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CLEAN ENERGY VENTURE FUND

CLEAN TECH 3.0:

VENTURE CAPITAL INVESTING IN EARLY STAGE CLEAN ENERGY
A Changing Investment Climate

November 2017

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CLEAN ENERGY VENTURE FUND

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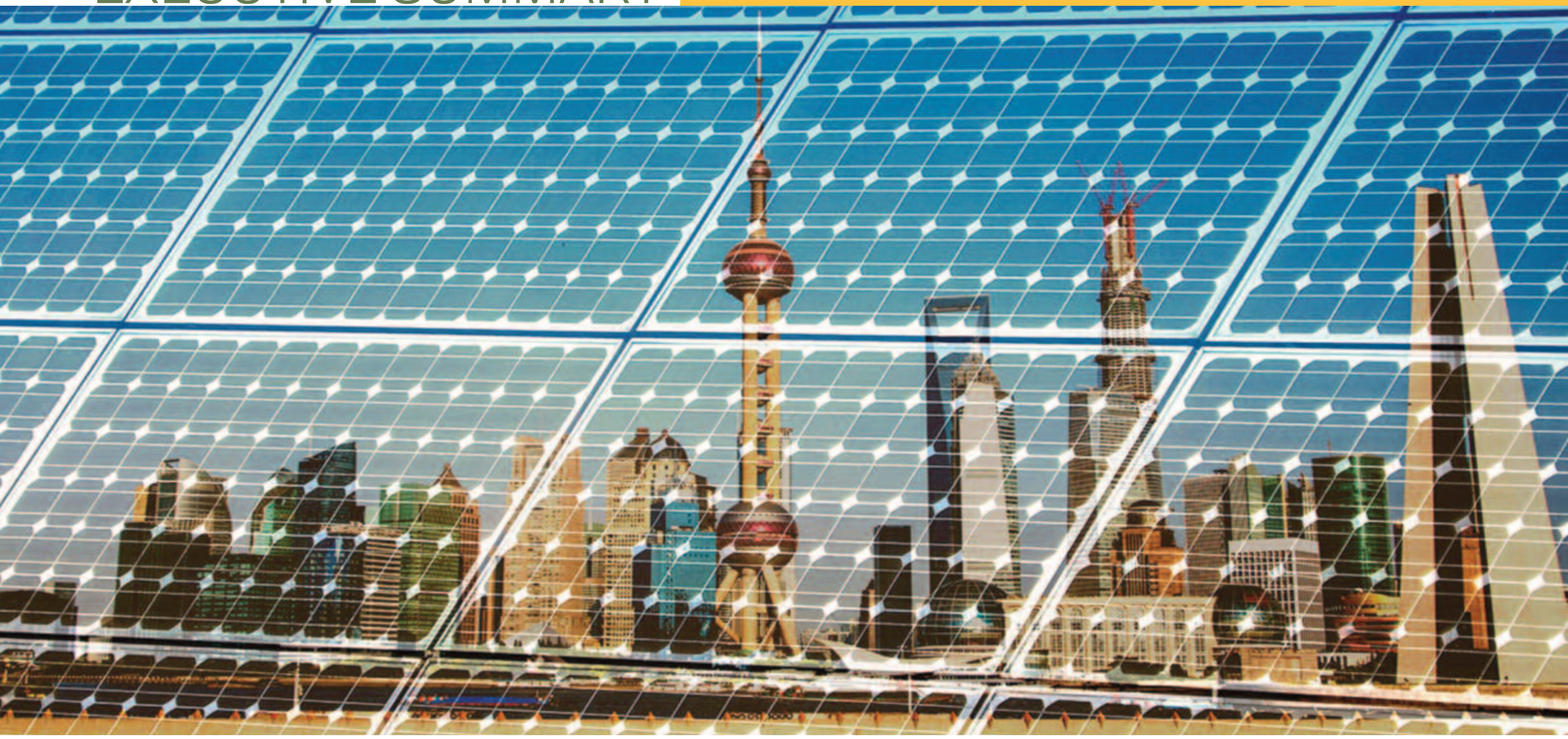
EXECUTIVE SUMMARY



This paper makes the case that the opportunities for investing in early stage clean energy technology companies have changed significantly and favorably in recent years to offer the potential for greater risk-adjusted returns in the sector than ever before. The authors examine what went wrong in prior cycles of venture capital investing in this sector and how markets, teams, and strategies have changed recently to fundamentally improve the investment landscape.

The long-term global transition to a low carbon economy, in concert with growing demand for clean energy, has created more competitive and diversified investment choices and presents a more attractive, lower risk opportunity set. Multiple trends point to a positive outlook. For example, there is increased market demand across all sectors for cleaner ways to produce and use "advanced" energy. In addition, more mature clean energy technologies are increasingly ready to be deployed commercially due to the greater availability of below-market capital for research, development and deployment (RD&D). As well, a greater number of strategic financiers and acquirers provide follow-on capital and liquidity options, joint ventures, pilots, and non-dilutive financing, and a robust ecosystem of incubators and accelerators, service providers and mentors help develop and commercialize technology.

