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Clean Energy - Bridging to Commercialization: The Key Potential Role of Large Strategic Industry Partners

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Summary

This white paper explores a range of potentially attractive partnerships, including those between established US industry members, the entrepreneurial CE (clean energy) community, and the financial industry. These partnerships, include those that can leverage a wide range of entrepreneurial and industry resources that are needed to promote the development and commercialization of innovative new technologies - partnerships that in turn can lead to accelerated, global utilization of CE, as well as US global leadership for the CE industry. The need for these partnerships is discussed within the context of the growing interest in CE, driven in large part by the anticipated strong, global growth in energy demand, as well as by the need for a spectrum of other long term (e.g. environmental) benefits from CE. The impacts of the rapidly changing investment and the market environment for innovative CE technologies are also explored.

The strong need for multifaceted enabling partnerships and resources are found to go well beyond those corresponding to financing, and includes for example, expertise on markets and market creation, and product development. In addition, deep resource levels are often especially needed in the pursuit of high potential, next generation CE innovative supply technologies that require costly technology development. Such is the case for example, where sophisticated manufacturing approaches are needed to exploit promising, and high performance, material combinations along with novel and complex technology based hardware. Further, access to adequate resources for the needed, high cost, technology development is increasingly less likely to be available from traditional partners such as VCs and their limited partners.

Of the key potential partners explored, Strategic Industry Partners (SIPs) are found to be particularly intriguing - they have the most robust range of appropriate resources to potentially benefit from these partnerships while also helping to fill the void in the commercialization food chain for technology development, where VC funding is not available. SIPs also play a broad enabling role for the growth of the entrepreneurial US based, CE industry. Moreover, SIPs also have the required stature and influence to impact global markets as well as to promote global US leadership in CE, while also contributing to the dialogue around public-private partnerships. While SIPs have stringent requirements for partnering, as well as intense competition for their resource investments, successfully pursuing mutually attractive partnerships with SIPs should be well worth the required effort.

The authors would like to thank numerous individuals for providing numerous insights, and helpful discussions, as well as reviews of early drafts and/or draft sections of this white paper. These individuals come from various organizations that are comprised of:

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Clean Energy - Bridging to Commercialization: The Key Potential Role of Large Strategic Industry Partners

A Summary White Paper

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Executive Summary

This White Paper explores a variety of partnership models including those between established US industry members, the entrepreneurial CE (clean energy) community, and the financial industry. The need for new partnership options is driven by a growing demand for power and by the massive investment requirements of the burgeoning clean energy industry as well as by the race to develop and bring to market second and third generation technologies to a globally competitive marketplace. In particular, there is a need for partnership options that can not only a leverage a range of financing options (which are always a core need), but that also include expertise on technology, market creation, manufacturing, product development, regulatory processes and infrastructure.

Quite importantly, partnerships that leverage and support global US leadership are needed to address for example long times to market, large expenditures for technology development, market uncertainties, portfolio risks, and regulatory risks associated with new energy supply technologies.

Five key conclusions emerge from our examination of clean energy commercialization investment trends and the benefits of various partnership models:

1. **The current CE investment community will not be able to meet the industries demand for long-term, capital-intensive investments.** Much CE investment is moving downstream (to investments having negligible technical risk), resulting in a corresponding gap in the upstream commercialization food chain - SolarCity is a good example of this downstream investment trend where the technology is well vetted.[1] This gap, or upstream investment shortfall, is caused largely by the mismatch between the current venture capital / limited partner (VC/LP) model, and the often very large investments and long times to market needed for the development and thorough vetting of many CE energy supply technologies.[2]
2. **U.S. leadership could stagnate from a lack of investment in the building blocks of next generation technology**. The shift to downstream investment has potentially far reaching impacts and could limit or prevent the upstream innovation and development of many next generation CE hardware technologies. This is especially true next generation CE energy supply technologies and in particular those that require the application of new materials and configurations, as well as the development of sophisticated manufacturing processes. These next generation CE supply technologies are needed to foster continued US world leadership in CE market development as well as the long term global competitiveness of the CE industry in the US.

[1] Downstream, for our discussion here, refers to ventures that use key technical innovations that are currently in the marketplace; these key technical innovations have been vetted to the extent no significant technology development is needed – though market based product development and engineering is often still be required. For example, SolarCity uses market ready photovoltaic cells and panels from a range of suppliers in its installations, for its scale-able solar installation, service and financing business.
[2] The VC/LP model as explained in our discussion below is operative and most effective for ventures that are platform opportunities and that do not require large capital investments and long times to markets; e.g. these include ventures that, for example, are based on software, IT, and social media (e.g. Nest).

On the positive side, the downstream focus has resulted in some dramatic successes and achievements for the commercialization of well vetted CE technologies (see conclusion 5 for further discussion of this issue). Thus emphasis on both downstream and upstream portions of the commercialization pipeline are needed.

3. **Strategic Industry Partners (SIPs) and Institutional Investors represent the most attractive partnering opportunities to address a good portion of the investment shortfall**. While, SIPs are well positioned to jointly benefit from providing the wide swath resources for bridging this resource gap,[3] partnerships between SIPs and CE Ventures with innovative technologies are particularly intriguing, if the partners can complement and leverage each other's core strengths and needs.[4] For instance, to meet long-term strategic objectives (e.g. enhanced profitability, global industry leadership) many SIPs want new investment opportunities and product innovations (along with the corresponding expertise) that entrepreneurial ventures can provide. Moreover, SIPs also have the required stature and influence to impact global markets as well as to promote global US leadership in CE as they help enable the growth of the entrepreneurial US based, CE industry, while also contributing to the dialogue around public-private partnerships.

   Another major strength of SIPs is that they have the ability to bridge across numerous segments of the commercialization food chain; and well structured partnerships, that provide a more robust portfolio of options along this food chain that can help reduce risks and investment costs to all participants. That said, other Institutional Investors will continue to be important to provide further robustness to the commercialization food chain through syndication of investment resources even more broadly. This is important because of the size of the investment the inherent risk.

4. **The U.S. Government has an essential role to play in facilitating, and in participating in this process**. Public-private partnerships will be crucial to the robust development and accelerated deployment of new cost effective energy innovations. Areas of particular importance include continued development of policies and effective incentives (e.g. the reliability of incentives is quite important to reduce investment uncertainties), programmatic technology investments that feed the new technology pipeline and, in promoting novel ways of participating in the investment CE commercialization ecosystem.

5. **New financial innovations will support these new partnerships**. A number of financial innovations, corresponding to downstream commercialization of CE technologies, are already being deployed and are rapidly accelerating the deployment of <u>well vetted</u> CE

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[3] For instance, SIPs often have large financial resources (that give them the capability to structure investments using a variety of debt, and equity instruments). SIPs also have strong technical expertise including that for manufacturing (and the associated facilities), in addition to well established know-how for market creation, supply chain management, and infrastructure development.

[4] For example SIPs have strong competition (internally especially) for their resources they often have other stringent requirements to help reduce risks; e.g. they always look protect their brand, as well as to improve operations.

technologies. For instance, as referenced above SolarCity has been a leader in developing leasing and power purchase agreements (PPAs) as well as for helping to create a CE asset class and a viable bond rating system while providing securitization of project investments through these leases for CE systems. Some have called these recent achievements groundbreaking.

On the other hand intriguing opportunities that can address the resource shortfall mentioned above for earlier stage investments are emerging. For example there is growing interest by long term institutional investors (LTIs) who typically seek larger, and longer term investments (e.g. in the $50 -500 Million range) and who believe that by taking more direct control of their investments, they can improve their capital investment efficiency, reduce overall costs and lessen agency problems.[5] LTIs are also often expert at dealing with infrastructure investments along with their inherent commodity like returns. They plan to do this while leveraging expertise and resources from partners such as SIPs, and public sector entities, as well as top VCs. The VCs for instance contribute their vetting (and selection), as well as start-up management, skills.

Finally, we bring this summary discussion to a close with a few brief observations regarding some rapidly occurring opportunities and challenges are greatly impacting CE commercialization; e.g. the evolution of the natural gas and electric utility industries.

[5] There is an Alliance of these funds which is still in its infancy. For instance, one member the New Zealand Super Fund (NZSF), a sovereign wealth fund that uses this newly evolving model, has recently made three investments (totaling more than $150Million) in US based technology ventures have not completed their technology development.

Acknowledgements

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List of Commonly Used Acronyms

CE	Clean energy
CAPEX	Capital Expenditure
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
FEMP	Federal Energy Management Program
IT	Information Technology
SII	Strategic Industry Investor
SIP	Strategic Industry Partner
GrE	Growth Equity (referring primarily to that provided by PE firms)
IPO	Initial Public Offering
LBO	Leveraged Buy Out
LP	Limited Partner
LTI	Long Term Institutional investors
NG	Natural Gas
PE	Private Equity
PPA	Power Purchase Agreement
M&A	Merger and Acquisition
PV	Photovoltaic
VC	Venture Capital

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Clean Energy - Bridging to Commercialization: The Key Potential Role of Large Strategic Industry Partners

A Summary White Paper

Introduction

There is a growing consensus that Clean Energy (CE) is an increasingly important component of the US energy portfolio. Critical drivers that call for increased development and application of innovative CE energy technologies include those that help meet the relentless growing global energy demand, as well as those that foster economic growth, energy security, regional portfolio requirements, and climate change goals. In the US, which is sometimes cited as being the most attractive market in the world,[6] there recently has been growing interest a range of industry members (e.g. Apple, Walmart, Google, GM, and Verizon etc.) to adopt existing well vetted, or downstream[7] CE technologies[8] to meet business objectives such as for powering information technology (IT) centers, backup power, and distributed generation. Beyond the US, the use of CE technologies is growing even faster in developed regions such as Japan and Australia. Further growth is most vigorous in parts of the developing world—such as in China, India, Saudi Arabia, and many Latin American countries, where increasing costs associated with more conventional centralized technologies is of growing concern.

