigating cases before the Supreme Court. He transitioned to developing solar power plants in Israel. Guy then spent the next decade in the travel industry, first as the co-founder and CEO of Eatwith, an online marketplace for home dining experiences, and then at Airbnb where he helped with Airbnb Experience. Guy brings experience in finding market product fit, building strategic partnerships, working with regulators, raising capital, and building communities.

In his free time, Guy enjoys hanging out with his family, spending time outdoors and traveling around the world. He holds a Bachelor of Law from the Israeli College of Management, a Master of Law from The Hebrew University, and a Master of Business Administration from Stanford University.

Guy believes the climate crisis is the most urgent challenge facing humanity and he looks forward to working closely with the Innovators to bring their technology to market and help mitigate the climate crisis.

CHRIS OZE

He/Him

Co-Founder, Aspiring Materials

Chris Oze joins Breakthrough Energy's Innovator Fellows program from Aspiring Materials in Christchurch (Ōtautahi), New Zealand (Aotearoa). Chris' research has focused on magnesium-rich rocks and how they become altered as they naturally capture CO2. As a founding director of Aspiring Materials, he works on accelerating and optimizing CO2 mineralization.

Aspiring Materials has developed a mineral refining process to transform magnesium-rich rocks into a wide variety of products capable of offsetting up to three tons of CO2 for every ton of rock. These products are needed for the green energy transition that is occurring worldwide. Through the Fellows program, Aspiring Materials plans to scale its technology for a pilot plant that will provide the foundation for global industrial operations.

Chris earned his Bachelor of Arts in chemistry-geology from Whitman College in Walla Walla, Washington and a Doctor of Philosophy in geological and environmental sciences from Stanford University. Chris has been in the mountains, lab, and classroom as a geology professor for nearly two decades.

STWART PEÑA FELIZ

He/Him

Co-Founder & CEO, MacroCycle Technologies

Stwart Peña Feliz joins Breakthrough Energy's Innovator Fellows program from MacroCycle Technologies in Cambridge, Massachusetts. With a background in process engineering and business development, he brings energy and enthusiasm to overcome the challenges of commercializing hard tech to create a positive environmental impact. As the co-founder and chief executive officer of MacroCycle, Stwart leads the commercialization of the technology and fundraising and operations of the venture.

MacroCycle Technologies' patented technology converts plastic waste into virgin-grade quality recycled plastic through a process that requires 80% less energy than competing depolymerization processes and can be powered with renewable energy to be entirely carbon free. Through the Fellows program, MacroCycle will optimize the technology for various waste streams and scale up to provide customers sufficient material to make the first zero-carbon upcycled PET bottles.

Stwart studied at Cornell University, where he earned his Bachelor of Science in chemical engineering. After multiple years in industry, he earned his Master of Business Administration from the Massachusetts Institute of Technology Sloan School of Management. Stwart's goals are deeply rooted in climate tech, and he plans to use his experience and resources to one day democratize access to clean energy for individuals all over the world, especially those in his home country of the Dominican Republic.

KATHRYN POLKOFF

She/Her

Chief Executive Officer, Hoofprint Biome

Kathryn Polkoff joins Breakthrough Energy's Innovator Fellows program from Hoofprint Biome in Raleigh, North Carolina. She has spent more than 10 years working at the intersection of livestock and biotechnology. At Hoofprint, Kathryn and her team leverage biology to achieve symbiotic livestock production: a mutually beneficial relationship between humans, animals, and the planet.

Cattle farming is responsible for nearly one-third of global methane emissions — methane is a greenhouse gas that's both potent and fast-acting. Hoofprint Biome is developing a probiotic to release enzymes that inhibit methane producing bacteria. This has the potential to dramatically reduce livestock greenhouse gas emissions while also improving animal health and productivity. Feeding cows just a mouthful of Hoofprint's probiotic yeast can increase farm profitability while making cattle farming a part of the climate solution.

Kathryn earned a Bachelor of Science and Master of Science in animal sciences from University of Illinois at Urbana-Champaign, and a Doctor of Philosophy in veterinary sciences (cell biology) from North Carolina State University.

LACEY REDDIX

She/Her

Chief Executive Officer, Olokun Minerals

Lacey Reddix joins Breakthrough Energy's Innovator Fellows program from Olokun Minerals in Los Angeles, California. Lacey has experience managing and executing large scale infrastructure improvement projects through her previous roles in the private and public sectors, including as a watershed program manager for the City of Atlanta.

Olokun Minerals is commercializing a novel way to extract critical minerals, like lithium and magnesium, from brines without using harsh chemicals or strong acids, which aids in transitioning to renewable and clean energy. Their approach allows for multiple minerals to be recovered simultaneously, providing a more efficient and cost-effective way to source the metals needed for renewable energy technologies with a smaller environmental footprint.

Lacey is passionate about finding solutions that improve human-environmental interactions and increase clean water access for vulnerable communities. She is a native of Jackson, Mississippi but has lived in Southern California since 2018. Lacey completed a dual-degree engineering program for her undergraduate studies, earning a Bachelor of Science in mathematics from Spelman College and a Bachelor of Science in civil engineering with a concentration in water resources and environmental engineering from Columbia University in New York.

FRANCISCO PÉREZ-OJEDA RODRÍGUEZ

He/Him

Business Fellow

Francisco Pérez-Ojeda Rodriguez joins Breakthrough Energy's Business Fellows program from Erlangen, Germany. Francisco is a seasoned energy industry professional with more than 18 years of experience in a variety of roles. As a Business Fellow, he is excited about collaborating with the brightest minds in the energy and climate space to tackle the challenge of commercializing and scaling new technologies.

