

Global^{'15} 100 Cleantech

A Barometer of the Changing Face of Global Cleantech Innovation





СНИВВ

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Executive Summary

100 expert panelists contributed to the evaluation process, including an increasing number of corporations – 43 – this year (see Appendix 1 on page 26).

33 of the Global Cleantech 100 have a Big Data component to their business model. The majority came from traditional big data sectors like Energy Efficiency or Smart Grid, but others are making headway in areas like Agriculture, Transportation among others (see page 19).

years of running the Global Cleantech 100 annual exercise, we expect to see more companies on the list demonstrating evidence of real commercial impact (either through high revenues or exits) especially from the companies who have been awarded several years in a row.

6900 companies were nominated for the 2015 Global Cleantech 100 and **323** were shortlisted (see Methodology in the FAQs section on page 24).

39 companies were new entrants to the Global Cleantech 100, with the majority intake coming from the Energy Efficiency (7) Advanced Materials (6) Energy Storage (6) and Agriculture & Food (4) sectors (see page 3).

12 Energy Storage companies made it to the 2015 list, compared to 7 in 2014, representing the biggest sector jump year on year. We read this as Energy Storage 'trading places' with Solar (on page 14) which has conversely experienced a downward trend in the Global Cleantech 100.

57 of the 100 GCT100 are headquartered in the US; however **20** of those companies have entities or manufacturing bases outside of North America (see Geography of the Global Cleantech 100 on page 9).

17 sectors were represented in the Global Cleantech 100, showing a diversity of interests beyond the narrower confines of just energy; there were also **2** new sector additions: Unmanned Aerial Vehicles and Internet of Things (IOT). See page 12.

• major themes (we call megatrends in section 6) were identified, illustrating that new opportunity sets continue to appear in the Global Cleantech 100 and beyond.



The Global Cleantech 100 – Alphabetical List

More in-depth profiles, additional stats and analysis, and the latest updates on the Global Cleantech 100 companies can be found on the GCT100 portal on i3 Connect.

4Energy

Advanced Microgrid Solutions

Airbnb

Airware

Alphabet Energy

Anesco

Anuvia Plant Nutrients

APATEQ

Aquion Energy

— — — — — — AutoGrid Systems

Avantium

Bayeco

_ _ _ _

Bidgely

BlaBlaCar

Blue Pillar

Bowman Power Group

Building Robotics

Cambi

Canatu

Carbon Clean Solutions

CarbonCure Technologies

ChargePoint

Clean Power Finance

d.light design

Digital Lumens

DyeCoo Textile Systems

E-Leather

Enbala Power Networks

_ _ _ _ _

Encycle

EnergySavvy

Enlighted

Farmers Business Network

FATHOM

FilterBoxx

FirstFuel Software

Fluidic Energy

FRX Polymers

GaN Systems

Geli

General Fusion

Genomatica

GlassPoint Solar

_ _ _ _ _ _

Green Biologics

Green Charge Networks

Gridco Systems

Harvest Power

_ _ _ _ _ _ _ _ _ Impossible Foods

Imprint Energy

INRIX

loxus

_ _ _ _ _ _ Joule

Kebony

KiWi Power

Kurion LanzaTech

Leosphere

Key Stats:

- 39 companies are first timers on the Global Cleantech 100 list
- 61 companies have previously been on a GCT100 list of which:
 - 50 were on the 2014 list
 - 11 are returnees after being on the list in 2013 or earlier

Renovate America

M-Kopa Solar

- - - - -

Moovit — — — — — NanoSteel

NBD Nanotechnologies

newterra

NexSteppe

Next Kraftwerke

_ _ _ _ _

Next Step Living

Off Grid Electric

Orbital Systems

Organica Water

OSIsoft

Ostara Nutrient Recovery Technologies

OxyMem

Peloton Technology

Phoebus Energy

Phononic

Planet Labs

PrecisionHawk

Proterra

Renew Financial

REstore Saltworks Technologies Scinor Water Sefaira SIGFOX Skeleton Technologies Skyonic Sonnenbatterie Space-Time Insight Stem sunfire Sungevity Sunverge Energy TaKaDu Tendril Transphorm Uber Verdezyne VisionFleet Ynsect

Younicos

Acknowledgements

The list would not have been possible if it weren't for the willingness of our 100-strong expert panel (listed in Appendix 1) who gave up their time during the summer months to provide expert input and opinion. This is in addition to the many hundreds who made company nominations. Thank you all.

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"What is most exciting to us, is the privilege of seeing and reading these viewpoints and interpreting them as part of our annual barometric read of the shifting sands within global sustainable innovation." Global ^{'15} Cleantech

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Foreword

For the seventh year running, Cleantech Group (CTG) is proud to present the annual Global Cleantech 100 list, our barometer reading of the global innovation community's shifting views on which companies, and which types of companies, are most likely to have big commercial impact in a 5-10 year timeframe.

The final 100 cannot be one person's 100; there is much disagreement and conflicting opinion on what and who is working. The final 100 is therefore, by its very nature, a compromise, the median of all those opinions, delivered to us directly as part of our annual research exercise. We pull together thousands of data-points, objective and subjective, quantitative and qualitative, from all over the world, with the end objective of identifying where the consensus of sentiment and opinion seems to lie amongst the international cleantech community. FAQs on the 100 and our methodology can be found on page 25.

We therefore do not definitively state any year's 100 to be the best or top companies in the world, as that would need a common measure or metric. They do, however, stand for where "consensus sentiment" lies both in terms of which companies active in sustainable innovation are in favor and are more commonly admired, and perhaps even more importantly for what kind of sub-sectoral areas and themes are in vogue.

What is most exciting to us is the privilege of seeing and reading these viewpoints and interpreting them as part of our annual barometric read of the shifting sands within global sustainable innovation. Yes, there are 101st companies, unlucky not be on the list, and individual disappointments that go with that. However, **this report is more focused on what this year's list tells us, relative to previous years, about this innovation and investment theme and where it is all going**. We hope you find our report thought-provoking and our read of the state of the market useful to you in planning the coming months.

Congratulations to those who made the 2015 list. We look forward to following yours and hundreds of other companies' progress in the coming 12 months.



The 2014 Global Cleantech 100 awardees, celebrating at 1776 incubator in Washington, DC.

1. The Global Cleantech 100 Fun Facts

- 1. Ostara Nutrient Recovery Technologies is the GCT100 company that has made it onto the list all 7 years of its existence. A provider of solutions for recovering phosphorus and nitrogen from used water streams, Ostara *"was there last year and I still like it,"* said one panelist. Other companies consistently on the list 6 years in a row include Avantium, Harvest Power and LanzaTech.
- 2.

Sonnenbatterie was the top nominated company in the GCT100 by expert

panelists. "The company managed to successfully turn a commodity product (electricity) into a tangible and valuable experience for the customer and gained a market leading position in the process."

- 3. General Fusion, last year's marmite listed company (refer to page 11 in the 2014 report) was strongly defended in this year's list. The developer of Magnetized Target Fusion power plants *"is the world's best chance for affordable, plentiful, fusionbased clean energy before the end of the decade."*
- 4. **newterra**, is the oldest founded company in the **GCT100**. Founded in 1863, newterra has designed and manufactured thousands of water treatment systems and "has a very impressive ability to deliver their solutions to various industries such as mining and oil & gas, around the world."



The image is from newterra's site depicting its founding fathers.

5. Farmers Business Network, registered in 2014, is the youngest founded company on this year's list. Their farmer-to-farmer network is providing growers with product performance, benchmarking and predictive analytics based on real world performance data. "FBN is bringing 'Big Data' analytics to agriculture, but doing so in a way that helps the farmers."

- 6. SIGFOX is the GCT100 company with the highest number of corporate and venture capital investors participating in a funding round, with 14 separate investors. Those investors included: Telefonica Ventures, Engie, NTT Docomo Ventures, SK Group, Air Liquide Investissement, Elliott Management, Idinvest Partners, Intel Capital, Elaia Partners, iXO Private Equity, Partech Ventures, BPI France, Eutelsat, and Samsung.
- 7. Planet Labs is the first GCT100 company that has decided to enter outer space, with plans to launch a network of earth-observation satellites to provide open-source information on earth's changing climate. Their efforts "will open up huge resource efficiency opportunities."