Table -1. Some Key Resource Allies Reviewed

- Strategic Industry Partners (SIPs)
- Strategic Industry Investors (SIIs)
- Large Industry Users of CE Technology
- VCs and Limited Partners
- Dedicated Private Equity (PE) firms
- DOD / DOE
- Crowdfunding
- Long Term Institutional (LTI) Investors
- Utilities
- Family Offices

The amount of CE technologies currently deployed, while growing, is still quite small relative to that from conventional energy technologies, thus leaving a large economic (including job growth) opportunity to exploit for expanding CE markets. On the positive side this opportunity is being recognized by numerous

[6] See for example: Meehan, C. (May 31,2013). "US Now Most Attractive Market for Renewable Energy, Finds Ernst & Young." *Renewable Energy World.* While the US is still number one, China is gaining fast; for an updated (2014) data base go to URL. http://www.ey.com/Publication/vwLUAssets/RECAI_40_-_February_2014/$FILE/EY_RECAI%2040_Feb%202014.pdf

[7] Downstream, for our discussion here, refers to ventures that use key technical innovations that are currently in the marketplace, and have established business models; these key technical innovations have been vetted to the extent no significant technology development is needed – though market based product development and engineering is often still be required. For example, SolarCity uses market ready photovoltaic cells and panels from a range of suppliers in its installations, for its scale-able solar installation, service and financing business. Conversely, upstream efforts, in our terminology emphasize providing technology innovations and resolving a host of R&D issue, across a range of technology development stages - from concept development, to the scale-up and verification of key manufacturing processes.

[8] Some users like Google also invest upstream in the development of the innovative CE technologies.

global financial giants which are increasingly participating in US markets. For example Goldman Sachs is making significant investment commitments in CE.[9] In addition large investment firms like MidAmerica Renewables (part of Berkshire Hathaway Holdings), CITI, Morgan Stanley, and Bank of America are boosting confidence in utility scale power through their investments,[10] while the maturation and progress in the investment and deployment of other renewables continues apace.[11]

While the global opportunity is large, developing a robust pipeline of next generation US based CE technologies to pursue this opportunity, is accompanied by a range of challenges. These challenges extend far beyond access to lower cost capital, and include those related to gaining an entre to resources for innovative technology development, the development of markets and market channels, distribution networks, and supply chain management systems. Moreover, while assuming a desire for US global leadership in this arena, it is important to recognize that the size of the resources needed for effective global competition by US industry is often much greater than a single entity can readily garner. For example, even though many large industry members have strong cash positions and the ability to pursue acquisitions and mergers, and other kinds of investments in CE, [12] the resource needs to address the challenges effectively will require mutually beneficial partnerships, that leverage contributions and assets from many entities including existing large US industry members, the entrepreneurial CE industry, the financial industry, and the public sector, to address a host of commercialization issues and other barriers.

Our target audience for this white paper is eclectic, though we place emphasize on ***entrepreneurs*** where we provide an overview of key current options and trends for attracting funding, and a host of other resources, along with strategies to secure same. Also, for example regarding ***strategic industry partners,*** we focus on the use and potential business opportunities provided by complimenting SIP resources with CE innovations, while addressing SIP needs, and requirements. Further, relative to the ***public-private sector*****,** we provide insight on potential opportunities for, and the value of promoting, robust support for partnerships with large SIPs, and the CE innovation community, as well as other entities such as utiliites.

With the above as background and context, as well as the detailed assessments in the body of the report, we provide five key conclusions below. More specifically, these conclusions largely derive from our exploration of the key challenges, along with their implications, as well as on opportunities to more effectively bridge to the required resources through partnerships. Also, while emphasizing large industry partners, we looked at a range of potential partners that are particularly relevant to upstream commercialization needs, as well as to the transition to downstream commercialization resources. A key objective is to identify partnership opportunities

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[9] See: Reuters. (February, 2014). "Goldman Sachs Group Inc plans to channel investments totaling $40 billion over the next decade into renewable energy." *Reuters*. URL http://www.reuters.com/article/2012/05/23/goldman-green-idUSL1E8GMDPR20120523
[10] For example, solar and wind (combined) represent more than 40% of recent utility capacity increases.
[11] See: Frankfurt School-UNEP Centre/BNEF (2013). *Global Trends in Renewable Energy Investment 2013*. (Frankfurt am Main). URL http://fs-unep-centre.org/sites/default/files/attachments/gtr2013keyfindings.pdf
[12] See for example: ChiefExecutive.net (October 4 2012). "10 Companies with the Biggest Cash Stockpiles in America." *CEO Briefing Newsletter.* URL. http://chiefexecutive.net/10-companies-with-the-biggest-cash-stockpiles-in-america#sthash.b5vxUKqN.dpuf 6

that can demonstrably improve both the continuity and robustness of the CE commercialization ecosystem.

Five Key Conclusions Discussed

1. **There is a growing gap in the upstream commercialization food chain for many CE innovations caused by the shift of many VCs and their limited partners to more profitable, and lower risk, downstream ventures.**[13] Thus CE Entrepreneurs will likely find it increasingly difficult to access the needed funding and other key resources for their CE innovations via the VC/limited limited partner route.[14] Examples of the shift to downstream investment, where technology development risks are almost nil, include Silver Lake's investment in SolarCity, the merger between SunPower and Total, and the acquisition of Albeo by GE. In each case the key CE technologies[15] had been well vetted, negating the need for expensive and time consuming, upstream technology development in the key CE technology components being used.

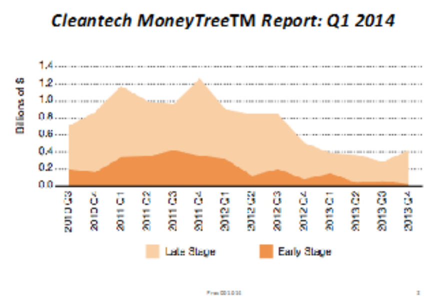
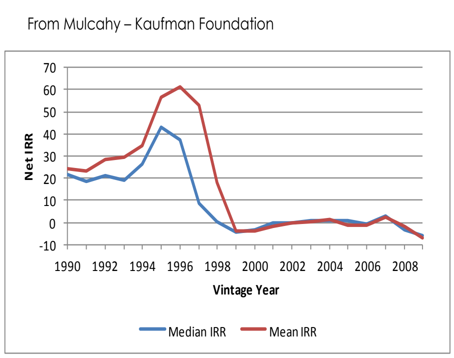


Figure 1. Cleantech Funding by Stage and Quarter, 2010-2013,

Central to the formation and growth of the gap is the growing tendency of most upstream financiers (e.g. VCs) to avoid investing in a significant amount upstream technology development, especially for the frequently costly and time consuming manufacturing scale-up, and the corresponding verification process for potentially disruptive technologies. Nor have VCs been investing in technology development for disruptive technologies where long times to market magnify market uncertainties. This situation is particularly pronounced where new materials and material combinations are deployed in novel technology configurations.[16,17] Quite



Source: Cambridge Associates, 2010 Benchmark Report, vintage year 1990–2009 funds (http://www.nvca.org/index.php?option=com_content&view=article&id=78&Itemid=102).

Figure 2. LIMITED PARTNERS "The Average Fund Barely Returns Investor Capital After Fees"

[13] As discussed in the white paper, VCs do still invest upstream in CE in areas like energy efficiency, IT, software, social media related to CE, as well and in other areas, where significant risky technology development is not needed, and where sufficiently large markets exist.

[14] For example see in Figure 1, how early stage VC investment has decreased dramatically recently. URL. http://www.pwc.com/en_US/us/technology/publications/assets/pwc-moneytree-cleantech-venture-funding-q4-2013.pdf

[15] SolarCity has a disruptive, scale-able service / installation, and financing business model, but the technology as noted above is not disruptive.

[16] Such requirements can make it nearly impossible for VC funds to satisfy their nominal "sweet spot target" of 10X return, an exit within the 7-10years, while having an initial product in the market place in about 3 years into the investment. To this point, several large profile VC firms, which focus on building $Billion businesses have essentially exited the space; and many more have severely curtailed their investment efforts in CE.

importantly, this movement away from investments by VCs in upstream technology development is caused by other considerations including the fact that many clean energy investments (including numerous high profile ones) have not been able to generate the needed downstream ROIs over the last 10 years required to provide reasonably good profitability for their limited partners; limited partners are typically the primary source the investment dollars needed and used by VCs. This low profitability for limited partners is strikingly illustrated in the Figure 2 above, from the Kaufman Fund Report;[18,19] see data from 1999 through 2008.

Other key interrelated problems have conspired to greatly reduce the profitability of many upstream technology investments and thus limit the future availability of investments. These problems include the fact that there has often been too much initial optimism in how quickly markets will, or can grow,[20] as well as the general global economic malaise and the credit crunch which began in late 2007. In addition, the current volatile and often lower prices for competing commodity energy sources (e.g. Natural Gas), and the decrease in government funding to help buy down these risks all contribute to the above problems.

Hence, with all of these issues (and risks) cited above, and lack of current high demand in much of the market place (especially in the US) there is not enough incentive for VCs and their LPs to take on the risks associated with disruptive energy supply technologies that require expensive and lengthy technology development.

Finally, we should mention why Private Equity (PE) Firms (e.g. like Silver Lake) don't provide equity funding, especially in the form of Growth Equity (GrE) in this gap. PE firms traditionally invest in the growth of the business (e.g. SolarCity), and in product development as needed, but they strongly avoid technology risk associated with the development of the base technology. Also, to qualify for PE/GrE funding, the technology based venture typically must have products / services in the marketplace, and in many cases must have solid cash flow. [21]

2. **The gap in the commercialization food chain can have far reaching impacts on the CE innovation pipeline over the longer term.** This is important because continued innovation is needed to accelerate market driven deployment of a wide range of CE technologies that can address global growing energy needs in the most cost effective manner.

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[17] Consider the experiences of A123, and MiaSole. In both cases, as the technology was being fast tracked to commercialization, significant manufacturing technology development issues arose, along with reliability problems. This resulted in not being able to meet cost/performance requirements and projected time to market, as well as market share– and both ran out of money followed by bankruptcy, with big losses for investors.