Throughout his career, Francisco held roles ranging from engineering to project management, proposals and portfolio management. Recently he has focused on the portfolio transformation of Siemens Energy by developing, scaling, and commercializing new technologies to decarbonize the energy industry. He has worked in three different countries, including Spain, the United States and Germany, and led projects around the world.

He holds a Bachelors and a Masters in industrial engineering from Universidad Pontificia de Comillas, ICAI School of Engineering in Madrid and the Sloan Fellows' Master of Business Administration from the Massachusetts Institute of Technology. In his free time, Francisco enjoys spending time with family and friends, mountain biking and being outside.

GIANLUCA ROSCIOLI

He/Him

Chief Executive Officer, Arculus Solutions

Gianluca Roscioli joins Breakthrough Energy's Innovator Fellows program from Arculus Solutions in Washington, DC. He brings nearly a decade of materials engineering and metallurgy research experience and currently works as chief executive officer of Arculus Solutions.

Arculus Solutions works to future-proof current natural gas transmission pipelines to safely transport hydrogen. By applying a multilayer hydrogen-barrier coating to the internal surface of natural gas pipelines, their technology will enable existing steel-based natural gas pipelines and other infrastructure to safely transport clean hydrogen and accelerate the adoption of hydrogen as a clean fuel across industries. Through the Fellows program, Arculus will develop the robot that will be used to apply their patented coating.

Gianluca holds a Bachelor of Science and a Master of Science in materials engineering and nanotechnology from Politecnico di Milano, a Master of Science in materials engineering from Politecnico di Torino, and a Doctor of Science in materials science and engineering from the Massachusetts Institute of Technology.

JAN-GEORG ROSENBOOM

He/Him

Co-founder & CTO, MacroCycle Technologies

Jan-Georg Rosenboom joins Breakthrough Energy's Innovator Fellows program from MacroCycle Technologies in Cambridge, Massachusetts. He has more than 10 years of academic and industrial research experience in polymer chemistry and process engineering. As co-founder and chief technology officer, Jan-Georg oversees MacroCycle's plastic recycling technology and intellectual property development.

MacroCycle Technologies' patented technology converts plastic waste into virgin-grade quality recycled plastic through a process that requires 80% less energy than competing depolymerization processes and can be powered with renewable energy to be entirely carbon free. Through the Fellows program, MacroCycle will optimize the technology for various waste streams and scale up to provide customers with sufficient material to make the first zero-carbon upcycled PET bottles.

Jan-Georg studied at the Hamburg University of Technology in Germany, University of California, Berkeley, and the University of Cambridge towards a Master of Science in chemical engineering. He completed his Doctor of Philosophy at ETH Zurich and a postdoctoral appointment at the Langer Lab at the Massachusetts Institute of Technology. His passion for blending science with entrepreneurship inspires his work at MacroCycle and has previously led him to co-found a social enterprise and consult for other firms on plastic sustainability.

ADAM RUTKOWSKI

He/Him

Chief Technology Officer, Marathon Fusion

Adam Rutkowski joins Breakthrough Energy's Innovator Fellows program from Marathon Fusion in San Francisco, California. Adam is a physicist and engineer with experience in thermal/fluids engineering at Otherlab and SpaceX. As chief technology officer of Marathon Fusion, Adam is responsible for guiding research and the development of fusion-enabling technologies.

Marathon Fusion is taking the critical next step to commercialize a fuel processing component essential for fusion power plants. Compared to conventional technologies, Marathon's approach enables a dramatic reduction in tritium inventory fuel processing cost while easing engineering requirements on other critical systems. This solution is simple, robust and highly scalable to meet the challenges of commercial fusion.

Influenced by a love of the outdoors and a desire to preserve the natural world, Adam has a deep interest in energy technologies and a drive to implement solutions to climate change. He completed his Bachelor of Arts in physics at Carleton College and his Master of Arts in astrophysical sciences at Princeton University.

MATTIA SACCOCCIO

He/Him

CTO, NitroVolt

Mattia Saccoccio joins Breakthrough Energy's Innovator Fellows program from NitroVolt in Copenhagen, Denmark. He has five years of experience researching ammonia synthesis. As chief technology officer, Mattia leads the engineering efforts to scale NitroVolt's technology.

NitroVolt is revolutionizing the nitrogen-based fertilizer industry by giving control of the production to the individual farmer, instead of relying on centralized production facilities. This new method of production cuts emissions from the transportation of the fertilizer and enables farmers to produce the fertilizer they need on demand. The Fellows program will help NitroVolt scale the technology from a lab-based system to a pilot unit capable of producing 1 kg/day of green ammonia.

Mattia completed his Bachelor of Science and Master of Science in energy engineering from the Polytechnic University of Milan (Politecnico di Milano), an engineering degree in energy and process engineering from the Technical University of Munich, and a Doctor of Philosophy in mechanical engineering from the Hong Kong University of Science and Technology. Mattia has been passionate about studying, understanding, and innovating how energy is harvested, converted, and used to better human life on earth since he was a teenager.

KYLE SCHILLER

He/Him

CEO, Marathon Fusion

Kyle Schiller joins Breakthrough Energy's Innovator Fellows program from Marathon Fusion in San Francisco, California. He brings expertise in early-stage startups and fusion industry road mapping and policy. As chief executive officer of Marathon Fusion, Kyle is responsible for company strategy, fundraising, and technical operations.

Marathon Fusion is taking the critical next step to commercialize a fuel processing component essential for fusion power plants. Compared to conventional technologies, Marathon's approach enables a dramatic reduction in tritium inventory fuel processing cost while easing engineering requirements on other critical systems. This solution is simple, robust, and highly scalable to meet the challenges of commercial fusion.