The image is from Planet Labs' Gallery of the Tres Marias Reservoir in Minas Gerais, Brazil.



2. Geography of the Global Cleantech 100

The Top Ranked Companies in Each Region



Africa and Asia

- 4% of the GCT100 are from Asia and Africa
- Returnees from the 2014 GCT100 list include M-Kopa Solar, and Scinor Technologies

M-K@PA

3. Through the Looking Glass of the Expert Panelists



What Impresses our Expert Panelists? What Drives their Voting?

Every year we like to put a 'looking glass' up close to the raw data we collect from expert panel commentary in order to extract insights on what drives their voting. Even when armed with the same evaluation criteria (see Phase III of our methodology on page 25), expert panelists may vary in how they interpret the question: which company has the greatest likelihood of making the most significant market impact over the next 5-10 years?"

However, the expert panelists were consistent in the top three reasons they cited for admiring companies: 1) *Market Traction* or evidence of customers and revenues 2) *Financing* i.e. track record of past capital raised and 3) *Partnerships* - particularly with multi-national corporates. **Leadership**, i.e. an impressive CEO or management team was the next most important factor although slightly more important to the 57 financial voters than the 43 corporate voters in this year's panel.

Revenues played an important part in defining the 2015 Global Cleantech 100, given that 90% of the companies have \$500k+ in revenues, and over 50% have \$2 million + in revenues. Below this threshold, there were strong reasons why companies

Expert Panel Commentary on Pre-revenue or Early Revenue GCT100 companies:

PLANET	"World changing mini satellite tech is ahead of competitors and in 5 years will game change imaging data" "Imaging the entire earth once per day at 5m resolution is just awesome, and they're making real progress toward this."
general fusion	<i>"If successful, truly game changing for humanity" "Swinging for the fences."</i> <i>"High risk, but possibly true game changer. Shows steady progress."</i>
Geli	"Platform technology for energy storage that is unique in its design" "Truly novel tech for managing storage and oth- er projects to monetize the benefits to the grid"
Skyonic	"Truly addressing the big picture." "Actually commissioned its 1st plant. Still may not work or be commercial, but very exciting"

were exempt from the usual standards. We found that early stage companies which made it to the GCT100, as illustrated below, fell strongly in the 'disruptive' category. In other words, they are addressing an important challenge in a novel way, which could be risky, but wins admiration nonetheless. This group of companies were more frequently voted for by the corporate expert panelists, not surprisingly as their interests align more strategically around companies that may help them cope with operational challenges, and new customer segmentation in the next decade. We found many panelists would bring up innovation trends as a reason that a company remains relevant. As an example, one panelist wrote about TaKaDu, the water treatment company: "TaKaDu is addressing one of the biggest future megatrends (water/drinking water) and has already established some interesting partnerships in the Middle East region and beyond."

Out of the negative commentary, over 50% used words related to 1) *Economics* 2) *Market Readiness or Market Attractiveness* 3) *Flaws in Business Model* - or other related phrases like 'not-robust' or 'old technology.' A frequent example of a negative comment includes: *"This company seems to be early stage without enough customer traction to demonstrate that the technology will penetrate a challenging market."* Of course, sometimes evaluations are 'subjective,' which is why we have taken a collective poll on how much panelists overall believe companies have established a path to market success.

Most Common Words Used in Negative Comments:

UNECONOMICAL CAPITAL INTENSIVE POOR PERFORMANCE TOO EARLY IN DEVELOPMENT NOT NOVEL OR UNIQUE DIFFICULT TEAM OLD TECHNOLOGY NOT COMPETITIVE OLD TECHNOLOGY NOT COMPETITIVE MARKET TOO SMALL POOR BUSINESS MODEL NO MARKET TRACTION NOT ROBUST OVER HYPED TOUGH TO SELL NOT SCALABLE VERY COMPETITIVE SPACE POR CUSTOMER EXPERIENCE FLAWED TECHNOLOGY



4. The Marmite List and the Lust List: Who Divides and Who Conquers?

What is in Marmite? Marmite contains the yeast that remains after being used to brew beer and is used to create a savory, dark spread. Marmite is not for everyone and is generally a very polarizing product - you either love it or you hate it!

Marmite List: We call companies in the final 100 'marmite' if they attract the strongest split of opinions across the expert panel. Those with the most significant volumes of both positive and negative votes are:



AQUION **ENERGY** Pittsburgh, PA

Aquion Energy makes clean, sustainable saltwater batteries that outlive and outperform traditional batteries.

Love it: "Rare storage tech that makes economic sense" with "strong investor syndicate."

Challenge: "Still needs to scale to reach targeted price levels." "A company that has overbuilt its OPEX."





Sunnyvale, CA

Bidgely is a provider of a business intelligence platform for utilities that enables customers to measure energy consumption patterns.

Love it: "A great solution for customer engagement with a strong technical expertise."

Challenge: Some believe that it is "very tough to sell to residential" and "needs to revert to marketplace model."

Energy Efficiency

TE-\rDRIL[®]

Boulder, CO

Tendril

operates a cloud-based software platform



to deliver personalized energy services.

Love it: "Has strong new partners" and "has a unique solution that addresses a growing market demand."

Challenge: "The company has pivoted its business model 5 times in the past 11 years," but some think they may have finally found traction both in the US and abroad.

Lust List: At the top of the 2015 List — as measured by companies that received the most peer validations in the expert panel assessments without any negative cases made against them — are the following three companies:

Energy Efficiency



Digital Lumens

is a developer of intelligent LEDbased lighting systems for industrial facilities.



an area which is "easily overlooked, but Digital Lumens is on its way to capture and transform a whole lot of it." Their technology reduces lighting energy use and provides fully integrated controls and reporting capabilities. They are "leaders in their segment, and are showing strong growth."



enlighted

Sunnyvale, CA

Enlighted is a

provider of lighting control systems for energy management applications. "They've won the

early land grab by using proven, standard hardware and smart data management." Our panelists were also impressed by a "fantastic management team." "I just love this company and its practical approach. This is a winner," said one panelist.

Energy Storage

Stem is "racking up big customer names with a compelling energy storage proposition." The



company uses "predictive analytics to optimize battery use to cut demand charges," and was universally praised as a "great use case for profitably deploying storage." Our expert panel believed their "behind-the-meter approach to addressing demand charges is impressive."



stem

Millbrae, CA

5. The Global Cleantech 100 by Sector





The Global Cleantech 100 by Sector – Continued

1. New Sub-Sectors Emerge as an Opportunity to Solve Global Challenges

The presence of a wide array of sectors represented in the GCT100 (17 in total) demonstrates not only the increasing variety of sustainable technology solutions but also the changing tide of investor preferences and market needs. Where energy efficiency and solar captured 30 to 40 percent of the list over the past 6 editions, areas that previously played a very minor role – if not absent all together – like **Air** and **Nuclear** have each increased their presence. This corresponds with our predictions since 2011 (*Emerging Market Demand Continues to Show Hunger for Technology and Innovation*) and the macro-trends we noted in the 2014

Global Cleantech Innovation Index¹ that there is less venture stage investment in renewables, and more emphasis on global resource challenges like clean water availability, sustainable food sourcing, and land and air pollution. Brand new sector additions and ones we expect to continue to shape future innovation trends include **Internet of Things** and **Unmanned Aerial Vehicles**. These areas are somewhat ubiquitous in terms of their relevance to a range of industries, but they also hold tremendous opportunity to collect and monitor data on climate and other environmental constraints of our planet (see section 6.3).

2. Transportation, Energy Efficiency Remain 'Old Darling' Sectors

Eight sectors (illustrated below) have been consistently in the GCT100 – even though the numbers fluctuate year to year and there is an element of company turnover. Investor appetite has trended more than ever towards **Transportation**, particularly the software companies that are revolutionizing mobility supply chains. Examples include sharing economy companies like **BlaBlaCar** and **Uber**, traffic/big data apps like **INRIX** and **Moovit**, and fleet and semi-autonomous vehicle software **VisionFleet** and **Peloton Technology**, which are largely responsible for driving up the sector's valuations (as you can see from the positioning of Transportation in the chart below). However, 'hardware' may be staging a comeback in the future: as battery costs come down, we may see more EV infrastructure (**ChargePoint**), battery powered buses (**Proterra**), and new business models surrounding electric vehicles and hydrogen electric vehicles.