[18] Mulcahy, D.; Weeks, B.; Bradley, H.S. (May 2012). "WE HAVE MET THE ENEMYAND HE IS US: Lessons from Twenty Years of the Kauffman Foundation's Investments in Venture Capital Funds and The Triumph of Hope over Experience." *Ewing Marion Kaufman Foundation.* URL http://www.kauffman.org/uploadedFiles/vc-enemy-is-us-report.pdf

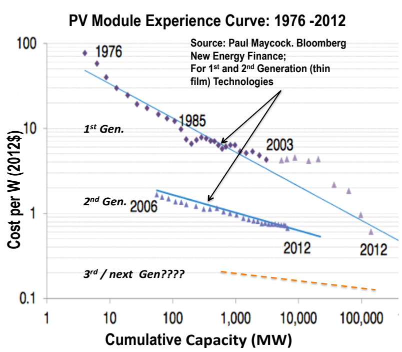
[19] It is important to note that these results from the Kaufman study are not limited to CE investments.

[20] Consider the experiences of A123, and MiaSole[20]. In both cases, as the technology was being fast tracked to commercialization, significant manufacturing technology development issues arose, along with reliability problems. This resulted in not being able to meet cost/performance requirements and projected time to market, as well as market share– and both ran out of money followed by bankruptcy, with big losses for investors.

[21] Hence, GrE does not address the expensive upstream technology development issues such as those related to scale up of manufacturing for which is discussed extensively above. See Appendix F

On the positive side, this downstream focus has given CE innovations considerable traction and acceptance in the current marketplace. Moreover, these recent, downstream based contributions have led to the growth of the industry, based primarily on first generation technologies[22] (e.g. SolarCity). And, this downstream focus also often also addresses infrastructure development. Further it is leading to new financing innovations and platforms,[23] such as the broader application of Power Purchase Agreements (PPAs) as discussed below, and the evolution of new relationships with Utilities such as those that are occurring with distributed generation and net metering. In addition this focus has helped to establish the securitization of solar energy contracts, and the creation of green energy funds including bonds.[24] And these secured Green bonds, while rapidly becoming popular, are concurrently creating a market asset class for CE, helping to reduce transaction costs.

Figure 3. Fostering Next Generation Technology Development



Conversely, not addressing the technology development gap effectively can severely limit or prevent the development and commercialization[25] of many worthy upstream CE technology innovations such as depicted in Figure 3,[26] for PV modules.

These innovations also include those needed for enabling, next generation, and dramatically more cost effective CE supply technologies such as novel wind turbine, battery, fuel cell, ocean, and energy storage, systems – these, often disruptive CE supply technologies, can often require and/or leverage novel material configurations, along with complex hardware development as well as innovative, and sophisticated manufacturing processes.

Also, since there is a mismatch between VC/LP model and very large investments, (as explained in Conclusion 1, above), the anticipation of not being able to complete the transition to the downstream commercialization process will preclude investment in the early upstream process (as depicted in Figure 4.).[27]

Figure 4. Equity Gap for Next Generation CE "Supply Technologies"

Investment, $MM (In scale)	10		100
Preferred CE Investments for VC/LPs	Upstream Venture – VC/ LP	Downstream PE/GrE	
Next Generation, CE "supply technologies"	Upstream Equity Gap VC/LPs won't risk investing here	If large $s, >> $10MM are needed later	Downstream PE/GrE

[22] Of course, contributions such as those that are based on combining first, and future generations of CE technologies with software and IT innovations, are quite important and should be fostered.

[23] Examples include numerous crowdfunding approaches such as for SolarCity (discussed below), Clean Power Finance, Noesis, and many others.

[24] See: Doom, Justin (Jul 25, 2014). Million in Bonds Backed by Panels. Bloomberg. Bloomberg News . URL http://www.bloomberg.com/news/2014-07-25/solarcity-raises-201-5-million-in-bonds-backed-by-panels.html

[25] We also discuss later, how this gap severely limits access to resources from other dedicated private equity (PE) firms – the vast majority of which do not invest in technology research and development (see Appendix F).

[26] While Figure 3, as reported by Maycock, shows progress in terms of cost vs cumulative capacity produced corresponding to 1st and 2nd generation PV technology (and thus to a great extent the impact of manufacturing scale), there is no apparent path to the next generation cells/modules in the current investment environment.

[27] For further discussion on this gap, and earlier work on "the Cash Flow Valley of Death." See also Appendix A (Inherent Challenges Within The Investment Gap).

In addition, the movement of VCs and their limited partners away from investments that require large capital expenditures represents much more than just a loss of access to capital for CE innovations. It also includes the loss of the traditionally important contributions by VCs to the management and business growth expertise, as well as to start-up, and operational support for nascent CE technology ventures. Further, and quite importantly, the result of not making the upstream innovation pipeline more robust is likely to cause the US to cede its CE leadership to non-US based industry members and investors[28] in the global economy, not only for the manufacture of new CE technology innovations, but also for their creation (and the associated intellectual property), development, and integration within the larger US energy infrastructure. Thus, the need for new kinds of resource partnerships is emerging; partnerships that will play an increasingly important role in helping to close this gap and to foster continued industry growth and development - as well as US industry leadership in CE.

3. **Large Strategic Industry Partners SIPs are potentially the best positioned group to benefit from providing a bridge to resources, eliminating the gap discussed above for CE** - resources that span a wide range of upstream and downstream commercialization needs - if strong business cases, can be made relative to the many other investment options that SIPs have.

In particular SIPs can provide access to a wide spectrum of expertise and other resources, if strong market demand for the products, along with the ability and willingness of customers to buy the products all exist. These resources include: (i) access to capital, (ii) technology and product expertise, iii) access to, and understanding of markets, (iv) supply chain development and management, and (v) their ability to Impact market and industry stability as well as the dialogue on policy. Moreover, the ability of SIPs[29] to vertically integrate a complex array of key resources and provide supply chain management is often world class.[30]

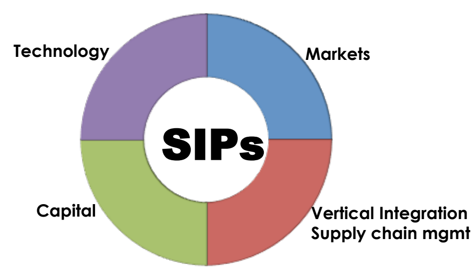


Figure 5. SIPs can provide integrated expertise and access to many resources

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[28] See for example, related discussions of Mia Sole, and A123 in Appendix C.

[29] We should also make a distinction between SIPs and Strategic Industry Investors (SIIs), as there can be some key differences in the objectives of each. For instance, SIIs may have as their primary focus the financial return aspects (including time constraints) of the investment itself, while not being as tightly tied to the longer term strategic needs of the industry member that they represent. Further, even if a particular SII represents the industry member's venture arm, and also is a limited partner to a venture fund, the other fund members will likely be looking for VC-like returns and timing, along with some (usually minority) shared controlling interest. Moreover, if the SII is making a direct investment in a CE venture, the SII may require a controlling interest that could enable the SII to change the future course of the venture.

[30] Another major strength of SIPs is that they have the ability to bridge across numerous segments of the commercialization food chain; and well structured partnerships, that provide a more robust portfolio of options along this food chain that can, in turn, help reduce risks and investment costs to all participants.

Key SIP Resource Area 1 - Access to Capital. SIPs can be a potential source of private capital investment, in the gap between traditional VC and Private Equity sources by potentially offering a wider range of options relative to what VC or PE investors can offer individually. Of course SIPs, have their own set of requirements and criteria for investment including for instance, their internal hurdle rates, cost of capital, and appetites for risk that must be evaluated by the venture seeking to partner. In addition SIPs, because of their industry stature, along with their market knowledge and understanding of market risks, can often attract other traditional and non-traditional capital (e.g. such as that from PE, family offices, banks, foreign investors) which is often more patient, and lower cost (see Table 2) when compared to the cost of capital available from purely financial (e.g. VC and PE) investors.[31] This is because SIPs look for sound long term investments which can lead to better capital efficiency including the ability to use debt to complement equity where appropriate. Further, SIPs are often not hamstrung by needing to cross investor category boundaries along the commercialization value chain; e.g. they have the ability to span VC, a wide range of other PE, and even project financing.

Table 2. Cost of Capital by Selected Sectors – NYU Stern School of Business, 1/30/14

	Industry Name	Number of Firms	Cost of Equity	Cost of Debt	After-tax Cost of Debt	WACC-Cost of Capital
Selected Subsectors	Biotechnology	349	8.62%	7.04%	6.96%	8.48%
	Chemical (Basic)	47	8.10%	7.04%	6.60%	7.76%
	Chemical (Diversified)	10	10.12%	4.54%	3.40%	8.44%
	Chemical (Specialty)	100	8.11%	5.54%	4.83%	7.65%
	Computer Software	273	8.38%	7.04%	6.61%	8.24%
	Oil/Gas (Integrated)	8	8.06%	4.54%	3.61%	7.71%
	Oil/Gas (Production and Exploration)	411	9.24%	7.04%	6.60%	7.63%
	Oil/Gas Distribution	80	7.12%	4.54%	4.35%	6.18%
	Oilfield Svcs/Equip.	163	9.56%	7.04%	6.28%	9.01%
	Pharma & Drugs	138	8.56%	7.04%	6.74%	8.33%
	Power	106	6.43%	4.54%	3.81%	5.23%
	Semiconductor	104	9.01%	6.04%	5.60%	8.61%
	Semiconductor Equip	51	9.31%	7.04%	6.68%	8.93%
	Shipbuilding & Marine	14	10.52%	7.04%	6.69%	9.01%
	Telecom (Wireless)	28	6.44%	6.04%	5.34%	5.88%
	Telecom. Equipment	131	8.76%	7.04%	6.55%	8.55%
	Telecom. Services	82	7.74%	6.04%	5.53%	6.82%
	Utility (General)	20	5.84%	4.04%	2.83%	4.61%
	Utility (Water)	20	6.78%	5.04%	4.31%	5.87%
	All Sectors	7766	8.07%	6.04%	5.42%	6.94%

SIPs, very importantly, also have the potential to promote more timely exits for (and co-investment with) VCs and other earlier stage investors, that have the venture in their investment portfolio; and they can catalyze, worthy potential mergers or acquisitions. These exits and partnerships can take the form of buying the innovative venture or the technology outright, licensing the technology, and / or purchasing the technology for the products produced by the respective SIPs.