Kyle previously worked as an engineer at Airbnb on the machine learning platform, and at Zenysis Technologies working with governments to improve health system performance and prevent infectious disease. Kyle earned a Bachelor of Arts in Asian studies from Carleton College.

ALLAN SCOTT

He/Him

Co-Founder, Aspiring Materials

Allan Scott joins Breakthrough Energy's Innovator Fellows program from Aspiring Materials in Christchurch, New Zealand. He has more than 20 years of engineering experience in industry and academic research and his work has mainly been focused on the development of low carbon and sustainable binder systems for concrete. As a founding director at Aspiring Materials, Allan is primarily responsible for the development and testing of the product they are developing as a partial replacement for Portland cement.

Aspiring Materials has developed a mineral refining process to transform magnesium-rich rocks into a wide variety of products capable of offsetting up to three tons of CO2 for every ton of rock. These products are needed for the green energy transition that is occurring worldwide. Through the Fellows program, Aspiring Materials plans to scale its technology for a pilot plant that will provide the foundation for global industrial operations.

Allan studied civil engineering and management at McMaster University in Canada before completing a master's and doctorate in concrete materials at the University of Cape Town, South Africa. Allan is an associate professor at the University of Canterbury in Christchurch, New Zealand.

VIVEKANAND TIWARI

He/Him

CSO, ClimateCrop Ltd.

Vivekanand Tiwari joins Breakthrough Energy's Innovator Fellows program from ClimateCrop Ltd. in Israel. He has several years of extensive research experience in plant genetic engineering, gene editing, and plant physiology. His academic research was focused on understanding the mechanisms of plants' abiotic stress tolerance and photosynthesis regulation. Vivekanand is the CSO at ClimateCrop and is responsible for designing scientific experiments and managing the R&D team.

ClimateCrop's technology increases plant yield without increasing the use of resources like water or fertilizers, resulting in a lower carbon footprint per unit yield. Additionally, it enhances the plant's ability to tolerate abiotic stresses, ensuring agricultural sustainability in changing climate conditions. Through the Breakthrough Energy Fellows program, ClimateCrop will develop the technology, connect with potential regulatory and business partners, and accelerate product commercialization.

Vivekanand developed a passion for plant science upon noticing plants' vast array of shapes, sizes, and colors, and their ability to adapt to daily environmental changes. His scientific journey began with a Bachelor of Science from Veer Kunwar Singh University in India, followed by a Master of Science in marine biotechnology from Annamalai University and a Doctor of Philosophy in biotechnology from CSIR-Central Salt & Marine Chemicals Research Institute/MK Bhavnagar University, both also in India. Before joining ClimateCrop, he conducted extensive research on photosynthesis regulation at the Weizmann Institute of Science and Agriculture Research Organization in Israel.

PILANDA WATKINS-CURRY

She/Her

Co-Founder, Chief Technology Officer, Olokun Minerals

Pilanda Watkins-Curry joins Breakthrough Energy's Innovator Fellows program from Chesterfield, Virginia. She is a chemist with more than seven years of experience developing and managing products and technologies for research organizations in the public and private sectors. Pilanda leads the research, development, and technological advancement of Olokun's wastewater treatment and mineral recovery process.

Olokun Minerals is commercializing a novel way to extract critical minerals, to create products that can be used in concrete, fertilizers, and batteries, from brines without using harsh chemicals or strong acids, which aids in transitioning to renewable and clean energy. Their approach allows for multiple minerals to be recovered simultaneously, providing a more efficient and cost-effective way to source the metals needed for renewable energy technologies with a smaller environmental footprint.

Pilanda enjoys leisure reading, traveling, cooking, and watching recreational sports like basketball and tennis. She holds a Bachelor of Science in chemistry from Spelman College, and a Doctor of Philosophy in chemistry from Louisiana State University. Pilanda is also pursuing a master's in law from Northwestern University Pritzker School of Law with a focus on intellectual property.

ANDREAS CARL WEBER

He/Him

Founder and CEO, Ferrum Technologies

Andreas joins Breakthrough Energy's Innovator Fellows program from Ferrum Technologies in Vienna, Austria. Andy is a trained metallurgist with a focus on iron & steel, and he is the founder and CEO of Ferrum Technologies.

Steel is foundational to global society – this industry emits 7 to 9% of global CO2 emissions. Ferrum Technologies is committed to eradicating this core problem and making steel production CO2 free. Its world-class technical team is commercializing a specific hydrogen-plasma technology, which has never been tried before, yet has the potential to be cost-competitive with carbon-based . Through the fellowship program Andreas and his team aim to derisk the technology further and optimize it for the first stage of the scale up.

Andreas earned a Bachelor of Science and a Master of Science in metallurgy from the University of Leoben. He also holds a Bachelor of Science in international business administration from the Vienna University of Economics and Business. After his time at Voestalpine (a global technology leader in the field), he spent two years on the investment team of Speedinvest (the largest seed venture capital fund in Europe).

ALUMNI

PROJECT OVERVIEWS

CHEMENT

TECHNOLOGY AREA

Cement

SUMMARY

Chement's patent-pending technology eliminates all CO_2 emissions in cement production.

FELLOW

GREGORY HOUCHINS

Innovator

Chicago, Illinois

About the Project

Concrete is the most widely consumed resource in the world after water, and the production of cement — the main component of concrete — is one of the biggest polluters on the planet.