Top Sector Representation in 2015 — Global Cleantech 100 by Paid-in-Capital/Revenue



Note: Uber was taken out of calculations for the Transportation sector as an outlier with >\$2billion in revenues and capital raised.

¹See http://info.cleantech.com/CleantechIndex2014.html, pg 8.

The Global Cleantech 100 by Sector – Continued

Energy Efficiency, for the fifth year in a row, appears as the leading sector, with 21 companies in the GCT100 (illustrated as the largest circle in the figure on the previous page). This category remains popular for its 'capital light' plays (compared to other longer-horizon sectors like Biofuels & Biochemicals). The majority are providers of intelligent software for building energy management, HVAC solutions or waste heat systems

such as **Building Robotics**, **Alphabet Energy** and **Bowman Power** with a few newcomers focused on energy efficiency financing solutions (see section 6.6). **Next Step Living** is the only remaining smart home company with a B2C business model in this category (with GCT100 graduates² like Nest and Opower coming off the list since being acquired and going public respectively).

3. Advanced Materials, Water Increasingly Prevalent but No Big Bets Placed Yet

Advanced Materials and Water & Wastewater, despite being increasingly popular sectors to invest in,³ have raised a relatively small amount of capital and likewise achieved proportionally smaller revenues compared to other sectors. **Advanced Materials** companies in the GCT100 are comprised of a spectrum of areas from graphene (**Skeleton Technologies**) to thermoplastics (**FRX Polymers**) to nanomaterials (see examples in section 6.4) while **Water & Wastewater** include a number of fracking, groundwater and wastewater treatment companies (e.g. **AP-**

4. Solar and Energy Storage are Trading Places

Solar has experienced the biggest downward trend in the GCT100, with six companies in the list compared to twenty at the height of its representation in 2009. With the exception of **Sungevity**, the solar systems integrator, there are no remaining companies on the list focused on utility-scale or residential photovoltaics. We believe this is a result of the rapid maturation of this space, with a sub-set of companies

ATEQ, Saltworks Technologies, and OxyMem respectively). These companies are tailoring solutions to industries like Oil & Gas and Automotive which are increasingly searching for ways to maximize resource and operational efficiencies. Nonetheless, high-stakes are not yet being placed in these areas (as illustrated by the low average paid-in-capital on the previous page), even for the crème of the crop companies that we have identified in the Global Cleantech 100. We think *The Best is Yet to Come*⁴, in the coming years for these sectors.

graduating from the list through IPO (SolarCity, Sunrun, SunEdison) and as we noted since 2013 – *Deployment Levels Continue to Trend Upwards* – with the global solar market projected to reach \$109 billion in 2020.⁵ Instead, a new minitrend has arrived, with several solar companies focused on off-grid solutions in emerging markets (see page 17).



Sector Representation Over Time: Comparison of Solar versus Energy Storage

²Graduates are companies that have made an exit either through acquisition or IPO in subsequent years after making it to the GCT100. ³You can find more data on investment trends across 18 sectors at i3connect.com. ⁴Looking Forward, Looking Back: *The Best is Yet to Come*, 2014

⁵Statistic from Bloomberg New Energy Finance noted in PV Magazine, June 2015



The Global Cleantech 100 by Sector – Continued

Where **Solar** has fallen, **Energy Storage** seems to be filling the gap. We see this as a positive sign. The sector demonstrates the biggest jump in representation on the list – growing from seven to twelve companies since 2014. A remarkable number of these companies are battery and ultracapacitor businesses, including **Advanced Microgrid** Solutions, Aquion Energy, Imergy Power Systems, Ioxus, Imprint Energy, Skeleton Technologies and Younicos as well as a number of companies providing big data software bundled with storage hardware components (see section 6.2).

5. Agriculture & Food Will Become a More Prevalent Theme

Four companies in the GCT100 are officially categorized as Agriculture & Food. It is worth noting, however, that many other companies on the list are just on the periphery of this sector, or are facilitating innovation in agriculture among other industries (as described in section 6.3 and section 6.5). While past GCT100 editions drew in 2-3 companies from traditional agri-tech themes such as plant genomics, breeding technologies and pest/disease control (e.g. Vestaron, Marrone Bio Innovations, Arcadia Biosciences), new excitement is moving toward precision agriculture. On the list this year are companies enabling more resource efficient farming through drone technology, such as PrecisionHawk, Planet Labs, and Airware, as well as nutrient-rich fertilizer developers like Anuvia, Ostara, and Harvest Power. Meat substitute companies are also appearing - arguably the most sustainable means of sourcing food protein in the future such as Impossible Foods and Ynsect.



Venture Capital Investment over the last 5 years in Agriculture & Food shows a steady increase - see more on i3connect.com

6. The Megatrends of the 100

One of the key outcomes of the annual Global Cleantech 100 exercise – the extensive analysis on which we identify companies that carry the most evidence of widely-held admiration amongst market players – is that we get to observe how sentiments shift, and how sector and thematic trends ebb and flow as well. In the following pages we identify and illustrate six megatrends. But first, here are three introductory observations:



The Megatrends of the 100 – Continued

1. Big Data Management is a Growing Feature of the 2015 GCT100

One-third of the GCT100 companies have explicitly called out 'big data' as a key component of their offering. An increasing number of innovation frontrunners are staying competitive by providing analytics that sync to the cloud and mobile devices either as standalone solutions or in combination with hardware. Last year we identified an emerging group of **Big Data Solutions Providers for Utilities** such as **Autogrid Systems**, **Enbala Power Networks**, **Gridco Systems** and **KiWi Power** who are leveraging data to improve the security and reliability of grid infrastructure or ameliorating energy management systems in buildings. This year, an even bigger cohort of companies (in section 6.2) are providing holistic energy services - including big data predictive and control software - not just for Utilities to manage their assets but eventually to automate distributed energy consumption.

Other clusters of companies in the GCT100 are demonstrating the multitude of commercial applications where big data can have a big impact on more efficiently managing resources. Those are:

- The Big Data and Internet of Things Tools for Monitoring the Planet (section 6.3) which leverage data and satellite technology to create actionable intelligence on how to manage our planet's resources better.
- More Power to All: Democratizing Energy Access (section 6.1), where we see how big data and mobile communications are enabling scalable business models to provide electricity to isolated, off-grid communities in the developing world.

2. The 2015 GCT100 are Increasingly Delivering 'Cleantech as a Service'

We see the continued relevance of *The Consumer-Centric* Business Models identified in the 2014 report. It is clear that this year's Global Cleantech 100 companies are more focused on delivering end-customer services - not just software or big data management as a service (as just outlined) but lighting 'as a service' (e.g. Enlighted and Digital Lumens) or energy storage 'as a service' - the move from product selling to service providing has become a popular model. Companies are also increasingly seeking out key partners in order to expand their customer offering. As an example, Airbnb partnered with Tesla (a GCT100 alumnus) to offer electric vehicle charging points for free to Airbnb rental owners. It still remains true that the most progressive consumers are demanding sustainable solutions while simultaneously becoming the 'anti-consumers,' preferring access and connectivity to goods rather than ownership. As one panelist described, INRIX, the developer of a predictive traffic service system, is "the backbone of future autonomous and current navigational technologies that power the resource conscious present and future." Those resource conscious consumers are the ones triggering the almost outrageous success of companies (for example, Uber and others in the Transportation sector referred to on page 13).

Section 6.6 titled Financing Solutions Accelerate Technology Adoption at the Customer End also illustrates examples of companies that are providing financial tools to enable adoption of sustainable innovation earlier than consumers would otherwise. Sungevity's partnership with

Sunrun (another



GCT100 alumnus) is an apt illustration of two companies working together to provide financing and asset management solutions to the increasingly competitive domestic and commercial solar installation market.