Key SIP Resource Area 2 - Technology and Product Expertise. SIPs can potentially offer joint product development with small entrepreneurial companies, while greatly enhancing product and market acceptability through their market place reputation as well as expertise. They may also provide crucial continuity, including that for manufacturing, in the innovation pipeline. They also bring deep understanding of technology infrastructure needs, including those related to input and off-take opportunities. Further they are often a good source of

[31] For many corporates WACC provides a floor above which value is created. For full list of Sectors see: NYU Stern Business School (January, 2014). "Cost of Capital by Sector." URL http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/wacc.htm. Interestingly, by Comparison, Morningstar recently reported (as of 1/31/13) a 10 year average trailing return on the S&P 500 index of less than 7.5%. Of course VCs and PE firms seek much larger returns.

knowledge on related competitor technology. They also bring a broad and valuable rolodex, including a support network to enhance access to a wide range of potential partners (e.g. those needed for manufacturing, project development, etc.). Thus, they can provide a commercialization pathway that is likely to be much more robust, and accelerated than that which a small CE entrepreneurial company can implement on its own – important since for example, time to market is so crucial in the fast-paced global environment.

Many potential SIP partners bring strong technical expertise and know-how related to large scale, and sophisticated manufacturing,[32] along with know-how to optimally translate manufacturing learning processes into cost reductions - reductions that are crucial to the successful commercialization of potentially attractive CE technology hardware innovations. Such innovations as noted above often require complex new configurations and material combinations. This manufacturing know-how is also crucial for downstream efforts that must focus on evolving, market focused products that leverage other attractive complimentary technology innovations.

Key Resource Area 3 - Understanding Of Markets and Competition*, and more specifically the relentless* focus that SIPs have on related markets and market needs is a key capability of SIPs. SIPs are not going to risk their resources or reputation on business partnerships that don't make sense or that don't help them compete more effectively in the marketplace.

For instance SIPs can provide CE company partners with insight on customer development, as well as the potential opportunity to leverage the SIP's marketing channels and (often world class) distribution networks. Moreover, SIPs not only have a very good sense of markets for their current product offerings as well as how to create markets for those offerings, they will also likely offer additional insights on promising new innovations and the corresponding products and markets for which they and the new venture can jointly bring to the table. In fact, it is the value added collaboration with SIPs in defining and developing new markets for the innovations from new venture, that is likely to be one of the most important and attractive features of any such partnership, especially if the resulting benefits accrue fairly to all parties.

Furthermore, SIPs bring market credibility for jointly developed products through well-designed partnerships. And quite importantly, these partnerships can promote more rapid access to markets, as well as greatly accelerate the time to market and ultimate profitability from innovative technology in the marketplace (e.g. decreases in the time to develop and access markets may be as much as an order of magnitude).

Key SIP Resource Area 4 - Access To, Understanding and Integration of Key Supply Chain Elements. SIPs' many insights, and experience with needed supply chain elements, can greatly help their partners gain access to the market place at an accelerated pace. It is the ability of these large corporations to combine and integrate these capabilities and resources,

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[32] This need could be extremely important to the future development and commercialization of innovative new technologies, that require large CAPEX, and manufacturing scale-up development, and longer times to market. See Appendix C: The Technology Cost/Performance and Investment Challenges Can Be More Daunting Than Many Have Believed - Especially In The Manufacturing And Scale-Up Regimes of Commercialization.

that make SIP involvement so compelling – and SIPs can do this for a wide range of upstream and downstream commercialization efforts as discussed above.

SIP expertise and know-how with supply chains is especially important for complex energy systems for developers of major complex energy components and systems that will most likely require multiple partnerships with many suppliers. These suppliers and partners include for example, those for key components and subcomponents, different funding sources, and product development services, as well as those partners corresponding to various market channels, and distribution networks. Even when the specific SIP does not have the needed expertise in house, they often have extensive networks, that include the needed value chain participants. This last point is noteworthy since big companies (e.g. GE, Exxon, and Utilities) often control relatively large portions of the energy industry, as well as the corresponding key supply chain elements, and market channels.

Key SIP Resource Area 5 - SIPs can make valuable contributions to Policy and Regulatory Dialogue. SIPs can have an impact significantly beyond their wide-ranging resources, their market focus, and their business and technical expertise. For instance, it their stature, and credibility in the international business community is important. And while large corporates are focused first on their fiduciary responsibilities, they often also have a much broader and longer-term perspective than just short term financial aspects of their own, and related industries. They also have informed perspectives of the needs, challenges, and opportunities that are likely to emerge as a result of Policy (and regulatory) decisions. For instance they have knowledgeable perspectives on the impact that policy is likely to have on specific market and related industry stability. Thus, SIPs, are well positioned to make valuable contributions to policy and regulatory dialogue relative to the commercialization of CE and the larger energy context for the benefit of all.

Moreover, by building on their position of stature and influence, SIPs, when aligned with the entrepreneurial CE community, will be key in helping to sustain and grow US global leadership in CE, while contributing to market stability. However, while building those partnerships can be daunting as will be discussed briefly below, developing an understanding of SIP perspectives and the context in which they operate, and successfully addressing their key needs (all of which shape their decision processes) can be well worth the required effort.

Key SIP Perspectives and Needs. For example SIP virtually all large companies are now international and they must adjust to global competition. SIP also have strategic perspectives can have time horizons that extend fifty years or more, even though SIP leadership may periodically change over time. Also, while some potential SIPs, may have interests limited to a particular CE technology (or piece of technology, such as a PV inverter), some the big companies may have a wide portfolio of interests specific to different operating units; for instance GE, beyond their many technology product lines, have noted that they are willing to collaboratively share market channels, and distribution networks when doing so is congruent with their strategic objectives. Also SIPs, when considering strategic partnerships, will always look to protect their corporate brand and their corporate image; and they will require clear access to the technologies that they look for. In addition, they need to perceive that any specific CE partnership investment is at least as good a strategic fit, as their other available investment opportunities. And SIPs need to see a clear picture of how such benefits will be monetized, and accrue to them, both for short term and longer term objectives. Further SIPs look for, and need, to see how the proposed innovations will then help them make their respective businesses more robust. SIPs often look first for solutions to their current business operation problems,[33] along with the ability to leverage their strategic platforms and competencies. Finally, if SIPs are going to be involved in technology development, they like to get involved early while having clear agreements on access to the technology.

SIPs can have a number of key concerns that need to be addressed (or at least understood) before entering into partnerships with entrepreneurial CE ventures. And according to one citation, which is consistent with the downstream investment focus that we are currently seeing, "The drivers are going to (*have to*) change to be much less environmental, and much more business-related." SIPs also have concerns about, and need to address, what they perceive as the over-hyping of renewables, and the relatively large incentives that CE technologies get. They also have significant reservations regarding how the uncertainty in policy and regulations and their corresponding impact on markets,[34] will impact the long term profitability for their businesses.

Regarding key needs, SIPs need to know that for the technologies that they invest in, that ultimately there is high likelihood that they will be in strong demand within the market place, where large numbers of customers want them, and are willing to pay, and can afford them;[35] they also want to know just how their own companies can profit from developing and bringing specific CE technology products to market. SIPs also want their decision processes to be supported by strong analytics using the best available information,[36] and strong due diligence. They also want the ability to address critical issues such as what the actual size of the addressable markets might be, as well as the right time for market entry (e.g. now, or 10 years from now?).[37] And SIPs need sound analysis to help understand the impacts from a range of policy and regulation issues.

Finally, in summary regarding SIPs, many have the money and other key resources to make the needed investments in CE for widespread adoption of these technologies, and many SIPs are currently looking for profitable investment opportunities. Assuming interest in new energy investment opportunities, they SIPs will also need innovations and the expertise (technical and market) that good entrepreneurial ventures possess. While there is rapidly changing environment for energy innovations, there are many growth opportunities,

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[33] Investment results in such cases (e.g. such as in energy efficiency) often accrue directly to the bottom line; and the impact of these solutions are often more transparent, as well as convincing, to corporate decision makers.
[34] A related and important perspective that SIPs have is that government set policy and help develop enabling innovations, businesses create markets – not governments.
[35] For instance, see Dr. William F. Banholzer's, Executive Vice President and CTO of Dow Chemical Company, talk. Banholzer, W (February, 2012). "The Future of Alternative Feedstocks and Biofuels: Recognizing Hype and Realizing Practical Limitations," Presentation to the Chemical Engineering Department at UC Berkeley. URL www.youtube.com/watch?v=W94210OvvWw
[36] The best available information, is often not in a form, or sufficiently vetted (e.g. the continued downward cost trend, anticipated relative stability of CE costs over the long term) such that is easily usable by prospective strategic partner SIPs.
[37] There are a host of other technology specific issues that are evolving rapidly, such as amount of electrical storage that is actually needed, all of which must be addressed with analytics. See Appendix D for a few examples.

including a growing interest and demand for these technologies and their corresponding broad portfolio of benefits, especially internationally.

4. **Public - private partnerships, will be crucial to the robust development and deployment of new energy innovations, as well as to the ability to engage large US industry partners in this effort,[38]** even while keeping in mind that businesses have the ultimate responsibility in creating markets. This is true even assuming that large equity investments for technology development, via Public-private partnerships are not likely to be available in the foreseeable future. For example, while recognizing the differences in missions and the corresponding perspectives of the public and private sector, it is especially important to minimize uncertainties regarding issues such as regulations and government incentives. These issues are vital to market stability, as well as for engaging large US industry and a wide range of commercialization partners, and for the global US leadership role in CE. In fact a number of CEOs of large US businesses have noted that their largest concern is the predictability of US policy; some say it can be more important than the level of incentives, especially over the long term.

   Examples of novel policy legislation on the horizon, and which are quite important, especially for downstream commercialization of CE technologies, include those that are being considered for Real Estate Investment Trusts (REIT's) and Master Limited Partnerships (MLPs).[39],[40] If enacted (Senate and house versions exist), this legislation could potentially enable risk reducing mechanisms, and other significant cost savings that are currently reserved for investment in conventional energy. This and other similar legislation could be key in maintaining the strong momentum that has been building in downstream commercialization of CE.