This paper explores: (1) the lessons of Clean Energy Investing 1.0 and 2.0; (2) what has changed since and why it matters; (3) the current investment landscape, a.k.a. Clean Energy Investing 3.0, and (4) the emergence of stronger exit mechanisms for early stage clean energy venture capital investing. For purposes of this paper, Clean Energy Investing 3.0 is defined as Post-2011 to distinguish it from Clean Energy Investing 1.0 (Pre-2006) and Clean Energy Investing 2.0 (2006-2011). The paper concludes with several case studies that highlight the types of growing opportunities for venture capital investment in early stage clean energy.

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I. INTRODUCTION:

THE VENTURE CAPITAL INDUSTRY AND EARLY STAGE CLEAN ENERGY INVESTING

Since the formation of the venture capital (VC) industry in the early 1970s, there has been significant growth in capital deployed, and the industry has produced an extraordinary number of successful technology companies across many sectors of the economy, from Intel to FedEx to Google.[1] The high risk nature of the industry means that many companies fail and requires that VC firms invest a relatively small amount of capital across multiple companies with the expectation that a few will generate outsized returns. VC firms have developed across the U.S., with significant expansion occurring after 1979 when pension plans were permitted to invest in these firms under the Prudent Investor Rule. The venture industry has had an extraordinary impact on the economy, with one-fifth of public companies having originated from VC funding. VC-funded companies have been an engine of economic growth in the U.S. and have generated massive private sector employment.

In the "Clean Energy Investing 3.0" timeframe, the demand for clean energy products and services from non-energy industry sectors such as retail, transportation, manufacturing, agriculture, real estate and others has created attractive investment conditions—nascent prior to 2011—for VC investment in early stage clean energy.

As adoption rates by both Fortune 500 and (increasingly) by smaller companies grow, market conditions are projected to develop favorably over the next decade largely irrespective of public policy volatility and of the price of substitutes such as oil and gas. One example is the adoption of efficient and connected lighting at major distribution warehouses (online retailers, express couriers, and retail distribution centers) and large retail stores (big box retailers). Another example is the large-scale corporate power purchases by Fortune 500 companies, especially technology-focused companies, to satisfy their increasing power needs for data farms/cloud services and general operations. The acquisition of Altenex, a major power broker for Fortune 500 companies, by Edison Energy (an affiliate of Edison International) illustrates the growth and importance of this matchmaking opportunity.

The rising demand for clean energy has been propelled by the entrance of strategic investors, increased mergers and acquisitions activity, introduction of innovative financing mechanisms, more experienced clean tech entrepreneurs and more market driven and cost-efficient technology development models (e.g. rapid prototyping to bring products to market on an accelerated path).

As the demand for new commercially viable clean energy technologies has increased, the supply of capital to scale RD&D companies through the early stage phase of the clean energy financing continuum has contracted as institutional investors left the market **(see Figure A below)**.

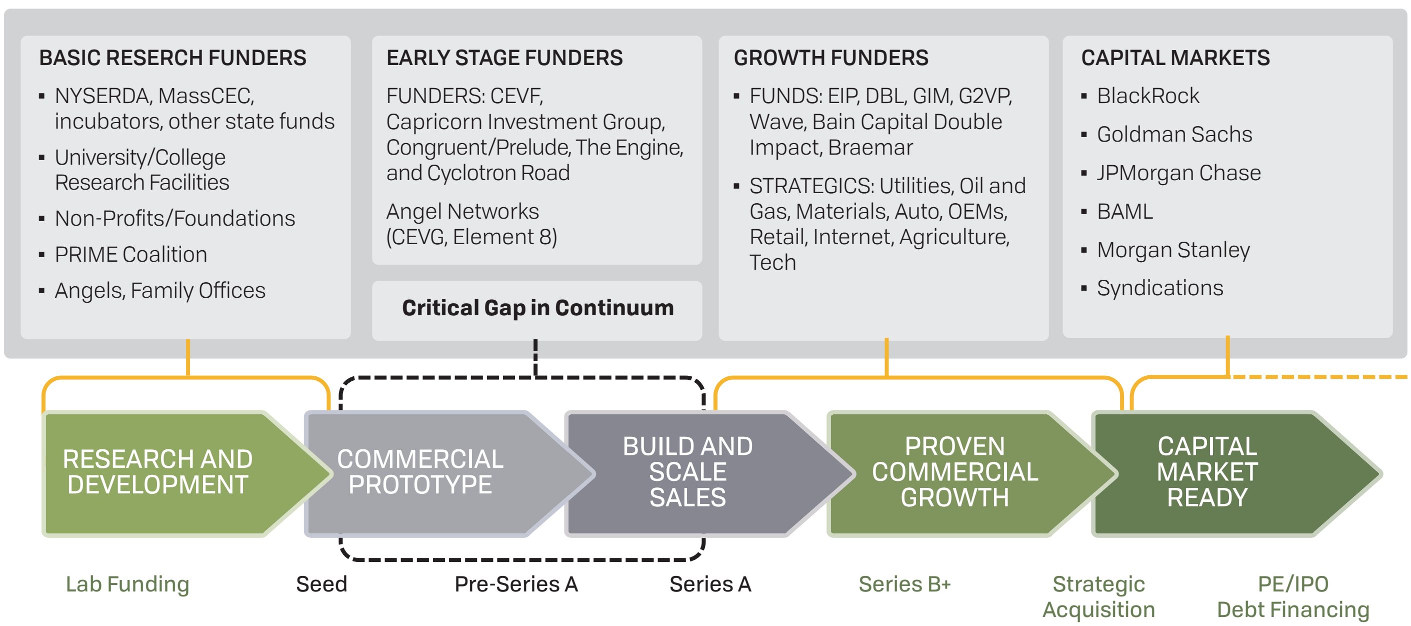
U.S. cleantech VC investment as a share of total VC investment plummeted from 16.8% in 2011 to 7.6% in 2016. By 2016, the average deal sizes had declined as well.[2] These trends demonstrated a clear reaction to the difficult investing environment and the well-publicized failures from the first and second waves.