The Megatrends of the 100 – Continued

3. The 2015 GCT100 are Helping Old Industries Re-Invent Themselves

Utilities, Oil & Gas, Transportation and other major industries are undergoing tremendous overhaul – and the GCT100 are helping them re-invent themselves in order to 'get with the times.' These companies are not only embedding sensors and capturing data on day-to-day industrial operations but also finding ways to help them move towards a re-use/recycle economy model. Like last year's megatrend: *From Waste to Wealth: Recovery of a Trillion Dollar Market*, this year, we see both the Manufacturing (section 6.4) and Agriculture & Food (section 6.5) industries, like never before, creating value out of waste whether through biofuels production and carbon capture storage or just keeping "perfectly useable stuff out of landfills," as one panelist put it.



6.1. More Power To All: Democratizing Energy Access

We have seen a number of companies that aim to offer off-grid solutions to the ~20 percent⁶ of the world's population yet to have access to electricity across Africa, Asia and India. New scalable business models are emerging to provide flexible approaches to harnessing power for everyday cooking, charging and lighting.

a) Energy Storage

Fluidic Energy is a developer of high-cycle life zinc-air energy storage technology for low-cost backup power to cellular towers in developing countries. The company has partnered with Caterpillar Inc. to provide electricity to 500 remote villages throughout Indonesia.

Imergy Power Systems will help SunEdison bring reliable electricity to millions of people in rural India with its vanadium flow battery. According to one panelist, Imergy's *"revolutionary technology is drastically outperforming Li-ion and other battery technologies."*



b) Lighting

d.light design manufactures and distributes solar lighting and power products in the emerging markets, described by one panelist as *"the shining star in affordable energy products"* with *"strong manufacturing capabilities and good connections for distribution."*

c) Solar

M-KOPA Solar is a provider of 'pay-as-you-go' energy for offgrid customers and has provided over 250,000 connected energy devices in Africa. According to several panelists, the company has *"a great business model that's scalable across much of East Africa."*

Off Grid Electric is offering 'solar energy as a service' in Tanzania, working to encourage people to switch from kerosene to solar at a lower cost, which will enable more people to light their homes.



6.2. The Multi-Dimensional Solutions for Utilities and Their Customers

A crop of companies in the GCT100 have emerged with combinations of solutions to address the whole energy management chain. Many develop energy storage hardware components as well as software applied to anything from grid stabilization to asset management to automated demand response, enabling utilities and their customers to both monetize distributed energy resources and benefit from a host of new services.

a) Behind the Meter

A combination of hardware and software components are being developed to connect and digitalize assets to better monitor and manage building energy use. Through in-depth data analytics, these companies can predict power spikes and produce insight into inefficient use of HVAC and lighting systems, or other loads. Examples include:

Stem is a provider of storage solutions and behind-the-meter learning software with the added benefit of no up-front cost to the building owner.

Blue Pillar is a developer of a software platform that integrates backup power systems with software to control any energy asset. Its 'Digital Internet Energy' platform *"solves a fundamental challenge of any basic coordination of assets (storage, generation, meters) on the customer side of the meter."*



Aurora is one of Blue Pillar's software products with multi-faceted offerings

b) Micro-Grids & Backup Power

Micro-grids are the latest solution to peak power reduction, and to ensuring backup power in the event of a physical or cyber security attack at the grid edge.

Advanced Microgrid Solutions (AMS) and Green Charge Networks are installing batteries in buildings to reduce demand charges and – potentially – to serve as grid-responsive energy assets.

Green Charge Networks and **Chargepoint** have partnered together to combine energy storage with EV charging, also eliminating the high cost of demand charges caused by spikes in power usage – often a barrier to installing EV charging stations.

Geli is "pioneering the concept of the Energy Operating Systems: a plug & play multi-platform management system for Energy Storage devices to interface with nano & microgrids."

c) Solar + Storage

As energy storage becomes cost competitive to conventional alternatives, some companies are preparing for a new scenario to materialize in the next five years, in which residential storage will be paired with solar panels.⁷



Picture of Sunverge's software services which monitor solar use along with the storage unit

Sunverge Energy "combines the ability to store electricity for up to eight hours with cloud-based software that can manage the output from many divergent sources," ensuring energy reliability and accelerating the integration of renewable energy and EVs.

Sonnenbatterie's Li-ion battery storage systems are being integrated into Sungevity's rooftop solar installations. The company is a *"perfect complement to solar powered mini-grids,"* said one panelist.

d) Virtual Power Plants (VPPs)

AutoGrid Systems, Geli,

and **Sunverge** among others are leveraging their existing software to provide power to utilities through virtual power plants (VPPs). Through aggregating and distributing variable renewable energy resources, these companies are more efficiently able to match local load with local capacity.

Next Kraftwerke is both a

virtual power plant operator and an energy trader with *"good market traction in Germany in aggregating biogas, wind, solar and CHP plants,"* according to a panelist.



6.3. The Big Data and Internet of Things (IOT) Tools for Monitoring the Planet

We have observed that a number of GCT100 companies are playing a role in environmental preservation and resource safety through drones, sensors, cloud services, wireless networks and machine learning tools that can monitor anything from pollution, land, forestry, water, transportation and energy.



You can Search for More Big Data and IOT Companies in i3 connect

a) Unmanned Aerial Vehicles (UAVs) and Satellites

UAVs were traditionally used for military operations, but are now being deployed for wider commercial use – namely for agriculture, farming research (pesticides, water treatment, livestock) and other land surveying applications. Further 'satellite' or remote sensing technologies are being developed for gathering and/or mapping geographic or atmospheric intel. Some key examples include:

Airware is the creator of a commercial drone 'operating system' used for *"land surveying, wind turbine inspection, farming, bridge inspection, and other*



tasks, and they have made significant positive impact on safety and the environment by replacing traditional methods that are often more resource-intensive," explained one panelist.

PrecisionHawk combines UAVs, artificial intelligence and remote sensing technologies to improve business operations and decision-making in data intensive industries. *"It has a number of potential market verticals including precision agriculture, forestry, livestock management and energy."*

Planet Labs provides earth-observation satellites that dissect "granular, daily information to enable efficient deforestation reduction, agricultural improvements, and efficient transport and pollution reduction," explained one panelist. Leosphere has developed a LIDAR (Light Detection and Ranging) technology for atmospheric observation, providing wind measurement and aerosol characterization. It has been used for wind turbine measurement, but also as a mechanism to detect severe weather and atmospheric hazards (from ash plume to air pollution to high dust levels).



Picture of Leosphere's lidar surveys for aerosol and wind measurement

b) Internet of Things and Sensors

Companies are increasingly building their businesses around connected devices, machines and sensors, which are powerful tools for collecting information on products and processes with many beneficial outcomes for energy and the environment. Many IOT companies are innovating in the water & wastewater sector (see appendix 2 page 33), but some examples from a few other sectors include:

SIGFOX has manufactured an ultra-narrow band technology for cellular connectivity of devices – *"an essential brick to IOT,"* explained one panelist. The company is embedding its technology across many devices in the agriculture and smart cities space, among others. In reference to SIGFOX, one panelist proclaimed there is no competition and *"only a few players could share the world."*

Farmers Business Network (FBN) employs data science and machine learning to provide its members with insights about each other's fields and to help them improve on their own farming practices.

Space-Time Insight

utilizes environmental and equipment sensor data in addition to real-time weather data feeds for situational intelligence solutions for grid operators to optimize their assets (fitting also into section



6.2's theme). The company uses its predictive analytics for a number of industries (transportation, natural gas) to monitor infrastructure, vegetation and security of operations.

6.4. The Latest Materials for Advanced Manufacturing

The future of manufacturing will depend on a number of breakthroughs in next generation materials to make products with less matter, less energy and less toxicity to humans and the environment. The combination of advances in materials with developments in 3D printing has the potential to transform many industries – from cement to steel to automotive industries, down to electronics and consumer products.

a) Raw Materials From Industrial Carbon Capture

Carbon Capture and Storage (CSS) is a key technology for eliminating carbon from manufacturing facilities, while simultaneously converting carbon back into valuable materials. Examples include:

Carbon Clean Solutions develops non-corrosive solvent technology for industrial carbon capture and reuse, which can be used in the steel, cement, fertilizer, chemical and petrochemical industries. The CO_2 recovered can be used as a raw material for downstream industries.

CarbonCure Technologies is producing carbon-sequestering equipment for precast concrete production. *"CarbonCure saves time and money by reducing the amount of concrete to achieve the same engineering strength,"* claimed one panelist. *"It is time something is made to bring a 2,500 years old material into the 21st century,"* declared another panelist.