5. **A number of other potentially good partnership opportunities for financial, and other resources have been identified.** While, none has the breadth and depth of commercialization resources when compared to SIPs (as discussed above), each has its own area of potential applicability for developing partnerships (most correspond to down stream commercialization) each is evolving, and progress in each of the areas should be tracked. For example we briefly describe three of these areas below:

   - Crowd Funding is interesting because of the potentially powerful ability to aggregate, and scale financing (and access to other resources) by leveraging the internet and social media for both equity-based and debt-based financing. And the industry is growing rapidly; investments totaling $5B is anticipated for 2013, up from $1.2B in 2012. While

[38] For a good discussion on the historical importance of promoting interplay between various members of industry and public sector see: Janeway, W.H. (Oct 8, 2012). *Doing Capitalism in the Innovation Economy: Markets, Speculation and the State.* Cambridge University Press. P79.

[39] We should note also that there are other forms of securitization where accredited investors such as pension funds would be able to participate and the potential influx of funds could reduce the cost of money as well. Climate or Green bonds have been developing nicely overseas. There was a large bond offering last year to finance a large wind farm also. Further, SolarCity just had a small (solar lease securitization) bond issuance to accredited investors with the bonds covered by the revenues from the solar leases.

[40] Feldman, David; and Settle, Edward (November, 2013). *Master Limited Partnerships and Real Estate Investment Trusts: Opportunities and Potential Complications for Renewable Energy.* NREL Report. URL http://www.nrel.gov/docs/fy14osti/60413.pdf

most of this early US investment to date is for donor sponsorship and projects,[41] interest in equity investments is ramping up in the US, and the concept has already seen much more broad adoption overseas. It is important to note that Crowd Funding for equity investment in the US, is currently largely constrained by SEC requirements to relatively small amounts of funding - of under $1M dollars per year in a given investment.[42] In addition, there are already some US broker dealers operating in this space, even though SEC requirements are not fully established; though many more are reportedly preparing their applications for certification. With equity ownership and the associated profits, the SEC will have a large say in how widely used and successful crowd funding will ultimately be.[43]

- Another innovation that is gaining broader traction, is the more wide spread application of Power Purchasing Agreements (PPAs). While PPAs have long been used by utilities, the use of PPAs have moved beyond this traditional utility use in a number of ways that may reshape utility relationships with the CE industry. For instance, large scale, independent power producers such as NRG (which is both a competitor, and supplier to larger utilities), have contributed to the growing use of CE technologies, often utilizing PPAs.

  PPAs (including closely related lease approaches) are also increasingly being used by a variety of smaller CE power producer companies such as SolarCity and BloomEnergy,[44] to help scale their residential and commercial businesses; PPAs are an attractive business element model because of their ability to efficiently aggregate associated subsidies, to make user payments more manageable, and to facilitate user access to the technology. We should also note that the growing success in this area by companies like SolarCity in expanding the commercialization of CE is also rapidly growing into contentious issue, as it represents a threat to, and is being challenged increasingly by utilities. One challenge is around net metering, and the associated allocation of transmission resources, including the equitable distribution of costs and revenues across participants.[45]

- Another important addition to innovative financing comes from Jigr Shah[46] who pioneered the no money down approach to solar installations with SunEdison. Generate

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[41] SolarCity recently purchased privately held financial technology company Common Assets LLC to provide an investment platform to distribute debt ala crowdfunding. See: Fehrenbacher, K. (JAN. 15, 2014).With startup acquisition, SolarCity will open up solar investing to individuals. GIGAOM. URL http://gigaom.com/2014/01/15/with-startup-acquisition-solarcity-will-open-up-solar-investing-to-individuals/

[42] Koldony. L. (October 2013). "AngelList And Beyond: What VCs Really Think Of Crowdfunding." *Venture Capital Dispatch.* URL. http://blogs.wsj.com/venturecapital/2013/10/08/angellist-and-beyond-what-vcs-really-think-of-crowdfunding/

[43] SEC requirements, which are meant to prevent fraud and protect small investors, are not yet fully defined, though many of them are available now for public comment. The requirements are expected to be finalized sometime in 2014.

[44] While PPAs are mostly used for helping to fund downstream investments, Bloom Energy has been able to use a form of PPA to complement and support their technology development needs by using their field experience and maintenance programs to provide modifications along with corresponding verification of their technology.

[45] Herndon, A (May 10, 2013). "Rooftop Solar Battle Pits Companies Against Utilities." Bloomberg News. URL http://www.bloomberg.com/news/2013-05-10/rooftop-solar-battle-pits-companies-against-utilities.html

[46] See: Fehrenbacher, Katie (Dec. 2014). "Meet Generated Capital, a new way to fund energy projects." GIGACOM. URL https://gigaom.com/2014/12/04/these-investors-are-using-the-solar-as-a-service-model-for-resources/

Capital has a focus on "infrastructure as a service," while not emphasizing PV applications. Generate Capital offers multiple types of services, and products including short term asset-based financing, and equipment leasing – in the $2M-20M (per project) range for commercial scale renewable energy heating equipment, energy storage projects, urban farms and water treatment technologies.

- Some VCs are experimenting with aligning selected companies within their respective portfolios, with specific targeted, large Bio-Pharma Companies in novel ways (somewhat like what might be described as akin to anchor SIPs). According to GEN:[47] "The newer bio-pharma-venture partnerships are designed to offer something for everyone. Bio-pharma giants, get access to new technologies through startups that offer potential licensing or acquisition opportunities. Start-ups get the expertise and capital of big pharma, and potential for investment from other partners. And for venture firms, it's connection to the expertise from the life science partners as well as potential buyers or licensors for the startups they back…." Time will tell, as we track the progress of the model, and its numerous other emerging variations, some of which are summarized briefly by GEN[48]), just how robust this process proves to be, and whether or not it can be attractive in the CE environment.
- Family Offices are also quite interesting since they are potential source of large amounts of capital. While the vast majority of Family offices are focused on wealth preservation, they are also evolving as limited partners to PE firms including VCs, hedge funds, and project financiers, and they have an advantage relative to many institutional investors since - they are often less restricted in their investments and their time frame perspectives can be longer term. While Family Office involvement in CE is still relatively modest, interest is growing as indicated by the formation of the Clean Tech Syndicate (a group of some 14 Family Offices with an interest in CE) that includes a number of firms such as Prelude Ventures and Black Coral Capital that have been active in CE for a number of years.
- Another area of financing showing rapid growth is in Green bonds, which may help provide the $1 trillion annual investments in clean energy that environmental groups say is necessary to limit the impact of climate change. In fact, more than $16.6 billion has already been sold worldwide this year, surpassing last year's $14 billion, as more companies issue the debt to finance downstream clean energy projects according to Bloomberg New Energy Finance.[49] According to one expert cited in the Bloomberg article noted that Green bonds offer a simple method for investors to tap into fixed income markets and finance clean energy, including energy efficiency and sustainable

[47] See: Philippidis, A. (May 24, 2012). "Recent Flurry of New Life Science Funds Aim to Start Bridging the Valley of Death: It remains to be seen whether these partnerships will succeed in advancing more medicines." *Genetic Engineering and Bio-Technology News (GEN)*. URL http://www.genengnews.com/insight-and-intelligenceand153/recent-flurry-of-new-life-science-funds-aim-to-start-bridging-the-valley-of-death/77899612/. Philippidis also gives several other examples of where major Bio-pharma firms have allied with a specific venture fund.

[48] Insight & Intelligence (June, 2013). "10 Industry-Venture Fund Alliances." *Genetics Engineering & Biotechnology News - GEN*. URL http://www.genengnews.com/keywordsandtools/print/3/31748/

[49] Martin, Christopher (Jun 26, 2014). "Green Bonds Show Path to $Trillion Market." ***Bloomberg Sustainability.*** URL http://www.bloomberg.com/news/2014-06-26/green-bonds-show-path-to-1-trillion-market-for-climate.html

business practices. The market for the bonds could top $40 billion this year and reach up to $100 billion in 2015. Moreover, a coalition of banks, including Citi, Bank of America Corp., JPMorgan Chase & Co. (JPM), Credit Agricole SA (ACA) and others created a common set of criteria for green bonds in January to act as a catalyst for the development of the market. They have helped to create the asset class as well – important for transitioning from upstream (helps upstream indirectly – provides assurance that there will be funding downstream).

A Few Other Observations and Opportunities for Building Partnerships

- As a source of energy, there is growing recognition that Natural Gas (NG) the biggest competitive threat to large scale CE commercialization in the near term. This threat also points to the need for exploring opportunities for synergies between CE and NG technologies. This has been done for electricity production,[50] and there are a number of studies, looking at the impacts of Natural Gas (NG) including the likely related macro effects on the US economy.[51] However, the rapid growth and scope of investment in the and use of NG, in particular shale gas and oil, by the other industries (including upstream NG exploration and distribution), could well indicate that numerous additional synergies with CE may be possible, along with corresponding partnerships.