The number of early stage capital providers and experienced investment teams necessary to supply proven commercial technology companies has not kept up with demand for capital by early stage companies.

As the percentage of early stage VC funding (seed and Series A) relative to total clean energy venture funding dropped from greater than 32% in 2001 to 13% in 2016, more capital moved downstream to fund growth rounds. In 2016, 87% of clean energy venture capital funding were for late-stage companies that were near or at profitability (Series B and growth equity rounds).[3]

The movement of investors away from funding commercial prototypes, as well as a lack of capital and expertise to build and scale sales of early stage technology, has caused a critical funding gap in the clean energy financing continuum **(Figure A)**. Early stage company valuations contracted with the reduction of available capital, and investment terms became more favorable for the few remaining early stage clean energy investors.

Figure A: Clean Energy Financing Continuum[4]



Note: The list of funders is illustrative as representative of major investors for each stage. It is not intended to be comprehensive.

II. CLEAN ENERGY INVESTING 1.0 AND 2.0: LESSONS LEARNED (PRE-2006; 2006-2011)

Prior to 2011, the investment experience in clean energy across asset classes led one prominent pension fund chief investment officer to term the sector "a noble way to lose money." Why did this happen? For clean energy investing, the year 2006 marked an inflection point. A confluence of factors, including rising fossil fuel costs, federal legislation that included lending support for alternative energy start-ups, growing public awareness of climate change, and greater news and media exposure such as the release of "An Inconvenient Truth," led numerous investors and VC funds to target the clean energy sector for increased investment. Between 1996-2005, venture firms had invested an average of $300 million/year in cleantech. According to the National Venture Capital Association, this investment level skyrocketed to $1.7 billion in 2006, ultimately peaking at $4.3 billion in 2011.[5]

A *Venture Capital and Cleantech* paper released by the MIT Energy Initiative (July, 2016) described the flawed dynamics of *Clean Energy Investing 2.0* and detailed why VC firms lost more than half of the $25 billion invested in clean energy technology start-ups from 2006-2011. Two critical reasons for these losses were an underdeveloped clean energy ecosystem and an inappropriate VC investing model for clean energy innovation. For example, investments in technologies that were highly capital-intensive (such as PV solar manufacturing, biofuels and gasification) in order to reach commercial scale had high commodity price exposure and long liquidation horizons at low exit valuations, among other factors.

In summary, the clean energy markets and ecosystem were immature, venture investors financed expensive and protracted business models, and energy market incumbents (e.g. utilities, oil and gas companies, equipment manufacturers) were not prepared to commercialize or to acquire disruptive technologies. The combination of the financial crisis (which ultimately caused project financing and private equity follow-on financing to dry up), immature market conditions, and the inappropriate financial models for clean energy innovation caused many traditional VCs to abandon early stage investments in the clean energy sector. Other contributing factors included Chinese competition, poor biofuels legislation, and the shale gas (fracking) revolution, which led to lower natural gas prices and a knock-on lower electricity prices. Nevertheless, there were a few early stage investors who backed "capital light" clean energy technologies with a high-touch approach during the 2005-2011 period with positive results.

With this background, the following sections of this paper provide an overview of the multi-dimensional transformations in the clean energy investing ecosystem since the "Clean Energy Investing 2.0" period, all of which have combined to create more attractive VC investment opportunities. The following questions help to shape our understanding of "Clean Energy Investing 3.0":

- Can attractive returns be achieved across boom/bust cycles of capital and commodity prices?
- Are there alternative investment strategies today that can produce more successful results?
- Can VC firms invest in technologies that require less funding to get to breakeven cash flow?
- Is there greater demand today from the consumer and corporate markets for clean energy?
- How important is government policy as a factor in the success of Clean Energy Investing 3.0?
- Are there more diverse and viable exit paths for investors in new clean energy companies?