Skyonic is a

developer of CO₂ mineralization technology for industrial use in capturing carbon emissions as valuable byproducts. Skyonic can transform greenhouse gases (GHG) into carbon-



negative products for the manufacture of PVC pipes and glass, cattle feed, and steel pickling.

b) Nanomaterials

Materials developed at the nanoscale have many beneficial uses for energy efficient products and processes.

Canatu makes transparent and conductive films for touch screen applications in electrical devices, mobile phones, and home appliances via their 'Direct Dry Printing' manufacturing process. A *"truly differentiated product offering 3D capability, whilst simultaneously decreasing the usage of toxic Indium Tin Oxide,"* said one panelist. **NBD Nanotechnologies** is producing hydrophobic coating materials to improve heat transfer performance of industrial condensers in power plants. *"The impact could be huge, as the technology could be applied to the whole fleet of existing thermal power plants."*

NanoSteel specializes in the design and commercialization of patented steels derived from their nano-scale microstructures. The company is creating a **"new family of materials"** with promising developments in such areas as powders for additive manufacturing.



c) Battery Materials

Aquion Energy's patented technology provides high performance energy storage for long-duration stationary applications. Aquion is using non-corrosive reactions at the anode and cathode to prevent deterioration of materials.

Fluidic Energy has developed a zinc-air battery technology that is rechargeable and well suited to grid storage applications. Founded by materials scientist Cody Friesen, Fluidic's technology has no toxic elements and has an improved carbon footprint compared to traditional batteries.

Imprint Energy is a

flexible thin-film battery technology for wearable electronics and is leading the way in printable, flexible battery design and materials. According to one panelist "the company's proprietary ZincPoly™ chemistry offers significant performance, safety, processing and design advantages over conventional battery chemistries."



An example of Imprint's flexible battery technology



6.5. The Food Frenzy Makes Its Way into the Circular Economy

The GCT100 and other innovation companies at large are increasingly working on different stages of the food life-cycle – either enabling food production to be less resource intensive or creating valuable byproducts (like bioenergy) out of food processes. Careful attention is being paid to how food is farmed, what nutrients go into food production, what happens to food waste, and how food is packaged and delivered to consumers. We have seen in section 6.3 a number of companies that gather data on agricultural practices to better help inform decision-making. However, this section extends across a wider spectrum of the food value chain.

a) Waste to Fertilizer

Discarded materials can become a 'gold mine' if treated creatively. We see several companies using waste as fodder for valuable nutrients for crop management.

Anuvia Plant Nutrients "has an amazing process that has a massive impact on redirecting from landfills." The company converts bio solids and animal residuals into a slow-release, high-nitrogen fertilizer product used for food crops.

Ostara Nutrient Recovery Systems provides a "cost effective conversion of waste to value and advantaged nutrients for agriculture." The company recovers phosphorus and nitrogen from used water streams and transforms them into



nutrient-rich fertilizer used to optimize crop performance.

Harvest Power is developing systems that maximize the value of food waste to produce soils, mulches and natural fertilizers. "Harvest has a strong project execution and technology for larger-scale conversion of organic wastes to beneficial biogas and bulk soil amendments in major retailers worldwide."

b) Food for Biofuels

Companies at the food-energy axis are reusing waste from agricultural processes, or growing new non-food based crops, to create more sustainable sources of energy.

Green Biologics is a developer of microbial, fermentation and process technology to turn readily available waste and agricultural by-products into high value chemicals and fuels. NexSteppe is breeding sorghum to create renewable feedstocks for biofuels, biopower and biobased products.



c) Chemicals for Food Packaging

Avantium has developed bio-based PEF plastics which can bring significant benefits to packaging material for oxygen-sensitive goods such as food. The company has a *"long term opportunity to replace petro based products such as bottles,"* according to one panelist.

d) Meat Replacement

Given the rate at which our population is growing, we will not be able to sustain our meat consumption forever; and moreover, the huge environmental impact of meat production (on our water supply and on CO_2 emission) has led several companies to develop alternative food options.

Impossible Foods is

tackling the resourceintensive meat industry by designing artificial meat. *"This company* has an incredible potential to change the food system," said one panelist.



Ynsect specializes in producing and selling insect-based products, and is addressing the "huge needs for proteins for animal and human consumption." The company has a "good team tackling the challenge of feeding a 9 billion people planet," claimed one panelist.

6.6. Financing Solutions Accelerate Technology Adoption at the Customer End

Deployment capital is essential to getting clean technologies into the hands of their customers – many of whom prefer a 'pay for service' or 'pay as you save' model, as opposed to up-front investment and installation costs especially for new products, even with the prospects of long term cost savings.



a) Financing Solar and Building Efficiency

As solar becomes commercially viable and moves from thirdparty owned to customer owned, the market for financial products in that context is growing. Property owners will have more options for energy efficient home improvements and solar installations through smart financing loans, yieldcos, power purchase agreements (PPAs) and programs like Property Assessed Clean Energy (PACE). Below are a few examples of companies that are facilitating customer technology adoption:

Clean Power Finance provides an online marketplace for finance and installation solutions for the solar industry. Their project finance solutions are *"an important part of the 'background infrastructure' that has to be in place for solar to really take off,"* claimed one panelist. The company's merger with Kilowatt Financial, the provider of solar PPA's, is a positive sign of more sophisticated solar consumers requiring new capital instruments.

Renew Financial allows property owners to finance the cost of energy efficiency, water efficiency and renewable energy upgrades. They are *"the first to create a compelling nationwide residential efficiency loan product - completing the first public securitization on Wall Street and earning a Single 'A' rating."*

Renovate America offers financing for renewable installations, their edge being *"a winning combination of an installer network and a financing platform through its use of the PACE program."*

Anesco is a UK-based energy services company (ESCO) which provides energy efficiency audit, retrofitting services and capital funding plans. It has also setup funds with banks like RBS to provide free biomass boilers and solar installations. **Enlighted** is *"using the successful solar project finance model for LED lighting,"* noted one panelist. The company installs its networked lighting system at no up-front cost but then takes a cut off of customers' monthly savings from their electric bills to earn back its investment.

b) Financing Energy Storage

Grid-scale energy storage might still be in its infancy compared to solar, but new project finance models are similarly becoming the key to unlocking the sector's potential. We anticipate more variety of investment vehicles and models to appear in the future as storage begins to take off. Current financing models are coming directly from the hardware installers such as:

Stem announced a \$5 million project financing fund with Clean Feet Investors to enable its customers to obtain its energy storage system with no upfront costs. They offer a leasing model – rather than owning the storage equipment, customers pay for energy storage as a service.

Green Charge Networks installs its lithium-ion batteries with performance-based and shared saving financing solutions for its customers.

Younicos develops micro-grid and gridscale PPA agreements in addition to storage installation for its customers and leverages financial partners to pre-package solutions to better enable switching from fossil-fuel peaker plants.



c) Financing Alternative Fuel Vehicles

VisionFleet offers alternative fuel vehicle fleet services including charging infrastructure, telematics and car-sharing technology, in addition to tax-efficient financing *"similar to what solar leasing and PPAs did for the solar industry."*



Advisory Board

Cleantech Group benefits from the advice and support of some of the most active and leading organizations in the clean technology ecosystem. Advisory Board memberships are reserved for only certain types of organizations, in particular for the most involved, committed and influential players in the world of open innovation and sustainable innovation.

North American Advisory Board







Cleantech. Group

Learn more www.cleantech.com/about/advisory-board

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FAQs on the Global Cleantech 100

Who can qualify for the annual Global Cleantech 100 list?

Any independent, for-profit cleantech company that is not listed on any major stock exchange, or is not a majority-owned subsidiary of another company.

What is considered cleantech?

CTG uses more than 900 unique identifiers to classify companies in important areas of innovation, organized by 18 over-arching categories. To see how our 18 cleantech sectors are broken down, please visit i3connect.com.

Who can nominate for this award?

Nominations are open to any market participant through the Global Cleantech 100 website cleantech.com/indexes/ global-cleantech-100/ and on i3connect.com. Those interested in taking part in the process are asked to nominate a minimum of three qualifying companies and a maximum of nine. Nominations must adhere to the 'Lust List principle' – meaning if you nominate your own company (or one you are part owner of) you must nominate at least two others that you admire (with which you have no association).