  For example, the energy intensive chemical industry, is gearing up to leverage the lower cost of shale NG, for their own process energy needs, as well as for a source of feed-stock in the production of lower cost commodities such as ammonia and fertilizer.[52] The chemical industry also anticipates that shale gas is will be a key element in the development and use of new lower cost polymer based chemicals and materials for derived, engineered products. In addition, there are fast growing subsectors such as that for natural gas liquids (NGL) from shale gas production which the chemical and energy industries are increasingly exploiting for ethylene production.[53] Finally, the growing number of applications seems to be especially important for the US chemical industry, particularly for manufacturing, and for export

[50] See for instance: Lee, A.; Zinaman, O.; Logan J. (December, 2012). *Opportunities for Synergy Between Natural Gas and Renewable Energy in the Electric Power and Transportation Sectors*. NREL Report. URL http://www.nrel.gov/docs/fy13osti/56324.pdf

[51] Stanford Energy Modeling Forum (September 2013). *Changing The Game?: Emissions And Market - Implications Of New Natural Gas Supplies.* EMF Report 26 Volume I. URL. http://emf.stanford.edu/files/pubs/22532/Summary26.pdf

[52] For example see: "PWC Corporate Report (Feb. 2013). "Shale Gas: Reshaping the US Chemicals Industry." URL http://www.pwc.com/us/en/industrial-products/publications/shale-gas-chemicals-industry-potential.jhtml

[53] Morris, G. (Aug. 2014). Shale Gas, NGLs Fuel Large-Scale Petrochemical Investments. American Oil and Gas Reporter. URL. http://www.aogr.com/web-features/exclusive-story/shale-gas-ngls-fuel-large-scale-petrochemical-investments

markets,[54] when one considers the growth and investment by the chemical industry in the US gulf coast area.[55]

- An encouraging CE example of how big industry can target, collaborate internationally (both upstream and downstream) on R&D, and bring products to the marketplace when the time is ripe is with Fuel cell powered automobiles. The decision to pursue fuel cell vehicle development by numerous automakers at an accelerated rate is a fairly recent occurrence. For instance, Toyota has announced plans to bring a new Fuel Cell vehicle to the market in 2015 - with numerous other offerings from Automakers; GM, Honda, Hyundai, Ford, Diamler, Nissan,[56] and BMW to enter the market place shortly there after. It is interesting to note, while being quite relevant for technology commercialization in general, that this rapidly growing interest and focus has resulted from hard won successes not only for the development of fuel cells themselves, but also from concurrent achievements in storage systems, electric drive systems and controls, and the initial steps in infrastructure development.

- Utilities will continue to play a major role in energy production and delivery, and they control a major part of the nations energy infrastructure, especially that associated with electricity, where they control several trillion dollars of assets. They should be considered as potential partners, though generally not as a large source of direct equity investment for early stage ventures having a focus on R&D, or especially for manufacturing technology development and scale-up efforts.[57] Though utilities have been users and sometimes owners of CE technologies,[58] their corporate financial structure and the constraints on investment opportunities are considerably different from those of other large industries;[59] this is true whether the utility is investor owned or a municipal utility.

  Moreover, the electric power utility industry is facing the specter of unprecedented global transformation, driven to a large extent by an accelerating shift to distributed energy – and in response, utility business models are going to have to change.[60] Related to these anticipated

[54] Sider, A.(March 24, 2014). "Gas Boom Rejuvenates Manufacturing." Wall Street Journal – Business Connect. URL http://online.wsj.com/news/articles/SB20001424052702303802104579451723117384620

[55] See for example: Boston, W. (Dec.17, 2013). "BASF Steps Up Investment in U.S.Economic Recovery, Shale-Oil Boom Spur a Shift for the Chemical Giant." WSJ. URL. http://online.wsj.com/news/articles/SB10001424052702303949504579263903951305372

[56] See the Diamler, Ford, Nissan Joint effort described at: Tschampa, D. (Jan 28, 2013). " Daimler Adds Nissan as Partner on Ford Fuel-Cell Project." *Bloomberg News.* URL http://www.bloomberg.com/news/2013-01-28/daimler-plans-joint-fuel-cell-project-with-nissan-ford.html

[57] There are of course exceptions to this. For instance E.ON, (along with Credit Suisse) made a $ 130Million later stage technology investment in Bloom energy systems (see Appendix on the Bloom Energy Commercialization Journey).

[58] Projects using CE technologies, provide not only operating data on the associated CE technologies also breed familiarity with the corresponding innovative energy technologies, and they can also help the participating utility meet regional portfolio standard requirements, while taking advantages of tax and other credits available within their regions.

[59] For example, When regulated utilities provide debt and, or equity investment in CE technologies, such as for PV and Wind, it is usually through an unregulated subsidiary (e.g. such as MidAmerican Renewables does within the holding company, Mid American Energy).

[60] To this point two German based Utilities are already undergoing significant re-focusing. For instance E.ON has been broken into two units (one focused on renewables, and one for the rest of their traditional utility operations). Further, Germany's second largest utility, RWE says It Will Create a New 'Prosumer Business Model' that will help

changes are a host of issues such as the fact that across much of the U.S. [61], demand for electricity is flat or declining. Also, the industry's aging infrastructure needs to be beefed up which will require a large amount of capital investment – while their revenues are stagnating in many cases. Energy efficiency, falling solar prices, demand-side management, hybrid Natural Gas / Solar systems, energy storage, and smart grid technology will all play a role in this global transformation. All of this presages the need for new relationships between utilities and the larger energy industry; including new potential partnerships with both the CE industry, and the natural gas industry.[62]

- Our white paper team has more recently become interested in the potential of long term institutional investors (LTIs) to participate and even lead in the acceleration the commercialization of attractive next generation CE technologies. LTIs that include pension funds, sovereign wealth funds, and some very big family offices are the focus of a recent study by Monk et al,[63] which discusses the possibility that LTIs can serve as important bridges for venture-backed, capital-intensive companies seeking commercial scale. Moreover, the authors argue, that LTIs can potentially be more capital efficient, and overall less costly, while concurrently reducing agency problems and integrating best in-class, investor types to focus on the problem. Further, LTIs can participate in the success of these companies over the long term. Moreover, the longer investment time frames (~10+years) and larger investment size ($50-500MM) preferred by LTIs are in alignment with the anticipated commercialization needs corresponding to large scale CE hardware innovations that require complex material combinations and sophisticated manufacturing, and infrastructure development as described above in this white paper.

  Monk et al, also describe the creation and early operation of an alliance of LTI's in a case study, that put some of the above ideas to the test. The Alliance includes the New Zealand Super Fund (NZSF[64]), the Alberta Investment Management Corporation (AIMCo) and the Abu Dhabi Investment Authority (ADIA). Right now the Alliance is operating based on letters of intent, and has deployed about $700MM over the last few years in a number of companies to help them achieve commercial scale by making sizeable commitments (e.g. in the $50-100MM range). The Alliance pools resources to vet opportunities, while, for example, engaging VCs from some of the worlds most prestigious firms to help de-risk

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them position themselves as a project enabler and operator, and [as a] system integrator of renewables.

[61] Journal Reports: Energy (April 8, 2014). "It's a Whole New Game." WSJ News. URL. http://online.wsj.com/news/articles/SB1000142405270230443260457947350068409481 . See also PWC (April 2013). "13th PwC Annual Global Power & Utilities Survey." URL. http://www.pwc.com/gx/en/utilities/global-power-and-utilities-survey/

[62] David Crane, CEO of NRG. Crane notes that, "The solar industry belongs with the natural gas industry -- those industries go together. They just don't know it yet." See: LaMonica, M. (November, 2013). NRG Energy Deploying Dean Kamen's Solar-Smart In-Home Generator. Greentech Media. URL. http://www.greentechmedia.com/articles/read/NRG-Energy-Deploying-Dean-Kamens-Solar-Smart-In-Home-Generator

[63] See: Bachher, Jagdeep Singh and Clark, Gordon L. and Monk, Ashby H. B. and Sridhar, Kiran, 'The Valley of Opportunity' Rethinking Venture Capital for Long-Term Institutional Investors (February 4, 2014). Available at SSRN: http://ssrn.com/abstract=2391005. 'The valley of Opportunity' corresponds to the 'gap' discussed extensively in this white paper.

[64] For example, the New Zealand sovereign wealth fund (NZSF) has recently made, three investments (a mixture of debt and equity) in three US based CE companies (Bloom, Ogin, and Lanza), representing some $165Million.

portfolio companies' business models.

- Another recent development is the fact that Solar City is vertically integrating and going beyond it core business as a service (i.e. installation maintenance, financing, and marketing) company. For instance Solar City recently purchased Silveo, a PV manufacturing facility last year (as noted above). The decision reflects SolarCity's desire to control its equipment supply and, in particular, the supply of low-cost solar panels that are efficient at producing solar electricity, company.[65] And they have a new ground breaking public-private partnership with the state of New York,[66] which is spending $750 million for **building a 1.2 million sq.ft. Facility** and supporting infrastructure at Riverbend, NY, and the state is purchasing the necessary equipment. Solarcity will lease the facility for ten years and over that period invest $5 billion into running the facility that is expected to open early next year and create 3,000 direct and spin-off jobs. It is the first of what is expected to be multiple production facilities around the United States.

[65] See for example see: dailykos (June 17, 2014). "SolarCity's Chairman Elon Musk annouces it will buy solar panel maker Silveo." SciTech by Houndog. URL http://www.dailykos.com/story/2014/06/17/1307693/-SolarCity-s-Chairman-Elon-Musk-annouces-it-will-buy-solar-panel-maker-Silveo.

[66] See: http://buffalorising.com/2015/02/solarcitys-silveo-headquarters-is-staying-in-california/

Appendix A – Inherent Challenges Within The Investment Gap

Consider first, the VC context in which VCs ideally target a 10 times (10X maybe more at times) return in five to seven years, at which time they seek to exit their investment in the innovative technology. Sufficient markets of at least $100M must also exist. Additionally, they ideally want the technology in the marketplace (in beachhead markets at least) in two to three years from the initial investment. However, a good number of CE technologies require 10 years (and sometimes significantly more)[67] from start-up, to significant revenues. Sometimes, even after two to three rounds of VC investment, these entrepreneurial companies still are not far enough along in the commercialization process for their current VCs and other early investors, to exit their investment and transition to, or access, PE/GrE financing. Also, sometimes these ventures overshoot (almost all do it to some extent) the original estimated time and cost milestones, due to the above noted complexities. And the longer time frames introduce additional risks as the market may have changed in unanticipated ways including the competitive, and volatile (and frequently changing) energy landscape. And all of these can conspire to significantly reduce the internal rate of return (IRR) attained by the investors, and their limited partners.[68] Further, return on the investment for energy technologies are often limited by commodity pricing as the technology matures and is sold into mainstream energy-related commodity like markets. These reasons are summarized in Table A-1 above.