Chement's patent-pending technology takes the same cheap and abundant raw materials used to make Portland cement (the most common type). However, Chement employs a room-temperature electrochemical process — rather than a 1450 degrees Celsius (2500 degrees Fahrenheit) coal-or gas-fired kiln — which eliminates the first 50% of CO_2 emissions in the cement-making process. The other half of emissions from the conventional process is chemically released and currently difficult to capture for reuse. Chement's technology changes this by generating a pure stream of CO_2 and allowing for much cheaper carbon capture, resulting in the elimination of the remaining 50% of CO_2 emissions.

When produced at scale, this technology could drastically cut the two gigatons of CO_2 produced each year from cement production that account for nearly 8% of all emissions worldwide.

DIOXYCLE

TECHNOLOGY AREA

Fuels and Chemicals

SUMMARY

Dioxycle's mission is to develop the most energy efficient and versatile CO_2 conversion platform for industrial applications.

TEAM

SARAH LAMAISON
Innovator
Paris, France

DAVID WAKERLEY
Innovator
Paris, France

About the Project

Dioxycle's technology provides a route to turn CO_2 into an asset rather than a pollutant. Their technology uses low-temperature electrolysis to convert CO_2, water, and electricity into renewable feedstocks, fuels, and commodities. Dioxycle's has developed a novel CO_2-converting electrolyzers, which are designed to operate as affordably and efficiently as possible.

This technology provides a solution for the many industries across the globe that have unavoidable CO_2 emissions in their processes. With a device that converts CO_2 into low-carbon chemicals and fuels, Dioxycle gives these industries a means to generate value from their CO_2 and therefore an economic incentive to avoid carbon emissions.

Low-temperature, efficient conversion of CO_2 to chemical fuels may enable low-carbon, long-distance transportation such as trucking, shipping and aviation, while the conversion of CO_2 to other chemical precursors may serve as a route to renewable polymers and pharmaceuticals.

EVOLOH INC.

TECHNOLOGY AREA

Hydrogen

SUMMARY

EvolOH (ee VOH loh) is blazing a path toward low-cost, green hydrogen production by solving the big issue of electrolyzer availability with a scalable manufacturing approach to stack production from low-cost materials using domestic supply chains.

TEAM

JIMMY ROJAS

Innovator

Menlo Park, California

SCOTT BLANCHET

Innovator

Chelmsford, Massachusetts

About the Project

EvolOH is developing a novel electrolyzer stack and manufacturing system with the potential for the lowest CAPEX, smallest footprint and most secure supply chain in the green hydrogen industry. EvolOH's proprietary stack architecture results in a highly scalable, high-speed manufacturable, solid-state device using domestically-sourced, earth-abundant materials to split pure water into oxygen and hydrogen without the need for caustic liquid electrolytes.

Green hydrogen produced using renewable energy and water can eliminate several gigatons of CO_2 per year for hard-to-abate sectors, such as heavy-duty trucks, shipping, airplanes, fertilizer and steel production, industrial heat, and long-duration energy storage.

EvolOH's innovative materials and design enable high-speed manufacturing, increased lifetime and improved efficiency compared to current technologies. These benefits will be transformative to achieving the necessary price-point for hydrogen in our low-carbon future.

FURNO

TECHNOLOGY AREA

Cement

SUMMARY

Furno is working to re-envision the way we make cement. Unlike the large, fixed, capital-intensive plants of today, Furno is leveraging oxyfuel combustion and a novel design to develop plants that are more adaptable and energy-efficient, less capital-intensive and enable the production of zero-emission ordinary portland cement.

FELLOW

GURINDER NAGRA

Innovator

Palo Alto, California

About the Project

In the world of cement there are two grand challenges: the need to build 12 New York Cities per year for 30 years (mostly in developing economies without enough cement supplies); and the need to bring cement emissions to zero. Furno's cement plant of the future is a small, modular, and more energy efficient plant, which would enable quick and efficient entry and exit from markets and be cost competitive on capital and operational costs. Furno's innovation is the combination of a novel plant design, which drastically improves heat transfer and reduces size, and an oxyfuel combustion system, which enables the production of a small scale and pure stream of CO_2 to be stored in a geologic formation (without the capture costs) or sold into the merchant market.

Furno diverges from the 'bigger-is-better philosophy' that has driven the majority of the innovation in the industrial sector over the 20th century by leveraging the low cost, nimble and adaptable strategy taken by mini-mills in the steel industry to dominate the steel market and adapt it to the cement industry by building smaller, more efficient and modular cement plants.

HERTHA METALS

TECHNOLOGY AREA

Steel

SUMMARY

Steel manufacturing accounts for more than 8% of global C02 emissions, and demand for steel has increased considerably in recent years. Hertha is developing an iron and steel manufacturing process that replaces coal with renewable power and hydrogen to reduce sector emissions by more than 95%. Hertha's technology offers scalable solution to manufacturing that is cost-competitive to traditional processes.

FELLOW

LAUREEN MEROUEH

Innovator

Brownsville, Texas

About the Project

Today, primary steelmaking relies heavily on coal as a chemical agent and energy source, while some greener steelmaking processes are more complex and dependent on particular, expensive materials such as high-grade iron ore. Hertha's technology harnesses green hydrogen and electric arcs — enabling production from low grade ores and smelting reduction at costs competitive to today's primary steelmaking.

Hetha has reimagined the design of existing furnaces — incorporating new methods of both hydrogen injection and iron-ore handling to overcome the obstacles that have thus far prevented successful scaling of hydrogen-electric steelmaking. By leveraging existing steel infrastructure and scientific fundamentals, Hetha presents a scalable solution to decarbonize the integral process of modern manufacturing.

LIQUIUM

TECHNOLOGY AREA

Fuels and Chemicals

SUMMARY

Liquium is revolutionizing the ammonia production process, making it cleaner, cheaper, and scalable enough to decarbonize heavy industries, including shipping, aviation, heat and power generation, and chemical production.