III. CLEAN ENERGY INVESTING 3.0 (2011-NOW):

NEW OPPORTUNITIES IN A CHANGED LANDSCAPE

The current early stage clean energy investors have learned from the investment strategy pitfalls pre-2011 and have focused on technologies and business models that are more likely to be successful. Many of these investors have adapted by targeting companies with lower capital intensity and increased speed of adoption, enabling portfolio companies to become cash flow positive sooner and with greater predictability. Success from lower capital intensity alone, however, is an oversimplification of new strategies. For example, OPower was a low capital intensity business, but the ability to achieve scale, strong revenue growth and profitability was primarily driven by utility adoption, ultimately leading to the company's public offering and subsequent acquisition by Oracle for more than $532 million.

The modified investment strategy combined with improved market demand is creating conditions that allow early stage clean energy investments to be more successful from a risk and return standpoint. Additionally, the proliferation of corporate partnerships and of non-dilutive financing have positively impacted the investment landscape. While challenges still remain (for example, although deployment itself can be more efficient with a capital light solution, the speed of adoption and length of the sales cycle remains a tricky points in energy investing), the landscape has changed markedly to the positive.

In this section, we identify four recent developments that have favorably shaped the current clean energy investment ecosystem. These developments have positioned clean energy venture investing to incur reduced risks and are anticipated to lead to above market-rate adjusted returns.

A. Increased Global Demand for Clean Energy Solutions

Since 2011, many global companies have realized that clean energy technologies are essential for their business models to continue to be successful. Many large and medium size oil and gas companies have built carbon pricing into their models. Concurrently, many major electric utilities are fundamentally changing their business models (e.g. the New York Reforming the Energy Vision or REV) with large capital allocations to clean energy technologies, alternative business models, as well as the inclusion of the cost of carbon emissions in their project planning. According to the Carbon Disclosure Project (CDP) Carbon Price Report, in 2016, 63% of the disclosing utilities and 52% of the energy companies reported that they currently price or plan to price carbon.[6]

A coalition of utilities has also signaled their clean energy commitment by becoming limited partners in a new growth stage fund, with many others backing other investors.[7] In 2016, one European energy company, GDF Suez, changed its name to ENGIE[8] and refocused the entire company from natural gas and fossil-based power to renewable energy, energy efficiency and digital energy. Concurrently, Statoil, Total, Shell, and even Saudi Aramco are all making strategic moves in clean energy, though progress has been limited in the context of the overall size of the companies. Overall, utilities' commitments are driven by a need to discover new technologies, learn about competitive threats, increase customer connectivity, find new revenue opportunities, strengthen the core business, and reduce operating costs in the face of flat or decreasing electricity demand.[9] Oil and gas companies are driven by a need to hedge against stranded asset risk and cannibalization of existing businesses. Also, a majority of states in the U.S. have renewable portfolio standards that require procurement of power from renewable sources. Many of the new clean energy areas mentioned above, such as digital energy, are expected to become crucial elements of the new electricity grid in the coming years, working hand in hand with deployment of renewable energy.

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Clean energy technologies also touch a more diverse group of sectors of the economy, including mobility and autonomous transportation, smart cities, distributed resource management, agriculture, digital energy and Internet of Things (IoT) strategies, big data/analytics, new industrial/commercial materials and direct to materials and direct to consumer energy business models. The disclosure of carbon pricing across all sectors increased by 23% between 2015 and 2016. CDP reported that 30-40% of disclosing companies in the Financials, Telecommunication Services, and Materials Sectors, and 19-25% in Health Care, Consumer Discretionary, Information Technology, Consumer Staples and Industrials currently price or plan to price carbon in their business models. Many companies in these sectors are preparing for a carbon-constrained future and are building a carbon price into their business strategies and operations. Many of these companies are also investing in early stage R&D in order to reveal hidden risks and opportunities in both their operations and their supply chains.[10]

Clean energy adoption in the construction and real estate sectors is being driven by commercial building energy code mandates in 43 of 50 U.S. states. California revised Title 24 requiring all new residential homes to be Net-Zero Energy (NZE) by 2020 and all commercial buildings to be NZE by 2030. These state mandates are accelerating the demand for "smart building" technologies such as predictive analytics, energy storage, peak loads management, plug load controls, energy loss management, advanced lighting and climate controls, demand response, and more.[11]

This increase in demand for commercial scale technology is evidenced by the fact that companies in the energy sectors, as described above, have advanced their incumbent business models and identified necessary new clean energy technologies that are central to their operations. There are helpful tailwinds that have supported this trend, such as the fact that renewable generation (both solar and wind) is now less expensive without subsidy in many parts of the world—an inflection point leading to exponential growth. Many companies have established mandates for increasing power from renewables. Concurrently, there has been a strong increase in demand for disruptive commercial scale technology from utilities, oil and gas companies, original equipment manufacturers, and municipalities and government. As one example, Lancaster, California has required the installation of solar panels on all newly constructed single-family homes since 2014, predating the statewide mandate detailed above.[12]