Table A-1. Increased challenges to VC investments relative to those for software, and social Media often include one or more issues such as:

- Large capital expenses that require
  - Development of new materials and material combinations.
  - The development, scale up, and verification of complex manufacturing processes (especially for hardware).
- Longer times to market (and to positive cash flow) with reduced ROI, sometimes resulting in greatly reduced market size, and market share.
- Market uncertainties due to:
  - Public policy and Industry regulation, and political barriers.
  - Institutional barriers and a vast existing industry market infrastructure.
  - Non Unique end market product (e.g. energy) and **competition (e.g. NG)** from numerous other energy resources (large form factors as well).
- Complex / expensive, supply chain development and Integration (including those for market channels and distribution networks)
- Low market driven commodity price structure that often drives returns

And they relate directly to the investment Gap discussed above in the main body of the white paper, between Venture Capital and Private Equity / Growth Equity. This investment gap is different from the upstream cash flow valley of death,[69] that is often discussed relative to very

[67] These longer times and larger CAPEX investments (along with the 20/2 VC model) make it difficult for VCs to deliver the needed return for themselves and for their limited partners.

[68] For instance a 20% overshoot on time will typically reduce ROI by at least 20%

[69] The cash flow valley of death referred to here occurs in the development, seed, and early portion of the start-up stages. See: Murphy, L; Edwards, P. (May 2003). *Bridging the Valley of Death: Transitioning from Public to*

early stage investments by angels and VCs. This gap, discussed in this white paper occurs in the latter stage of the technology development portion of the commercialization process, where key technology issues still exist and before the technology is in the market place; ie. with the manufacturing process development, its scale up, and its verification – but it is before where funding from private equity firms is usually applicable. Since the technology is not yet in the market place, and key technology issues still exist,[70] other forms of equity investment such as from PE/GrE, are generally not available. At the same time VCs (and their limited partners) see the venture as being to be too risky (capital intensive, and possibly one that will require too long a time to get to market as, discussed above) for them to continue investing – especially where commodity like pricing for energy is likely to exist, also while many competitor in the energy marketplace exist. Add in additional uncertainties in regulation (within a very complex infrastructure for energy), and the resulting risk / reward for many equity investors doesn't fit their business model.

Quite simply put, most equity financiers don't want to (and many can't), pay for technology development related to manufacturing and manufacturing technology scale-up of complex hardware where new, and high performance materials are being used. This is true for Private Equity firms (ala GrE), as well as VCs and their limited partners as discussed in this white paper.

Private Sector Financing. NREL/MP-720-34036. National Renewable Energy Laboratory, Golden, Colo. URL http://www.nrel.gov/docs/gen/fy03/34036.pdf

[70] Moreover, we should note that, we discuss the difficulties of both trying drive down cost / performance to compete in commodity like markets, while keeping the keeping the investment costs under control; see Appendix B. Obviously this issue impact the willingness of both VCs and their limited partners to invest in these technologies . With respect to this conundrum, we also discuss how two innovative technologies (A123 and MiaSole) were fast tracked for commercialization too early, and the ensuing bankruptcies resulted.

Appendix B - VCs Are Still Making Investments In CE

While many VCs (including some very high profile folks) have scaled back their investments in clean energy, some have stopped all together – and as discussed above, some VCs have been quite constrained in their ability to raise additional funds from limited partners; especially institutional partners. Other reasons (beyond those discussed above), and perspectives that VCs give as to why their interest in making CE investments vary. For instance, some insist that they currently "are doing just fine," and others who are pulling back say that "it's not for lack of money, its that there are not enough really good ideas." Moreover, some have noted that "its just that CE is not a hot area anymore." That said, there are number of areas where VC's continue to fund the commercialization of CE technologies, which include, but are not limited to those ventures that:[71]

- Address issues like energy efficiency for commercial businesses, and industrial processes,[72] and/or that help to address regulatory issues – such as issues that are likely to remain stable or increasingly more favorable to investment over time (e.g. Smart Grid).
- Are based on technology combinations that leverage software, and / or, leverage existing IT[73] in novel ways with CE, and where they can access customers, markets, and partners quickly and at relatively low cost (e.g. through the web),[74] such as with Nest and Opower.
- Fit well within the current industry potential partners, products and associated customer bases; including where obtaining a license for the new technology is possible (e.g. the partnership between Total and SunPower discussed above)
- Can leverage and be plugged into existing business infrastructure and operations within a given industry (e.g. the recent purchase of Albeo by GE for their commercial and residential lighting businesses)[75]
- Focus on developing innovative, key sub-components and systems such as PV inverters, novel wind turbine drives, and innovative PV racking systems for field installation, as well as building integrated control systems for PV and lighting installations
- Are entrepreneurial companies such as SolarCity, and Sunjevity that are deploying well vetted key technologies (solar cells) from any of a number of vendors in their products – while not a technology development company, Solar City for example is primarily a scale-able PV installation, financing, marketing, and service company

[71] It should be noted that the in most of examples given below most have virtually no (or little) technology risk, or perceived manufacturing technology development or manufacturing scale-up issues, and most frequently they have relatively low CAPEX requirements. Moreover the times to market, and total VC investment is fairly constrained, while the path to market is clear for each respective example.

[72] For example, process related energy efficiency improvements are often quite attractive to industry participants since the results can frequently and visibly accrue to bottom line profitability.

[73] IT that does not require major expensive innovations and infrastructure development such as for meters, sensors and wireless communication.

[74] For example Shah estimated that, "20 percent plus of all energy can be offset with ICT (Internet Communications Technologies)." See: Jigar Shah (July 11, 2012). "Why Diluted Investments Are Diluting Cleantech's Impact." *GIGAOM*.

[75] See: Chernova, Y. (NOVEMBER 26, 2012). Braemar Nails Positive Exit by Selling LED Co. Albeo to GE. Dow Jones VentureWire. URL http://www.braemarenergy.com/news/media/2012/albeo_venturewire_1126.html. Braemar Energy Ventures saw a quick return on its $6.5 million investment in light-emitting-diode company Albeo Technologies Inc., which is being sold to General Electric Co.

- Offer new high value enabling capabilities applicable to a number of existing industries such as Ambri which provides large scale energy storage in the form of novel liquid metal,[76] flow and other batteries or thermal media.
- Can leverage DOD national security needs (as well as shared development cost) such as the US Navy's move towards getting half of its fleet fuel from biofuels by 2020. In this case the DOD is providing a market for cost effective biofuels, and is willing to buy down the risk, associated with the research development of the corresponding innovations.[77]

[76] Martin,C. (Mar 6, 2014). "MIT's Liquid Metal Stores Solar Power Until After Sundown." *Bloomberg New Energy Finance.* URL http://www.bloomberg.com/news/2014-03-06/mit-s-liquid-metal-stores-solar-power-until-after-sundown.html

[77] Biofuels is an example of a technology for which manufacturing of large hardware does not appear to be a current problem – though process scale up has been an issue in the past. Further, there has been a resurgence in VC/LP investment in the space over the last two years (e.g. by Shell Ventures, Khosla and others), helped no doubt by the US Navy's push to get 50% of its fuel from renewable resources, as well as by the ability of a number of companies to build expanded platforms across a range of applications and products (e.g. chemicals) in the international arena. Industry examples include both big companies such as Dupont, and small start-ups like Lanza industry.

Appendix C – Balancing Technology Cost / Performance and Investment Challenges in The Gap

The **Technology Cost / Performance and Investment Challenges** along with the issue of large CAPEX, and longer times to market, deserves more discussion, as do the inherent causes. It should also be noted that these issues lead to much higher risk, and the company may be stalled (and run out of money) in its commercialization efforts if these challenges are not adequately addressed.[78] This is because, for instance many new energy technologies face increasingly more challenging difficulties including rapidly growing resource needs at times, depending on their stage of development, especially as they relate to manufacturing scale-up; there can be a good deal of technical risk in the manufacturing and scale up process itself – and sometimes this is where technology innovation is most needed.[79]

For instance, this problem can be especially thorny for technologies that require new material sets as well as the development of sophisticated, novel manufacturing processes. Moreover, if for instance, the manufacturing process is scaled up in size quite effectively, but does not reach the desired cost and performance levels, the resulting size of the original anticipated markets can be greatly reduced — and the justification for the large investment needed is made much more difficult (not withstanding the other market uncertainties discussed in the above main body of the white paper). Quite simply most investors, including most VCs, are often not willing to take on these technical risks in the manufacturing scale up process even if initially anticipated cost / performance and market targets are seen as robust, especially where the needed investment is growing rapidly, and the performance / cost levels are increasingly chasing very low and often volatile commodity like prices.

For example, consider that a new technology (e.g. Battery, thin film PV, or fuel cell) technology can often be shown to be feasible in the lab, and at the lab scale prototype, at a relatively small cost and short time frame. However, getting to a small pilot prototype scale can easily require a factor of ten more investment, and much more time to get there as well. By far, however, and this is where the VC-limited partner model has difficulty. The biggest challenge is to show that the technology can be scaled, and demonstrated at a given cost and level of performance in a robust manufacturing environment – some times the cost of doing this can be 100 (or more) than the costs requirements for getting to the smaller scale pilot prototype. This very large investment need often is where small companies, that have not shown their technology to be market feasible, at cost and performance (as well have a clear path to revenue and positive cash flow), get into trouble, and can run out of money as noted above.

The conundrum of satisfying both technology cost / performance and investment requirements discussed above is illustrated schematically in the Figure C-1 as a function of technology

[78] Moreover, these manufacturing and scale up technology improvements and innovations, are needed continually to get to ever lower cost performance and larger market share. This is especially important when commodity markets are pursued and approached.

[79] For example, by rough analogy, consider the scale up and in size of semiconductor wafers over the last 25+ years. Each size jump in wafer size has required numerous years and many 10s of millions of investment dollars, even though the basic processes and much of the basic chemistry have been understood for many years. And SEMATEC, and the numerous member industry partners still keeps at it – to keep the US in the forefront of this industry.

development time; this figure illustrates that while cost / performance decreases, at a lessening rate with time through further technology development, the required investment (and the attendant risk) can simultaneously rise at (and sometimes at a quite high) rate over the same time period.[80] Also note, regarding this schematic figure, that several key technology development milestones are shown including: 1.) basic technology feasibility; 2.) lab scale prototypes of key elements; 3.) pilot level - prototype products; 4.) manufacturing scale-up, and performance /reliability demo. and; 5.) first commercial plant(s). While many clean energy technologies can be brought to stage 3, in 5-7 years, reaching stage 4 or 5 may take double the time or more; with much more attendant cost and market risk.