FELLOW

FRANCK NATALI

Innovator

Wellington,
New Zealand

About the Project

Currently, fossil fuels are the only economically viable pathway for ammonia production. Energy sourced from coal and natural gas are required to activate the extreme operating conditions required to synthesize ammonia. For each ton of ammonia produced, three tons of carbon dioxide are emitted, making ammonia production one of the most polluting chemical processes in the world.

Liquium has developed a cost-effective technology to create ammonia at low temperatures and in normal atmospheric conditions, significantly reducing carbon emissions and paving the way for localized, small-scale green ammonia production. Liquium will lower the barrier to entry for clean ammonia production, creating smaller, decentralized plants that are more economically feasible and have a stronger alignment with renewable energy generation projects.

Over time, Liquium aims to scale a solution to fully meet the massive industry demand for clean ammonia.

METPEEL

TECHNOLOGY AREA

Steel

SUMMARY

MetPeel is developing a new manufacturing process for making steel sheet and strip using a unique low-temperature, single-step process in place of conventional fossil-fired hot rolling.

TEAM

DINAKAR SAGAPURAM

Innovator

College Station, Texas

About the Project

More than 99% of the world's steel is rolled after casting. This process requires repeated fossil-fired heating and cooling of the material as it passes through multiple rollers. This is estimated to produce 0.2 to 0.4 tons of CO_2 per ton of steel product produced — or 1% of all greenhouse gas emissions.

MetPeel replaces the fossil-fired, hot-rolling process with a new, low-temperature, single-step mechanical process for making steel sheet and strip that significantly reduces energy consumption and CO_2 emissions.

Fundamental improvements in materials science and control systems have enabled this process, which involves machining or "peeling" a continuous, thin metal strip directly from a solid metal feedstock surface in one single step without the need for external heating. MetPeel's one-step process has the potential to eliminate 1.4 billion tons of CO_2 emissions annually by 2050.

VERNE INC.

TECHNOLOGY AREA

Hydrogen Storage

SUMMARY

Verne Inc. is developing high-density and lightweight hydrogen storage systems for heavy-duty transportation at low cost.

TEAM

DAVID JARAMILLO

Innovator

San Francisco, California

TED MCKLVEEN

Innovator

San Francisco, California

BAV ROY

Innovator

San Francisco, California

About the Project

Heavy-duty trucks, airplanes, and ships are increasingly being developed with hydrogen (H_2) fuel cell technology as a pathway to zero-emission transportation. However, inadequate hydrogen storage technology is a recurring challenge for these applications.

Despite its availability and increasingly low cost, compressed H_2 gas, a conventional hydrogen storage method, is low in density, limiting vehicle range and reducing the vehicle payload capacity. In contrast, liquid H_2 is much denser and takes up less space, but it is prone to evaporation and is energy intensive to produce, resulting in higher costs and operational complexity.

Verne is building high-density, low-cost hydrogen storage systems to solve for these challenges and therefore is helping the heavy-duty transportation sector transition to zero-emission fuel cells.

The Verne system will store hydrogen in a cryo-compressed state at moderate pressure and low temperature levels for heavy-duty applications. The ultra-high density achieved in this method enables long-haul trucks, ships, and planes to store the required energy to travel full routes, while avoiding the inefficiencies, costs, and infrastructure limitations of alternative methods (e.g. liquid hydrogen).

This technology has the potential to reduce H_2 storage costs by 40% and to enable vehicles to refuel at any hydrogen refueling station, doubling storage capacity and increasing fueling flexibility for long-haul trucking and other transport.

ALUMNI

FELLOW BIOS

2021 Cohort

KATHLEEN BAIREUTHER

She/Her

Business Fellow

Kathleen joins Breakthrough Energy's Business Fellows program from Austin, Texas. As a Fellow, she will work hand-in-hand with technologists committed to decarbonization at scale. She brings expertise in developing and executing go-to-market strategies for emerging technology companies in the urban mobility and clean technology sectors.

Kathleen has spent her career at the intersection of the public and private sectors in a wide range of contexts, including consulting, academia, think tanks and large corporations. She brings professional experience in technology commercialization strategy, community and economic development, transportation and mobility, and public-private partnerships. Most recently, she was with Ford Motor Company supporting business strategy and operations for Ford's autonomous vehicle division.

In her free time, Kathleen is an avid traveler, enjoys hiking, and maintains an advanced Iyengar yoga practice. She holds a Bachelor of Arts from the University of Virginia and a Master of Philosophy from the University of Cambridge.

SCOTT BLANCHET

He/Him

EvolOH

Scott joins the Innovator Fellows program from Billerica, MA. Scott's work focuses on increasing the availability and reducing the cost of clean hydrogen. He brings more than 25 years of experience overseeing the development and commercialization of groundbreaking products from technologies across the hydrogen and fuel cell value chain. As a Fellow, Scott will work with the EvolOH team to bring game-changing electrolysis technology out of the lab and into the market.

Prior to joining the Breakthrough Energy Fellows program, Scott worked as chief technology officer for Nuvera Fuel Cells and held prior positions with FuelCell Energy and General Motors, working to drive innovative technologies from the lab to the real world in service of a cleaner and greener environment. Over the course of his career he has been granted more than 265 patents worldwide related to hydrogen, fuel cells, and vehicle emissions technologies, including 48 in the U.S. related to clean energy technologies.

A longtime resident of Massachusetts, Scott resides in Chelmsford, MA with his wife and family. In his free time, Scott enjoys exploring Boston and practicing mindfulness. He received a Bachelor of Science in mechanical engineering from University of Miami and a Master of Science in mechanical engineering from Stanford University.