This trend is also demonstrated by the growing commitments of companies in the Fortune 500 to setting renewable energy targets. According to the April 2017 report *Power Forward: How the largest U.S. companies are capturing business value while addressing climate change*, authored by Ceres, the World Wildlife Federation, Calvert, and the Carbon Disclosure Project, 53 of these companies—roughly 10% of the index—are setting such public targets, as compared with 42 companies in the 2014 Power Forward report[13]. Notably, more than 48% of the 2016 Fortune 500 (240 companies) have a greenhouse gas reduction target, a renewable energy target, an energy efficiency target, or some combination of these targets.[14]

Finally, while carbon pricing policy efforts remain stalled at the U.S. federal level, companies such as Microsoft are leading the charge on instituting an internal price of carbon; since 2012, Microsoft has implemented an internal carbon "fee" whereby all internal business groups must factor in the market price of offsetting the carbon footprint of their activities.[15] In addition, following the U.S. federal government's proposed withdrawal from the Paris Climate Accord, U.S. cities, states, investors, companies, and academic institutions are stepping up with commitments to achieve or even to exceed the U.S. Conference of the Parties' Paris Accord targets.

B. Clean Energy Technologies are More Mature and Increasingly Ready To Be Deployed Commercially

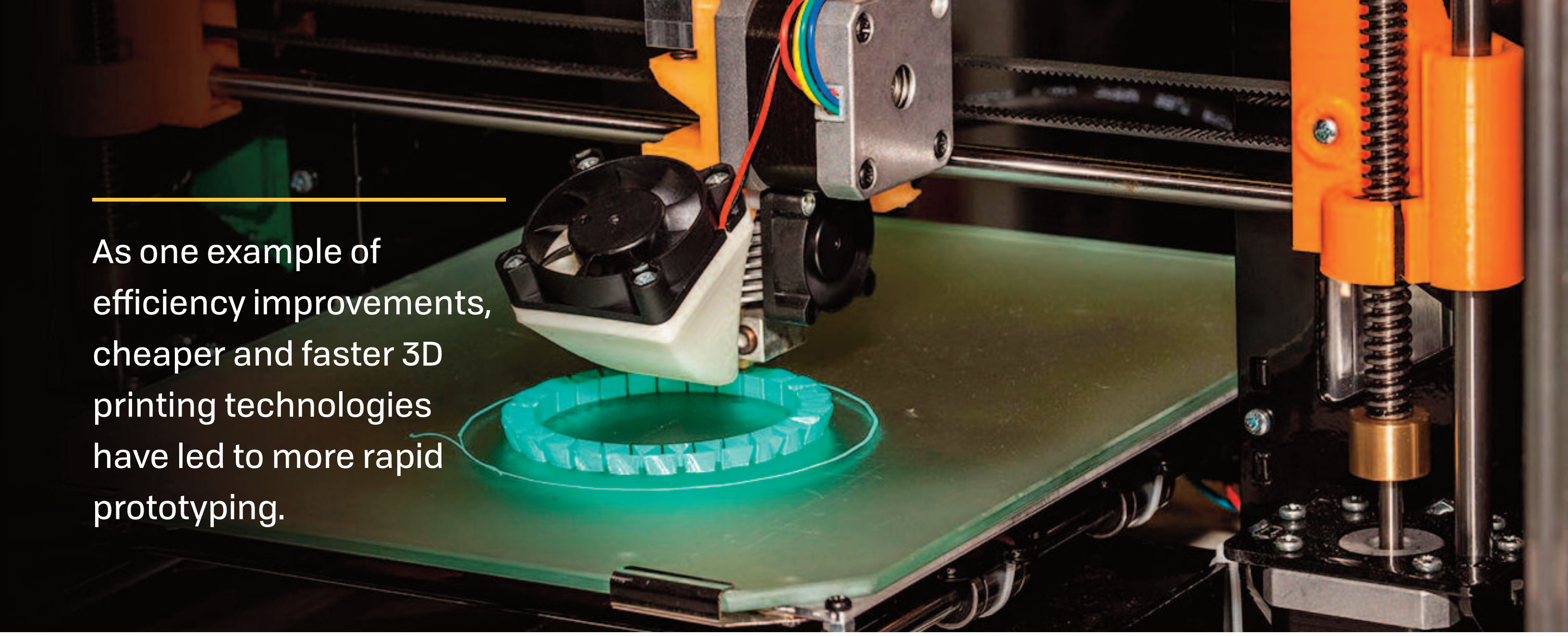
Prior to 2009, many clean energy technologies were in earlier stages of development when attempts were made to commercialize them, leading to the funding of risky "science projects." However, since that time, there has been an escalation in philanthropic support, patient capital, and government funding for clean energy research, development and deployment (RD&D) that has enabled these technologies to mature prior to commercialization and seeking traditional venture financing.

Since 2009, new RD&D funding sources have formed to support early development of clean energy technology. These have included the Department of Energy's Advanced Research Project Agency-Energy (ARPA-E), Tata Center, the MIT Energy Initiative, MIT's The Engine, Massachusetts CEC, PRIME Coalition, NYSERDA and ACRE, Cyclotron Road, Breakthrough Energy Coalition, and Chicago's Clean Energy

Trust, among other state and privately supported efforts. Many of these organizations support the initial stages of technology development and commercialization and are designed to hand off the later stages of commercialization of these technologies to the private sector.