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he 2015 list			Glol Clea	oal ^{'15} - antech	00
LOGO	COMPANY NAME 🔻	COUNTRY A	FUNDING A	SECTOR A	
(airbnb	Airbnb	USA	\$801.4M	other cleantech	2008
F Airware	Airware	USA	\$35.7M	other cleantech	2010
alphabet energy	Alphabet Energy	USA	\$2.9M	energy efficiency	2009
	Aquion Energy	USA	\$123.4M	energy storage	2007
AutoGrid	Autogrid Systems	USA	\$21.75M	smart grid	2010
ST BOWMAN	Bowman Power	United Kingdom	\$35.02M	energy efficiency	2004
BUILDING III	Building Robotics	USA	\$6.64M	energy efficiency	2012
Carbon Clean CCS Solutions	Carbon Clean Solutions	United Kingdom	\$1.05M	other cleantech	2012

Where can I find more information about the Global Cleantech 100 companies?

More in-depth profiles, additional stats and analysis, and the latest updates on the Global Cleantech 100 companies can be found on i3connect's GCT100 section⁸.

How can I increase my chances of being a Global Cleantech 100 company?

Cleantech Group pulls from a number of public sources and expert panel opinions. We encourage cleantech companies to create or update their profile on i3connect. com to ensure we have not missed any important public data. We pride ourselves on this list coming out of a robust system, and not a "popularity contest," so getting all of your friends and family to nominate you will not give you better odds.



Phase I: Nominations

Nominations come from 4 sources:

Cleantech

- 1. Public nominations submitted by Cleantech Group's network and other market participants.
- 2. Collection of nominations derived from 414 third party awards and other rankings where expert assessment has already been applied.
- 3. Passive nominations from data in i3connect.com, based primarily on investment history (venture backing, grants, project financing, etc.) and significant commercial partnerships (e.g. channel partnerships, technology development partnerships, or pure customer/supplier relationships).
- 4. Nominations from the expert panel, also adhering to the lust list principle (see previous page) before the voting process in Phase III.

In 2015, **6,900** companies were nominated, which was then filtered by a scoring system to a short list of **323** companies for consideration by our expert panel.

Phase II: Scoring

The scoring system rewards companies that have multiple validations across multiple sources, to align with our objective to synthesize and represent collective opinion. Therefore, a company that has completed numerous market transactions (tracked through i3connect.com), been nominated by multiple people in the market — both publicly and within our expert panel — and appeared in third-party rankings, will tend to score better under our methodology than a hidden gem that few know about and vote for.

Phase III: Expert Panel Voting

The 100 expert panelists evaluated the 323 shortlisted companies based on the following three criteria:

- 1. Innovation (the problem it solves; uniqueness; sustainability of advantage, etc.)
- 2. Market (accessibility, size, growth dynamics, barriers to entry, etc.)

3. Ability to execute (finances, team competencies, connections and networks, etc.)

The expert panel could vote positively OR negatively for up to 50 companies in the shortlist and were invited to provide commentary.

Phase IV: The Final 100

A combination of data from Phase I and Phase III are pooled together, and adjusted as much as possible for geographic or other biases. Companies with the greatest number of points overall made it to the final 100.



Appendix 1: Expert Panel

For individual biographies of our expert panel, please go to: http://www.cleantech.com/indexes/global-cleantech-100/expert-panelists/

Laura Nereng, Business Development Manager, ${\bf 3M}$

André Loesekrug-Pietri, Managing Partner, **A Capital**

Grant Allen, Senior Vice President, ABB Technology Ventures

Alex Betts, Managing Partner, Adaxia Capital

Rhea Hamilton, Managing Director, Aeris Capital

Greg Fleming, Investment Director, ALIAD (Air Liquide)

Taejoon Park, Senior Investment Associate, **Applied Ventures**

Nathaniel Gorence, Technology-to-Market Advisor, **ARPA-E**

Pascal Siegwart, Partner, Aster Capital

Björn Heinz, Investment Manager, BASF Venture Capital

Anthony Van Bommel, Senior Managing Partner, **BDC Capital**

Dr. Karl Ludwig Kley, Managing Director, Bilfinger Venture Capital

Rob Day, Partner, Black Coral Capital

Ulrich Quay, Managing Director, **BMW i** Ventures

Meghan Sharp, US Director, **BP** Ventures

Sulkhan Davitadze, Investment Director, Bright Capital

Sophie Baeten, Managing Partner, Capital-E

Paul Decraemer, Partner – Cleantech Investment Practice, Capricorn Venture Partners

lan Cooke, Director, Carbon Trust

Dr. Wal van Lierop, President & CEO, Chrysalix Energy Venture Capital



Paul Straub, Partner, Claremont Creek Ventures

Stefan Brand, Senior Manager, New Business Development, Clariant

Peter Kennedy, Managing Director, **CLSA Capital Partners**

Andrée-Lise Méthot, Founder and Managing Partner, Cycle Capital Management

Nancy Pfund, Managing Partner, **DBL** Investors

Olivier Dupont, Chairman of the Board, **Demeter Partners**

Steve Hahn, Senior Research Scientist, **Dow Chemical**

Rodrigo Navarro, New Business Creation Manager, **DSM Innovation Center**

Konrad Augustin, Head of SCI US, E.ON

Dr. Paul-Josef Patt, Managing Partner & CEO, eCAPITAL

Chris Morrison, Assistant Vice President, Technology Scout Team, Ecolab

Ilian Iliev, CEO, EcoMachines Ventures

Valery Prunier, Director, Innovation North America, **EDF**

Luis Manuel, Executive Director, **EDP** Inovação

José Eduwardo Claro Glorigiano, Growth/Innovation Senior Manager, Embraco

Gina Domanig, Managing Partner, **Emerald Technology Ventures**

Riccardo Amoroso, Head of Innovation & Sustainability, **Enel Green Power**

Wally Hunter, Managing Director, **EnerTech Capital**

Hendrik Van Asbroeck, Director, Engie New Ventures

Klaas de Boer, Managing Partner, Entrepreneurs Fund



Appendix 1: Expert Panel

Fabrice Bienfait, Principal, Environmental Technologies Fund

Dr. Lutz Stoeber, Investment Director, Evonik Venture Capital

Dirk de Boever, Head of Investments, **Finindus**

Ignacio Martinez, Partner, Flagship Ventures

Chris Thomas, Founder and Partner, **Fontinalis Partners**

Andrew Lackner, Senior Director, Investments, **GE Ventures**

Colin Le Duc, Partner, Generation Investment Management

Nicholas Atkins, Partner, Georgieff Capital

Sherwin Prior, Managing Director, GM Ventures

Eric Wang, Partner, GRC Chrysalix

Jamie James, Chief Innovation Officer, Greensoil Investments

Thorbjorn Machholm, Group Director, Business Development, Emerging Water Technologies, **Grundfos**

Tao Xie, Disruptive Technology Director, Haier

Catherine Jhung, VP, Technology and Energy Technology Groups, Hercules Technology Growth Capital

Robert Liu, CEO, Huaneng Invesco

Amit Shilony, Business Development Manager, Hutchison Kinrot

Diego Diaz Pilas, Head of New Ventures, **Iberdrola**

Peter Williams, Chief Technology Officer, Big Green Innovations, **IBM**

Nicolas Chaudron, Partner, Idinvest Partners

Christian Ehrenborg, Managing Director, **IKEA GreenTech**

Kelsey Lynn Skinner, Director, Technology Ventures, Imperial Innovations

Sean Petersen, Senior Investment Officer, International Finance Corporation

Joe McGee, Executive Vice President, Strategic Planning & Development, Jabil

Kevin Self, Senior Vice President, Schneider Electric, (formerly Vice President, Johnson Controls)