MATTHEW (MATT) HAMMOND

He/Him

Business Fellow

Matt Hammond joins Breakthrough Energy's Business Fellow program from Nuremberg, Germany. He is an energy transition strategist who has worked across the globe creating and scaling new clean technology businesses. As a Business Fellow, he is excited to work with innovators to overcome the challenges of bringing impact climate technologies to market.

Whilst a Director at Accenture Strategy, Matt spent the last four years focused on clean hydrogen and its role in the energy transition, leading and advising on 15 growth strategy engagements across both the globe and the hydrogen value chain. This ranged from working with single-person startups developing new technologies, through to working with Fortune 500 companies to create market-leading green hydrogen ventures planning to deploy over $30 billion of capital over the next decade.

In his free time, Matt cherishes spending time with his wife and two young sons. He holds a Bachelor of Science in Business Administration from the University of Bath in the United Kingdom and completed executive education at INSEAD, Oxford University and the Kellogg School of Management.

GREGORY HOUCHINS

He/Him

Chement

Concrete is the most widely consumed resource in the world after water, and the production of cement — the main component of concrete — is one of the biggest polluters on the planet. Greg hopes to change that with his company, CHEMent.

Cement production typically requires burning large amounts of fossil fuels at extremely high temperatures. Using CHEMent's electrochemical technology instead of thermal processes, Greg is working to increase the energy efficiency of cement production, cut fossil fuel emissions, and capture other emissions harmful to the atmosphere.

Greg brings expertise in electrochemistry, lithium-ion battery cathodes, computational methods, and atomistic simulations related to electrochemistry — including high-performance computing and machine learning — to the BE Fellows program.

Greg recently relocated from Pittsburgh to Chicago to be closer to the Argonne National Lab and the growing cleantech industry in the area. Besides his passion for clean technology and saving the world, Greg has a serious dedication to coffee. There's a place in Greg's heart for every cup of coffee, but he's always on the search for the best of the best. He received a Bachelor of Science in physics and mathematics from James Madison University, as well as a Master of Science and a Doctor of Philosophy in physics from Carnegie Mellon University.

DAVID JARAMILLO

He/Him

Co-Founder & CTO , Verne, Inc.

David joins the Innovator Fellows from Verne, Inc. in San Francisco, Calif. With his colleagues, David is tackling a hydrogen storage challenge. Typically, hydrogen is stored as a liquid or as compressed gas making it costly to store and transport. David is developing a new way to store hydrogen in its cryo-compressed state—offering high density storage and lower costs to unlock more applications for hydrogen fuel cells.

For David, Breakthrough Energy's Innovator Fellows program is a game changer—it gives him and Verne the opportunity to de-risk their core technology and accelerate commercial product development. With fast-tracked de-risking and commercialization, Verne's technology will rapidly increase the use of fuel cells and hydrogen power in heavy-duty transportation, helping to abate 10% of CO_2 emissions.

Despite living in the Bay Area for about five years now, he keeps his Northeastern and Colombian roots close to his heart. David's first language is Spanish, as he spent the initial eight years of his life in Medellin, Colombia before moving to Greenwich, Connecticut. He received a Bachelor of Arts in chemistry from Harvard University and a Doctor of Philosophy in organic and materials chemistry from University of California, Berkeley.

SARAH LAMAISON

She/Her

Co-Founder & CEO, Dioxycle

Sarah joins Breakthrough Energy's Innovator Fellows from Dioxycle in Bordeaux, France. With her colleagues, Sarah has developed novel approaches to design and make carbon dioxide (CO_2) electrolyzers. Dioxycle has demonstrated the performance of their device in converting CO_2, water, and electricity to electrofuel precursors such as carbon monoxide and syngas.

Dioxycle's technology provides a route to see CO_2 as an asset, not a pollutant. Through their process, it will be possible to take CO_2 and clean energy to generate valuable, renewable feedstocks, fuels, and commodities. Dioxycle's goal is to make their custom-built CO_2-converting electrolyzers as energy-efficient and cost-effective as possible for as many commodities as possible to help displace fossil fuels.

Growing up by the sea in the Basque country, Sarah's motivation in developing a climate technology has come from her childhood passion for whales and surfing and an intense dislike for plastic pollution. Sarah holds a Bachelor of Science in mathematics, physics and chemistry from Ecole Polytechnique (France) and she completed graduate work in organic chemistry at Ecole Polytechnique and environmental economics at Université Paris-Saclay. She then earned a Master of Philosophy in chemistry from the University of Cambridge. Sarah obtained her PhD
from Collège de France (Paris) after conducting research on CO_2 conversion between Collège de France and Stanford University.

TED MCKLVEEN

He/Him

Co-Founder & CEO, Verne Inc.

Ted is co-founder and CEO of Verne and a Breakthrough Energy Innovator Fellow. With his Verne team, Ted is tackling the challenges posed by hydrogen storage. Typically, hydrogen is stored as a liquid or as compressed gas, making it costly to store and transport. The team at Verne is developing a new way to store hydrogen in its cryo-compressed state, offering high-density storage and low costs to unlock more applications for hydrogen fuel cells. With support of the BE Fellows program, Verne's technology will rapidly increase the use of fuel cells and hydrogen power in heavy-duty transportation, helping to abate 10% of CO_2 emissions.

As a business leader, Ted brings strategy, operations, corporate finance, and management experience to the team. Having grown up in Minnesota, he is an avid outdoorsman. He enjoys downhill and cross-country skiing, hiking, cycling, and backpacking. Like his teammates, Ted is passionate about mitigating climate change and protecting the environment. He received a Bachelor of Arts in chemistry from Harvard University and an MBA from Stanford University.