For example, ARPA-E is a bipartisan initiative created under President George W. Bush's administration to fund the development of clean energy technologies. ARPA-E has provided more than $1.5 billion in funds for more than 500 projects (with areas of focus including carbon capture, grid storage, biofuels, and batteries for electric cars) which have attracted $1.8 billion in private sector funding. Since its launch in 2009, 74 of ARPA-E's grantees have attracted $1.8 billion in private money, while 56 formed new companies.[16] In total, 25 percent of the teams raised additional capital and approximately 13 percent earned patents.[17] Congress approved a $15 million increase in funding for ARPA-E in the 2017 federal budget. Based on two years of analysis, a June 2017 report concluded that ARPA-E is on track to achieve its intended purpose and should retain its focus on "potentially breakthrough technologies."[18] The report also acknowledged that ARPA-E's three-year timeframe is too short for most technologies to move from concept to market.

The current U.S. presidential administration has indicated a move to shutter ARPA-E by 2019. In response, as with other elements of federal climate and energy policy retrenchment, individual states are stepping up to fill the gap. California has proposed a new "California Climate and Energy Research Fund," to be funded by revenue from the state's ambitious new cap-and-trade proposal, which would provide funding on the order of hundreds of millions of dollar annually—potentially surpassing the current funding levels for ARPA-E (which was $290 million last year).[19]



As one example of efficiency improvements, cheaper and faster 3D printing technologies have led to more rapid prototyping.

Beyond these federal and state mechanisms to bring clean energy technologies to maturity and secure a better chance of future financing from traditional capital sources, new tools, resources and development models have enabled more cost efficient and rational technology development options.[20]

Rather than new technologies needing to be developed from scratch, they can be developed by combining or extending existing technologies, which can be accomplished in a shorter timeframe and with less risk. As one example of efficiency improvements, cheaper and faster 3D printing technologies have led to more rapid prototyping. Furthermore, entities like PRIME Coalition have funded emerging technologies such as Quidnet Energy, which uses geologic reservoirs for energy storage, using philanthropic capital to prove out the efficacy at pilot scale after which commercial investors, such as the Clean Energy Venture Group and strategics, provide critical follow-on capital for scale-up.

C. Greater Number of Strategic Financiers, Acquirers, and Public-Private Partnerships

The increase in demand for clean energy solutions has attracted new financiers and strategic investors/acquirers to enter the market to supply capital for companies that are looking to overcome the dual challenges of financing their early stages of commercialization and demonstrating their technology at commercial scale. An increasing number of companies are establishing Corporate VC (CVC) funds. These include, for example GE Ventures, BMW iVentures, Shell Technology Ventures, and even emerging market government-owned or government-linked companies, that operate like traditional VCs investing in next-generation technology.[21] In 2016, CVCs grew by more than 20% with 107 new corporate VC funds making their first investment in 2016 with 75% of deals made at the seed, Series A or Series B stage (for all CVC investment, not limited to clean energy CVC investment).[22] The CVCs who make energy-related investments is trending upward, with more venture stage firms receiving investment from CVCs than in previous years. In Q2 2014, 15 of the 51 most active CVC firms reported energy investments, with a large proportion in clean energy technology.[23]

Major companies across sectors are making commitments. Royal Dutch Shell announced that it will form a new company division with $1.7 billion in funding to develop renewable energy and low carbon power. Goldman Sachs intends to invest $150 billion into clean energy projects and technology, notwithstanding already having reported $41 billion in clean energy investments since 2012 in 89 companies that generated 31 gigawatts of clean energy, employed more than 129,000 people, and created $34 billion in revenue in 2016.

State sponsored government funding models have also emerged, such as the New York and Connecticut Green Banks, to bridge the gap between private investment and clean energy technology development. By investing limited amounts of public money, green banks hope to spur private investment to create clean energy jobs, lower energy costs and reduce emissions. Connecticut created the first green bank in 2011 and boasts an average of six dollars in private funding created from every dollar in public money. It has currently helped to unlock over $755 million in private investment. The New York Green Bank has invested a total of $346 million to date in clean energy projects, which is expected to mobilize between $1.0-1.4 billion in clean energy project investments across the state. Hawaii, California, and Rhode Island also have green banks, and several other states are currently exploring the option or have variations on the green bank model.