Eric Tao, Partner, Keytone Ventures

Kai Engelhardt, Head of Corporate Venture Capital, Mahle

Adam Rein, Principal, MissionPoint Capital Partners

Kevin Kuhn, General Manager, Mitsubishi

Dr. Martin Kröner, Managing Partner, Munich Venture Partners

Ravi Viswanathan, Partner, New Enterprise Associates

Sasha Brown, Vice President, New World Capital

Keith Gillard, General Partner, Pangaea Ventures

Gabriel Kra, Managing Director, **Prelude** Ventures

Iñigo Palacio Prada, Deputy Director, Repsol New Ventures

Keimpe Keuning, Investment Director, **RobecoSAM**

Dhiraj Malkani, Partner, Rockport Capital Partners

Fabien Mondini, Senior Investment Manager, **SABIC Ventures**

Chris Brown, Partner & Chief Scientist, **SAIL Capital Partners**

Dorothee Martin, External Venture Manager, Saint-Gobain NOVA

Brian Tolliver, Director, Strategy & Business Development, Schneider Electric

Wouter Jonk, Managing Director, **SET** Ventures

Gerd Goette, Investment Partner, Siemens

Matt Maloney, Head of Energy & Resource Innovation Practice, Silicon Valley Bank

Joshua Raffaelli, Partner, Silver Lake

Thierry Piret, Head of Corporate Venturing, **Solvay Ventures**

Dr. Mark Bonnar, Investment Director, Southern Cross Venture Partners

Kurt Faulhaber, Partner, Stafford Capital Partners

Eric Landais, Managing Director, Suez Environment

David Harris Kolada, Vice President, Alliances & Market Development, Sustainable Development Technology Canada

Andreas Stubelius, Senior Project Manager, **Swedish Energy Agency**

Todd Jaquez-Fissor, Managing Director, **Tennenbaum Capital Partners**

Astorre Modena, Partner, Terra Venture Partners

Nick Cizek, Sensor Strategist, Climate Corporation

François Badoual, CEO, **TOTAL Energy** Ventures

Steve Kloos, Partner, True North Venture Partners

Stephan Dolezalek, Managing Director, VantagePoint Capital Partners

Peter Auner, Partner, VNT Management

Pat Ramm, Director, Corporate Venturing, Waste Management

Khalil Maalouf, Managing Director, XPV Capital Corporation

Samer Salty, CEO, Zouk

ADVANCED MATERIALS			
CANATU	Canatu (Finland) is a manufacturer of thin film components and carbon nanomaterials		
CARBON CURE.	CarbonCure Technologies (Canada) is a producer of carbon-sequestering equipment for precast concrete production		
DyeCo, Dyeing Technology	DyeCoo Textile Systems (Netherlands) is a producer of machines for dyeing textiles with carbon dioxide instead of water		
e-leather	E-Leather (United Kingdom) is a producer of engineered materials based on waste from the leather industry		
FRX polymers	FRX Polymers (United States) is a developer of a patent protected, non-halogen, non-burning family of transparent high flow thermoplastics		
Gan Systems	GaN Systems (Canada) is a developer of gallium nitride (GaN) technologies		
ke DO Fy	Kebony (Norway) is a manufacturer of sustainable hard wood created by modifying sustainably sourced soft wood		
inano	NBD Nanotechnologies (United States) is a developer of highly hydrophobic coating materials that have anti-wetting and improved condensation performance		
NANOSTEEL	NanoSteel (United States) is a developer of advanced nanostructured steel solutions for automotive, oil and gas and advanced manufacturing applications		
SKELE-ON	Skeleton Technologies (Germany) is a manufacturer of graphene ultracapacitors, using patented curved graphene technology		

AGRICULTURE & FOOD

1	
	Anuvia Plant Nutrients (United States) formerly VitAG Corporation, is a developer of technology that con- verts organic feedstock into a slow-re- lease high-nitrogen fertilizer product
FARMERS BUSINESS NETWORK	Farmers Business Network (United States) is a developer of a membership website for farmers to upload data-sets and share information
IMPOSSIBLE	Impossible Foods (United States) is a producer of plant-based meat replacement patties
∕ Ynsect∕	Ynsect (France) is a developer of bioconversion solutions of organic resources by insects for feed and nonfood applications
Bayeco	Bayeco (China) is a producer of industrial pollution control solutions for the oil & gas and chemical industries
Bayeco Carbon Clean Solutions	Bayeco (China) is a producer of industrial pollution control solutions for the oil & gas and chemical industries Carbon Clean Solutions (United Kingdom) is a developer of non- corrosive and proven solvent technology for industrial CO2 capture and reuse
Bayece Carbon Clean Solutions	Bayeco (China) is a producer of industrial pollution control solutions for the oil & gas and chemical industriesCarbon Clean Solutions (United Kingdom) is a developer of non- corrosive and proven solvent technology for industrial CO2 capture and reuseLeosphere (France) is a developer of an atmospheric monitoring system for the detection of light (LIDAR)

BIOFUEL	S & BIOCHEMICALS	
avantium	Avantium (Netherlands) is a developer of a process to convert biomass into bio-based materials and fuels	4
Genomatica sustainable chemicals	Genomatica (United States) is a developer of bio-based processes that produce widely-used chemicals from alternative feedstocks	
GreenBiologics	Green Biologics (United Kingdom) is a developer of microbial fermentation and process technology to turn readily available waste and agricultural by- products into high value chemicals and fuels	A
JOULE	Joule (United States) is a provider of diesel and ethanol directly derived from sunlight and CO2 using microorganisms	
LanzaTech	LanzaTech (United States) is a developer of a carbon capture and reuse technology that transforms abundant waste and low-cost resources into low carbon fuels and chemicals	NT E Th
<u>nexsteppe</u>	NexSteppe (United States) is a developer of sustainable feedstock solutions for the biofuels, biopower and biobased products industries	BU Ro
(verdezyne	Verdezyne (United States) is a developer of metabolic pathway engineering tools to develop unique yeast strains for production of bio-	
	chemicals using non-food co-products from low cost plant oil feedstocks	EN
BIOMASS	S GENERATION	

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Cambi (Norway) is a provider of technology to convert biodegradable material into renewable energy

ENERGY EFFICIENCY

4 ENERGY Intelligent Innovation	4Energy (United Kingdom) is a developer of cooling devices for thermally sensitive equipment such as radios, routers, batteries, and data centers
alphabet energy	Alphabet Energy (United States) is a developer of low-cost thermoelectric technology for waste heat recovery
Anesco complete energy services	Anesco (United Kingdom) is a provider of energy efficiency and carbon reduction solutions for homeowners, local authorities and businesses
fill_bidgely	Bidgely (United States) is a provider of a business intelligence platform for utilities that enables customers to measure energy consumption patterns
х ^і воwман Ÿ(r	Bowman Power Group (United Kingdom) is a developer of waste heat recovery systems for the distributed power industry
BUILDING	Building Robotics (United States) is a developer of people-centered smart control systems for commercial buildings
DIGITAL LUMENS	Digital Lumens (United States) is a developer of intelligent lighting systems for industrial facilities that reduce light-energy use and provide control & reporting capabilities
ENERGY <mark>SAVVY</mark>	EnergySavvy (United States) is a developer of software systems that integrate utility and government energy efficiency programs for homeowners
enlighted	Enlighted (United States) is a provider of lighting control systems for energy management applications

CAM:j

- recycling energy

ENERGY EFFICIENCY (continued)				Renovate America (United States)
(B) ENCYCLE	Encycle (Canada) formerly REGEN Energy, is a developer of wireless demand response solutions for		RENOVATE AMERICA"	for the adoption of renewable energy sources in commercial and domestic buildings
SMARTER ENERGY	lighting and HVAC FirstFuel Software (United States) is		S sefaira	Sefaira (United Kingdom) is a provider of software for high performance building design
FIRSTFUEL ANALYTICS BUILDING SCIENCE SOFTWARE	intelligence software for energy providers		TENDRIL	Tendril (United States) is a provider of Energy Services Management (ESM) solutions, using an open, cloud-
	KiWi Power (United Kingdom) is a developer of demand response			based software platform to deliver personalized energy services
	hardware and software used by large industrial and commercial consumers of electricity as well as government regulators		transphorm	Transphorm (United States) is a developer of technology to eliminate the electric conversion losses when converting power from one form to
	Next Step Living (United States)			another
next step living。	solutions, providing informed advice and funding guidance for municipalities, civic organizations,			STORAGE
OSIsoft.	Corporations and utility companies OSIsoft (United States) is a provider of a real time data and event management software platform with applications to many industries, including power utilities, government		Advanced Microgrid Solutions	Advanced Microgrid Solutions (United States) is a developer of energy storage systems in buildings by providing financing, consulting and management services for advanced micro grid energy technologies
PHOEBUS ENERGY	data centers and industrial facilities Phoebus Energy (Israel) is a developer of hybrid water heating systems that uses solar thermal energy and electricity to maximize efficiency for large facilities	-		Aquion Energy (United States) is a developer of saltwater battery technology that yields high- performance, safe, affordable energy storage in long-duration, stationary applications
phon <mark>ô</mark> nic	Phononic (United States) is a developer of cooling and heating through solid state thermal management solutions for electronics cooling, cold storage refrigeration and transport, and climate control		FLUIDICENERGY	Fluidic Energy (United States) is a developer of rechargeable metal-air battery technology for commercial load-shifting applications, primarily focused on telecom and industrial markets
RENEW FINANCIAL	Renew Financial (United States) is a provider of innovative solutions for renewable energy and energy efficiency financing		Geli	Geli (United States) is a provider of software and business solutions to design, integrate, network, and economically operate energy storage and micro-grid systems