LAUREEN MEROUEH

She/Her

Hertha Metals

Laureen joins Breakthrough Energy's Innovator Fellows program from South Florida. As a mechanical engineer and entrepreneur, she brings deep expertise in renewable energy, energy storage, and hydrogen. Laureen wants to harness the benefits of profitable green hydrogen production to reduce emissions on the order of gigatons, bring clean and affordable energy to countries around the world, and shift today's trajectory of worsening global inequality.

Laureen is the founder and CEO of Hertha Metals, a company focused on manufacturing iron and steel with 95% less emissions than conventional steelmaking. By leveraging existing infrastructure and new discoveries, Hertha presents a scalable solution to decarbonize steel manufacturing. Hertha aims to demonstrate the world's first five-ton furnace that produces molten iron through hydrogen and electricity by 2023. By 2027, they aim to begin deploying steelmaking units that can process 200,000 tons per year to integrate with existing steel mini-mills, while continuing to scale their technology to produce two million tons per year by 2030.

She holds a Bachelor of Science in civil and mechanical engineering from the University of Florida, as well as a Master of Science and a Doctor of Philosophy in mechanical engineering from the Massachusetts Institute of Technology. Laureen also has a graduate minor in business and entrepreneurship from the Massachusetts Institute of Technology.

ROBERT MURPHY

He/Him

Business Fellow

Robert joins the Breakthrough Energy Business Fellows program from Victoria, British Columbia. As a Fellow, he will collaborate to develop the critical solutions needed to get to net zero and accelerate commercialization of truly impactful technologies.

He has spent the last two decades working on energy and climate challenges. Most recently, Robert led strategy and business development with San Francisco-based climate tech startup Aclima, where he developed business, partnership, and policy strategies and helped secure anchor customers and early funding rounds. In prior roles with global corporations and multilateral institutions — including the World Bank, Enbridge, and Chevron — Robert worked to solve their most complex problems utilizing expertise ranging from strategic planning and business development to geopolitical and quantitative analysis. Robert currently serves on the Berkeley Earth Board of Directors and the Carbon Mapper Policy and Impact Committee.

Robert was born in Canada to Irish immigrants and spent his formative years in Yemen, which inspired his fascination with the overlapping commercial, social, economic, and environmental complexities of energy. He holds an Honours Business Administration (HBA) degree from the Ivey School of Business in Canada and a Master of Arts in international security studies from the Georgetown University School of Foreign Service.

GURINDER NAGRA

He/Him

CEO & Founder, Furno Materials

Today's cement is made in large, expensive, fixed plants. And its production is one of the biggest contributors to climate emissions. With Furno Materials, Gurinder wants that to change. As CEO and founder of Furno, Gurinder and his colleagues are working to re-envision energy-efficient and zero-emission cement production by leveraging oxyfuel combustion and re-designing the cement plant to be compact and modular.

Born in India and raised in rural Australia, Gurinder received a Bachelor of Advanced Science from University of New South Wales, Sydney and a Master of Science in Earth system science from Stanford University. He expresses himself by devoting his efforts to intense physical exercise and taking on big, audacious problems. Before finding his passion for clean technology, Gurinder grew up dreaming of playing professional cricket.

FRANCK NATALI

He/Him

Associate Professor of Physics, Victoria University of Wellington
Liquium

Franck joins the Breakthrough Energy Innovator Fellows program from Wellington, New Zealand. With his colleagues, Franck is revolutionizing the ammonia production process, making it cleaner, cheaper, and scalable enough to decarbonize heavy industries, including shipping, aviation, heat and power generation, and chemical production.

Liquium has developed a cost-effective technology to create ammonia at low temperatures and in normal atmospheric conditions, significantly reducing carbon emissions and paving the way for localized, small-scale green ammonia production. Liquium will lower the barriers to entry for producing clean ammonia by creating smaller, decentralized plants that are more economically feasible and have a stronger alignment with renewable energy generation projects.

While Liquium is based in New Zealand, Franck was raised in the magnificent vineyards of Bordeaux, France. Currently he serves as Associate Professor in Physics at Victoria University of Wellington. As a father of two bambinos, he enjoys getting out on the slopes or into the surf with his family. Franck holds a Bachelor of Science from Université de Bordeaux, a Master of Science from Université de Bordeaux, and a PhD from Université Nice Sophia Antipolis.

MIKE PAMBIANCHI

He/Him

Business Fellow

Mike joins the Breakthrough Energy Business Fellows program from Madison, NJ. He is a R&D executive who has spent his career developing cutting-edge technologies and delivering market-leading products. Currently, he is the principal at Industrion Technologies LLC, which provides advisory services and angel-round investments in tough tech. Prior to starting Industrion, Mike spent 20 years at Corning in a variety of executive roles.

Mike has extensive experience identifying emerging technologies, building teams, and influencing business leaders and customers. He also has deep expertise in advanced functional materials across a wide spectrum of industries, including telecom, semiconductors, sensors, energy, consumer electronics, and pharmaceutical packaging.

In his free time, Mike enjoys sailing, small-scale farming, making wood-fired pizza, going to jazz clubs, and spending time with his wife Christy and their four kids. He holds a Bachelor of Arts from Cornell University, an MBA from Harvard Business School, and a doctorate in condensed matter physics from the University of Maryland.

JIMMY ROJAS

He/Him

EvolOH, Inc.

Jimmy Rojas joins Breakthrough Energy's Fellows program from EvolOH, which he founded in 2020. EvolOH is dedicated to enabling a path toward low-cost green hydrogen production using innovative electrolyzer hardware.