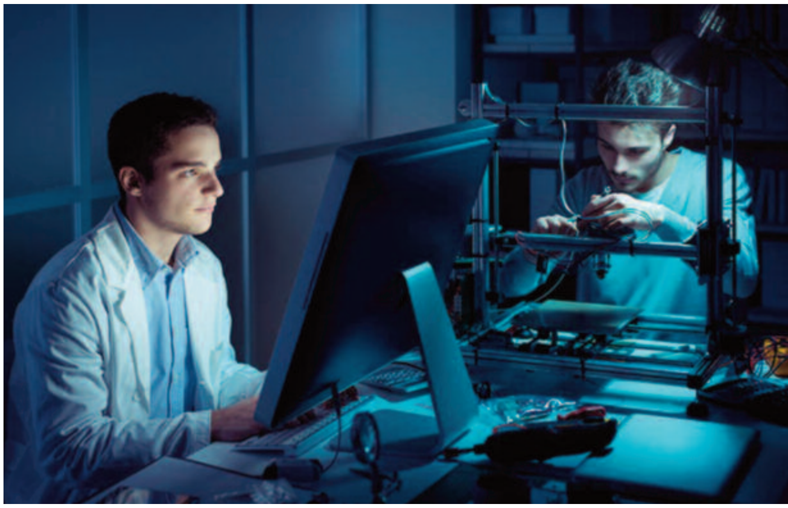
In spite of the view of some that government funded technologies and projects are a waste of taxpayer dollars, the much maligned Loan Program Office of the Department of Energy (DOE) has generated $1.65 billion in interest revenue, more than three times the losses of the high profile bankruptcy of Solyndra. The loan program portfolio is performing with a below market loss ratio (2.3%) and expects to generate $5 billion in profits for the federal government.[24] Notwithstanding the press, this program is viewed as a strong success and has far exceeded the goals set out in its mandate.

D. Robust Ecosystem Supporting the Commercialization of Technology

Today, as noted at the outset of this section, a broader range of clean energy technologies is being developed with application to both existing infrastructure (e.g. the electricity grid) and emerging industries (e.g. the shared economy, autonomous transportation, IoT applications, digital electricity and distributed energy resources). There are several factors that have reduced commercialization cost and time, as well as increased the probability of success.

First, through the use of new technology, outsourced prototyping (e.g. rapid prototyping using 3-D printing), companies are able to design, prototype, test and introduce their product to early adopters and customers faster and with greater certainty of the applicability of their solution. The number of energy accelerators across the U.S. has increased from five to 19 since 2010,[25] including Greentown Labs, LACI, ACRE, Otherlab, Powerhouse, Elemental Accelerator, Argonne National Laboratory and Oak Ridge National Laboratory (under the DOE's Innovation Crossroads program), Breakout Labs, and Cyclotron Road, many of which are providing shared facilities with electronics, CAD software, 3-D printing shops, welding/milling/cutting machinery, centrifuges and other expensive tools for entrepreneurs to develop technology faster and less expensively. These accelerators provide necessary pieces of the ecosystem allowing companies to prosper while centralizing the opportunity for venture capital and corporates to engage with start-ups. This provides early venture capital with an opportunity to invest at a stage of development that has a lower technology commercialization risk profile and higher probability of market adoption.

The number of energy accelerators across the U.S. has increased from five to 19 since 2010, many of which are providing shared facilities with electronics, CAD software, 3-D printing shops, welding/milling/cutting machinery, centrifuges and other expensive tools for entrepreneurs to develop technology faster and less expensively.



Secondly, outsourced manufacturing and the key supply chain inputs are typically identified from third parties, reducing risks. Manufacturing companies such as Flex (previously Flextronics) allow entrepreneurs to avoid the financing risk of raising significant amounts of capital to build custom manufacturing plants. In addition, the clean energy ecosystem is in its third cycle and teams are typically more mature with valuable industry experience. They often include COO and sales and marketing staff at an earlier stage of development, which has been shown to make a material difference in the ability to scale faster.

IV. STRONGER EXIT MECHANISMS

The clean energy sector shares the attributes of requiring large infrastructure and experienced management with other sectors built with VC capital in the past, such as biotech, semiconductors, IT/networking, and mobile. VC capital flowed into these sectors once exit mechanisms with generally accepted exit criteria were established. In the biotech industry, a process was established whereby pharmaceutical companies stepped in to buy promising startups based on technical and/or clinical milestones, perhaps before commercial viability has been proven. In the IT/networking sectors, leading incumbent players such as Cisco, Lucent, HP, Oracle and others played a similar role for early stage companies. Pre-2011, the clean energy sector lacked a robust set of similar large and acquisitive industry players. Post-2011, many incumbent players from diverse industries—such as BMW, Google, Engie, and Emerson Electric—have stepped up to acquire promising technology companies and provide liquidity for early stage investors. The history of capital intensive industries such as biotech, semiconductors and IT/networking indicate that early stage companies experience significant increase in value and liquidity once the incumbent players start buying the early stage companies.[26]

The history of capital intensive industries such as biotech, semiconductors and IT/networking indicate that early stage companies experience significant increase in value and liquidity once the incumbent players start buying the early stage companies.

V. CONCLUSION:

THE CASE FOR INCREASING VC ALLOCATION TO EARLY STAGE CLEAN ENERGY FUNDS

In summary, market conditions and investor friendly dynamics, as outlined in this paper, indicate that it is time for asset managers to consider allocating a portion of their alternative investments and specifically venture capital commitments into clean energy.