ENERGY STORAGE (continued)		FUEL CE	LLS & HYDROGEN	
greencharge n e tworks	Green Charge Networks (United States) is a provider of risk-free financed energy storage, and software that time-shifts power use, optimizes EV charging, solar & energy efficiency measures	sunfire	sunfire (Germany) is a provider of energy conversion technologies, including solid oxide fuel cells and renewable synthetic fuels (diesel, jet-A, SNG) based on solid oxide electrolyzers	
	Imergy Power Systems (United			
IMERGY [®]	States) is a developer and manufacturer of redox flow batteries	INTERNET OF THINGS		
POWER SYSTEMS	for the telecommunications and renewable energy industries	SIGFOX	SIGFOX (France) is a developer of ultra-narrow band technology for	
IMDDINT	a developer of ultrathin, flexible,	117 17 One network A billion dreams	Machine-to-Machine communication and Internet of Things applications	
lenergy	rechargeable batteries using its proprietary ZincPoly chemistry	SPACE-TIME	Space-Time Insight (United States) is a developer of situational	
	Ioxus (United States) is a developer of ultracapacitors and hybrid-capacitors that can be made into individual cells, pre-packaged modules, or complete	`І N S I G H T	into intuitive visual displays that can be used to analyze resources across location and time	
10/03	systems			
	Sonnenbatterie (Germany) is		R	
BATTERIE	a provider of battery systems specifically designed to support distributed solar photovoltaic arrays	general fusion	General Fusion (Canada) is a developer of magnetized target fusion energy generation with a new	
_	Stem (United States) is a provider		compression system to collapse the plasma	
stem	that combines big data, predictive analytics and energy storage to reduce electricity costs for businesses		Kurion (United States) is a provider of modular, quickly deployable technology solutions that isolate	
	Sunverge Energy (United States) is a provider of intelligent energy storage		nuclear waste nom the environment	
	systems comprising batteries, power		ING & WASTE	
controlled by software running in the cloud			Harvest Power (United States) is a	
Younicos Let the fossils rest in peace.	Younicos (Germany) is a developer of sodium-sulfur (NaS) battery systems, and provider of renewable energy and building efficiency consulting	HARVEST Power of We*	developer of systems that maximize the value of organic materials through the production of renewable energy and soils, mulches and natural fertilizers	
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RESOURCE SHARING		M-K PA SOLAR	M-KOPA Solar (Kenya) is a provider of pay-per-use solar charging systems	
airbnb	Airbnb (United States) is a developer of an online marketplace that allows people to list and book private accommodations	OFF-GRID ELECTRIC	Off Grid Electric (Tanzania) is a provider of energy services to individuals and communities who have	
SMART G	RID		limited, unreliable, or no grid access	
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	AutoGrid Systems (United States) is a provider of software and cloud-based	SUNGEVITY	systems integrator targeting the residential rooftop market	
AutoGrid	end users		ORTATION	
Blue Pillar " Digital Energy Network	<b>Blue Pillar</b> (United States) is a provider of digital energy asset management products and services	Bla Bla Car	<b>BlaBlaCar</b> (France) is a provider of a car-pooling online marketplace	
	<b>Enbala Power Networks</b> (Canada) is a provider of demand side energy management services through continuously connected electricity supply and demand management	-chargepoin <del>t.</del>	<b>ChargePoint</b> (United States) is a provider of electric vehicle (EV) charging solutions	
<b>GRIDCO</b> SYSTEMS [™]	Gridco Systems (United States) is a provider of grid infrastructure solutions for utilities	INRIX	<b>INRIX</b> (United States) is a developer of a predictive traffic service system	
<b>NEXT</b> KRAFTWERKE	<b>Next Kraftwerke</b> (Germany) is a developer of power generators, cogeneration units and biogas plants	♥moovit	<b>Moovit</b> (Israel) is a developer of a mobile app that aggregates real-time public transportation data	
<b>PRE</b> store	<b>REstore</b> (Belgium) is a provider of Automated Demand Response services to balance the grid	PELOTON	<b>Peloton Technology</b> (United States) is a developer of vehicle-to-vehicle communication systems for truck fleets	
SOLAR			<b>Proterra</b> (United States) is a developer of battery-powered buses and other clean commercial transit solutions	
Clean Power 🛿 Finance	<b>Clean Power Finance</b> (United States) is a developer of an online business- to-business marketplace to connect the solar industry with capital markets	U B E R	<b>Uber</b> (United States) is a provider of an integrated, mobile-based car booking and payment system	
d.light	<b>d.light design</b> (United States) is a manufacturer and distributer of solar lighting and power products		VisionFleet (United States) is a provider of financing solutions and services to accelerate and optimize float management of clean vahicles	
GlassPoint	<b>GlassPoint Solar</b> (United States) is a manufacturer of solar steam generators for the oil and gas industry		neer management of clean vehicles	



UNMANN	IED AERIAL VEHICLES (UAV)	
<i>≡</i> Airware	<b>Airware</b> (United States) is a developer of hardware, software and cloud solutions for commercial Unmanned Aerial Vehicles	C
<b>PLANET</b> LABS	<b>Planet Labs</b> (United States) is an operator of a network of earth- observation satellites to provide open-source information on earth's changing climate	ΟX`
	<b>PrecisionHawk</b> (United States) is a provider of an end-to-end solution, from Unmanned Aerial Vehicles to data collection and analysis software tools to provide better business intelligence	<u>به</u> که
WATER 8	WASTEWATER	<b>S</b> :
	APATEQ (Luxembourg) is a provider	

🔁 ΑΡΑΤΕΟ	<b>APATEQ</b> (Luxembourg) is a provider of chemical-free and cost-effective treatment systems for fracking flowback and produced water
FATHOM	<b>FATHOM</b> (United States) is a provider of cloud-based utility-to-utility solutions for municipalities to manage water systems
FilterBoxx" Water & Environmental Coro.	<b>FilterBoxx</b> (Canada) is a supplier of containerized water treatment systems to industrial, municipal, resort and aboriginal clients
	<b>newterra</b> (Canada) is a provider of sustainable water, wastewater and groundwater treatment solutions for industrial, military, municipal and land development clients
Orbital Systems	<b>Orbital Systems</b> (Sweden) is a developer of an efficient closed loop showering system
ORGANICA	<b>Organica Water</b> (Hungary) is a provider of Fixed-Bed Biofilm Activated Sludge (FBAS) wastewater treatment plants in urban and residential population centers

OSTARA	Ostara Nutrient Recovery Technologies (Canada) is a provider of solutions recovering phosphorus and nitrogen from used water streams and transforming them into slow- release fertilizer
	<b>OxyMem</b> (Ireland) is a developer of smarter aeration systems for wastewater treatment
Saltworks	Saltworks Technologies (Canada) is an advanced water treatment solu- tions provider that designs, manu- factures, and assembles systems for desalination, brine management and chemical recovery applications
<b>Scinor</b>	Scinor Water Technologies (China) is a developer of ultrafiltration membranes and engineers desalinization, industrial waste water and urban water treatment solutions
ΤαΚαΔύ	<b>TaKaDu</b> (Israel) is a provider of a web-based platform that monitors water distribution networks and gives real-time alerts on inefficiencies, water loss, faults and other network problems





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