Use of green hydrogen can eliminate several gigatons of carbon dioxide emissions annually, while also reducing the particulate matter that disproportionately impacts disadvantaged communities living near industrial complexes and ports. However, for green hydrogen to be widely adopted, the cost of green hydrogen production needs to be significantly reduced.

EvolOH's innovative hardware is optimized to facilitate manufacturing, increase lifetime, and improve efficiency—all of which improve upon current technology and will help drive down cost. Jimmy is driven by the notion that once cost-competitive, green hydrogen can truly impact society on a global scale.

Jimmy grew up in Costa Rica, where he picked coffee for a living starting from a young age and became one of the first in his family to finish high school. He then spent a year saving money and learning English before applying to colleges in the U.S. He earned a Bachelor of Science in mechanical engineering and a Bachelor of Science in nuclear engineering from the Massachusetts Institute of Technology (MIT), as well as a Master of Science in mechanical engineering, a Master of Science in management science, and a Doctor of Philosophy in mechanical engineering, each from Stanford University.

BAV ROY

He/Him

Co-Founder & COO, Verne Inc.

Bav is co-founder and COO of Verne and a Breakthrough Energy Innovator Fellow. With his Verne team, he is tackling the challenges posed by hydrogen storage. Typically, hydrogen is stored as a liquid or as compressed gas, making it costly to store and transport. The team at Verne is developing a new way to store hydrogen in its cryo-compressed state, offering high-density storage and low costs to unlock more applications for hydrogen fuel cells. With support of the BE Fellows program, Verne's technology will rapidly increase the use of fuel cells and hydrogen power in heavy-duty transportation, helping to abate 10% of CO_2 emissions.

Along with his Verne colleagues, Bav brings his experience in renewable energy, business operations, go-to-market strategy, and product development to the BE Fellows program. He grew up in Sydney, Australia surrounded by Australian bushland, where he developed a deep connection to nature and its conservation. Before moving to San Francisco, he worked as an engineer in the solar energy industry and as a consultant for Boston Consulting Group. Outside of work, he enjoys tennis, bouldering, board games and sci-fi. Bav earned a Bachelor of Commerce and a Bachelor of Engineering from University of New South Wales and an MBA from Stanford University.

DINAKAR SAGAPURAM

He/Him

Assistant Professor & Inventor, Texas A&M University
MetPeel

As an Assistant Professor in industrial engineering at Texas A&M, Dinakar joins Breakthrough Energy's Innovator Fellows with his cutting-edge steel strip manufacturing process, MetPeel. Steel sheet and strip, which makes up more than 55% of all steel products worldwide, is traditionally manufactured using energy-intensive and complex rolling processes that rely on fossil fuels and large, wasteful production plants. Without a clean solution, steel sheet and strip manufacturing would release more than 1.4 billion tons of carbon emissions per year by 2050.

MetPeel disrupts the traditional manufacturing processes by producing steel strip through a more efficient, emission-free, single-step process of peeling a thin foil from the circumference of a rotating metal feedstock using only electricity for power.

Dinakar chose to headquarter the research and development process at Texas A&M, in College Station, Texas, where he's worked since 2016. There he can access the support structure and resources from Texas A&M Engineering Experiment Station.

Dinakar grew up in Andhra Pradesh, a province in southern India, and received his Bachelor of Science in materials engineering from the Indian Institute of Technology Madras. Prior to joining Texas A&M, he received his Doctor of Philosophy in materials engineering and completed postdoctoral research at the Center for Materials Processing and Tribology at Purdue University.

HARSHITA MIRA VENKATESH

She/Her

Business Fellow

Harshita joins the Breakthrough Energy Business Fellows program with an MBA from the University of California Berkeley Haas School of Business and an expertise in economic consulting. During her MBA program, she held an internship with Rivian and was a participant in Berkeley's clean-to-market accelerator program. She also served as a research assistant in the mathematics and economics departments at the University of Rochester and held analyst and associate positions at Charles River Associates. Harshita's consulting experience ranges from high-profile mergers to antitrust issues. She has also held numerous non-profit and volunteer roles outside of work focusing on women's rights and climate equity.

Harshita is driven by an urge to combat climate change, which she believes to be humanity's most troubling issue. She was inspired to apply to the Fellows program to have the opportunity to help early-stage, deep technology companies that share her passion for fighting climate change.

Harshita has lived in over twelve cities, including Rochester, N.Y. where she attended the University of Rochester, and Berkeley, Calif. where she currently lives. With her migrating experience, she confidently chooses Chicago, Ill. as her favorite place in the world.

Breakthrough Energy Fellows

BIOS

DAVID WAKERLEY

He/Him

Co-founder and CTO, Dioxycle

David joins Breakthrough Energy's Innovator Fellows from Dioxycle in Bordeaux, France. With his colleagues, David has developed novel approaches to design and make carbon dioxide (CO_2) electrolyzers. Dioxycle has demonstrated the performance of their device in converting CO_2, water, and electricity to electrofuel precursors such as carbon monoxide and syngas.

Dioxycle's technology provides a route to see CO_2 as an asset, not a pollutant; through their process it will be possible to take CO_2 and clean energy to generate valuable, renewable feedstocks, fuels, and commodities. Dioxycle's goal is to make their custom-built CO_2-converting electrolyzers as affordable and efficient as possible for as many commodities as possible to help displace fossil fuels.

Although Dioxycle is based in France, David grew up in a small town in the middle of England where life was simple and fish & chips were plentiful. He was always fascinated by new technologies and clean energy, which led him to pursue a Doctor of Philosophy in chemistry at the University of Cambridge. He then left England to research CO_2 reduction at both the Collège de France (Paris) and Stanford University.

Breakthrough Energy | 2023