Ten years ago, investments in clean energy solutions were pigeonholed into the energy sector as an insignificant footnote in the discussion of fuel and power production. These and other large industrial sectors (including autos and transport) are at the beginning of a major transition in their operations, production, supply chains and logistics. Companies from retail to real estate increasingly factor in cheaper and cleaner use of energy as a fundamental operating consideration.

The demand for clean energy solutions continues to increase globally regardless of public policy volatility in the U.S. or the low price of fossil-based fuels and knock-on electricity prices. In spite of the increasing global adoption, there is a significant imbalance between the market demand for clean energy and the development of possible solutions. Financiers and strategic investors typically shy away from early stage, pre-commercial scale risk, and recognize the significant “hands-on” management expertise required to scale early stage clean energy companies. This creates both a need and an opportunity for early stage VC investors.

Over the last six years the clean energy financing value chain has filled out with the formation of upstream early funding entities (ARPA-E, PRIME Coalition, MassCEC, etc.) through follow-on growth capital (EIP, Vision Ridge, DBL, Capricorn Investment Group, CEVG, Generate Capital, etc.) to acquisitions by strategic investors (Cisco, ENGIE, Total, Ariva, Walmart, Google, Enel, and many others). The maturation of the financing value chain provides follow-on capital and liquidity options that dramatically improve the risk return profile of early stage clean energy investing.

The maturation of the clean energy value chain is similar to the early stages of the biotech, semiconductor, IT/networking and PC sectors that ultimately generated substantial returns for the early vintage VC funds and their limited partners. Long-term investors can profit from this transition by selecting experienced managers and entrepreneurs who can capitalize on the emerging tailwinds. Notably, despite an overall dip in clean energy investment in the first quarter Q1 2017 as compared to Q1 2016 (total investments globally for the quarter were down by 17%), venture capital and private equity funding of clean energy companies jumped 55% in that quarter, up to $2.3 billion. Having learned from the lessons of Clean Energy Investing 1.0 and 2.0, with increased municipal and commercial demand, and with an expanding and varied ecosystem of clean energy incubators and acquirers, the opportunities for investors to generate strong risk-adjusted returns through investing in the potential breakthrough technologies of tomorrow have significantly changed for the better. Given the future is not expected to look like the past, investors and their advisors are encouraged to revisit the opportunities offered by early stage clean energy investment.

APPENDIX: CASE STUDIES

CASE STUDY #1:
GREEN CHARGE NETWORKS → ENGIE

1.	Company Name
	Green Charge Networks
2.	**VC Investors/Funders**
	K-Road DG (independent power developer/investor) and Department of Energy grants.
3.	**Technology/Business Description**
	Turnkey energy storage developer, differentiated by control software to predict load and dispatch at the right time.
4.	**Keys to Company's Successful Growth**
	Some of the key factors include the following: a) Company was begun as a mobile charging business, then pivoted to commercial and industrial (C&I) storage; b) Initial focus transitioned from New York to California as the market provided a self-generation incentive program (SGIP). Led by a strong sales team, Green Charge won multiple California SGIP deals; c) Early traction demonstrated feasibility of business model with multiple deployments and led to K-Road's investment; d) Real assets in the market and a viable business model were critical to the ENGIE acquisition.
5.	**VC Investments (Dollars In)**
	$56M (bulk was project finance with a fraction dedicated to corporate equity).
6.	**Exit Details**
	80% bought by ENGIE (20% earn out) as part of ENGIE's push into getting close to the C&I customer (ENGIE had been challenged as an IPP and needed improved returns from asset investments); attractive exit for investors.

APPENDIX: CASE STUDIES

CASE STUDY #2:
MYENERGY → NEST LABS → GOOGLE

1.	Company Name

MyEnergy

2.	VC Investors/Funders

2011 Series A investors included Clean Energy Venture Group, Point Judith Capital, Conservation Services Group, as well as some angel investors. The Series A was the only funding round.

3.	Technology/Business Description

Artificial intelligence-driven software used to retrieve data from utility websites to find and aggregate relevant information on utility (electric and gas) residential customer patterns of use. Using the information, MyEnergy conveyed the aggregated information to the customer to motivate behavior change and to drive significant energy savings.

4.	Keys to Company's Successful Growth

Some of the key factors include the following:

a) Founding team was brilliant and passionate, yet responsive to constructive feedback, and persistently driven to deliver results;

b) Developed and evolved unique technology to enable the company to support a wide range of utilities across the country;

c) Pivoted as needed and focused on ability to motivate consumers to drive down energy use and create cash savings;

d) Focused on strategic relationships, which led to initial partnership with and eventual acquisition by Nest Labs.

5.	VC Investments (Dollars In)

$3M Series A.

6.	Exit Details

MyEnergy shares were exchanged for Nest Lab shares in 2013, and Nest Labs was acquired for $3.2B in cash by Google one year later.

END NOTES

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3 Saha, Devashree and Mark Muro, *Cleantech venture capital: Continued declines and narrow geography limit prospects*, Brookings, May 16, 2017, https://www.brookings.edu/research/cleantech-venture-capital-continued-declines-and-narrow-geography-limit-prospects/

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