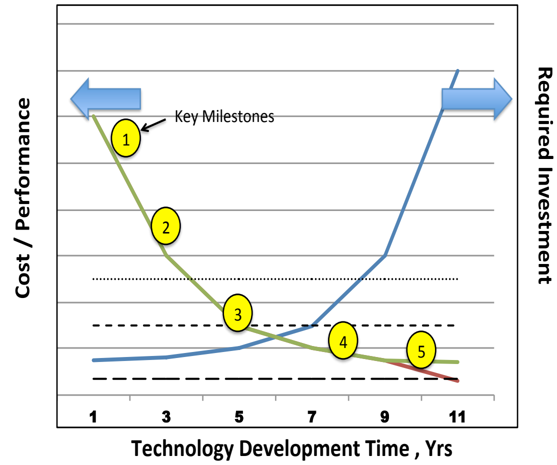

Figure C-1. Technology Cost/Performance and Investment vs Time

Further, the risk associated with reaching stages 4 and 5 can grow nearly exponentially with the required investment because of a number of factors beyond technical uncertainties with manufacturing scale-up. These include risk uncertainties from market volatility, and emerging competition over the intervening, and extended time frame. In addition this schematic shows different levels of cost / performance requirements corresponding to different levels of market penetration as dashed lines.[81]

Moreover, it should be noted that these later, larger investments (e.g. for stages 4 and 5), frequently require primarily private sector financing, while earlier investments (e.g. for stages 1 - 3) can often be financed with a combination of both public sector and private sector resources. Further, these earlier stages, through stage 3, often represents the sweet spot for VCs; and at these lower levels it is often easier to syndicate the deal.

For example, consider what occurred with the battery maker A123[82, 83] to better illustrate the above discussion.

- The novel lithium battery technology had been vetted quite successfully, at a small scale, and prototype elements for a larger battery system had been manufactured successfully with the desired, initially acceptable performance.

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[80] It is important to note that as long as cost / performance levels denoted by numbers 4 and 5 in the figure are being pursued, there are often still technology uncertainties that go significantly beyond the normal manufacturing learning processes.

[81] The top dashed curve might correspond to a key enabling technology where the cost is not be a significant driver. The bottom dashed curve would correspond to a case where the technology must compete on cost in commodity like markets.

[82] William J. Holstein. (October 17, 2012). What the A123 Bankruptcy Means. October 17, 2012. URL http://williamjholstein.com/blogs/what-a123-bankruptcy-means . Holstein is also the author of The Next American Economy

[83] Kessen, J. (Mar 29, 2013). “Confusion on our Company Name - It's Still A123.” *The Pulse - A123 blog*. URL. http://info.a123systems.com/blog/bid/175891/Confusion-on-our-Company-Name-It-s-Still-A123

- However, the systems level technology did not advance as quickly as hoped for (this includes both the energy storage capacity to improve auto range, and reliability at the hoped for cost and performance; they built out their manufacturing too fast, and the hoped for improvement in system performance did not result. The resulting reliability led to a recall and lost potential profitability. They needed more time to drive down costs, and increase performance of the battery subsystem. Basically, "learning as you go" was not occurring apace with the build out of manufacturing.[84]
- The markets (for electric car batteries) did not materialized in the hoped for time frame, further complicating the economic viability of this technology in the near term…..as well as its chances for attracting continued investment.
- As a result A123 filed for bankruptcy, and restructuring. Johnson Controls, who also produces lithium-ion batteries for Ford (based on licensing from a French firm) made a bid (which was initially approved) to acquire it, but was out bid by Chinese auto parts supplier Wanxiang Group. Both of these groups have the staying power to continue bringing the company forward – but for many of the original investors much was lost. A123 systems is now focused on Hybrids, and is still operating its plants in the U.S. thus preserving a good number of jobs (about 70% of the level prior to the bankruptcy) while having access to deep pockets from the Wanxiang Group, until demand picks us; A123 is also continuing the building of infrastructure.[85]

In another example, illustrating the above conundrum, the thin film PV company Mia Sole (trying to compete with First Solar Inc. (FSLR), the biggest maker of thin-film panels by shipments) was in the midst of dealing with this manufacturing technology and investment conundrum, when they ran out of money - the firm couldn't, and wasn't likely to make money in the foreseeable future in the face of cheaper imported panels from China. And MiaSole was sold, at level estimated to be about $30M to a Chinese firm (Hanergy) even though they raised upwards of $500 million from Kleiner Perkins and others and was once valued at $1.2 billion.[86]

[84] Bullis, K. (October 18, 2012). "A123's Technology Just Wasn't Good Enough." *MIT Technology Review – Energy News.* URL http://www.technologyreview.com/news/429647/a123s-technology-just-wasnt-good-enough/
[85] Ramsey, M. (Oct. 8, 2013). "Battery Maker Shifts to Hybrid Car Focus: Revived A123 Systems Sees Future in Advances for Gasoline-Powered Cars." *Wall Street Journal News.* URL. http://online.wsj.com/news/articles/SB10001424052702304441404579123603727420142
[86] Guglielmo, C; Geron, T. (May 27, 2013). "John Doerr's Plan To Reclaim The Venture Capital Throne." *Forbes.Com.* URL http://www.forbes.com/sites/connieguglielmo/2013/05/07/john-doerrs-plan-to-reclaim-the-venture-capital-throne/

Appendix D – More Thoughts on Meeting SIP Needs

Beyond the discussion of meeting SIP needs and concerns given in the body of the white paper there are numerous other important related considerations when partnerships are being pursued with SIPs. For instance, there may be a wide variation on the kind of partnership that specific SIPs are seeking – they may be looking for a single, or multiple partners, an ultimate merger, or other arrangement. Also for example, SIPs will want, and / or need to:

- Protect their proprietary, corporate strategic other related information. However, this need "to protect" can sometimes be at odds with the ability to fully understand and adequately address specific SIP business needs effectively while leveraging SIP core capabilities and strengths.[87]

- Know how a specific a particular partnership will likely affect key SIP business indicators; e.g. market size, stock price, etc.[88] SIPs want to see as much detail as possible as to just how their own companies profit from and can monetize their investment by developing and bringing CE technology products to market. And if applicable SIPs want to know how the new technology will impact their current business line and product portfolio.

- Access and deploy increasingly more robust due diligence, with robust data and other related information that supports better decision making, including the ability to understand and address a number of key issues related to developing markets and dealing with policy. In particular SIPs want:

    - Access to the best current, and well vetted, information on key technology issues related to the deployment and profitability of CE technologies. For example the real need for storage vis-s-vis dispatch-ability with renewables is not uniformly understood or agreed upon; e.g. with electricity generation frequently, according to recent information, more than 30% penetration may be possible without storage – while others believe only 15% or lower is realistically achievable.
    - More robust information to help them make better decisions on when (now or ten years from now?) and how to enter certain markets within various policy environments, and definition on the implications for their businesses and markets over the long term. This is important to support market development in the global environment.
    - Preferably get involved early in the technology development process so as to have the best opportunity to impact the commercialization trajectory, yet innovators may not know how to help them best incorporate new technologies into their business lines, or help in other ways if SIP needs are not understood (some times SIPs simply may not want this kind of help).

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[87] However, this need "to protect" can sometimes be at odds with the ability of potential partners to fully understand and adequately address specific SIP business needs, perspectives and assumptions effectively. This extends to having insight on new products and technologies that may be in the respective SIP product and strategy pipelines. In addition, different SIPs may also have good sized strategic analysis staffs performing evaluations that are not readily available.

[88] Such information will help then make the argument to investment to the SIP stockholders, and boards of directors.

Appendix E – Is the VC- Limited Partner Investment Model Broken?

A recent Kaufman Foundation report (by Mulcahy etal, May 2012)[89] showed that there clearly is a problem with the limited partner model based on their experience. For instance, the Kauffman Foundation investment team, study analyzed their twenty-year history of venture investing experience in nearly 100 VC funds with some of the most notable and exclusive partnership "brands" and concluded that "the Limited Partner (LP) investment model is broken. Limited Partners—foundations, endowments, and state pension fund—invest too much capital in underperforming venture capital funds on frequently misaligned terms." For example and more specifically, a study of their own portfolio noted that:

- "Only twenty of 100 venture funds generated returns that beat a public-market equivalent by more than 3 percent annually, and half of those began investing prior to 1995.
- The majority of funds—sixty-two out of 100—failed to exceed returns available from the public markets, after fees and carry were paid.
- Only four of thirty venture capital funds with committed capital of more than $400 million delivered returns better than those available from a publicly traded small cap common stock index.
- Of eighty-eight venture funds in our sample, sixty-six failed to deliver expected venture rates of return in the first twenty-seven months (prior to serial fundraises). The cumulative effect of fees, carry, and the uneven nature of venture investing ultimately left us with sixty-nine funds (78 percent) that did not achieve returns sufficient to reward us for patient, expensive, long- term investing."

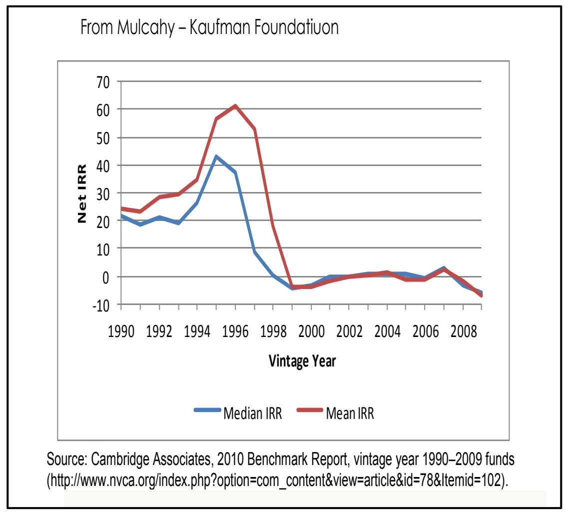

Figure E-1. "The Average Fund Barely Returns Investor Capital After Fees"

Moreover, their study noted that "LP hopes for VC returns are high, and those hopes fuel new money into VC funds nationwide. A Probitas Partners survey of nearly 300 institutional investors found that two-thirds of investors expect a 2x+ multiple from top quartile, early-stage VC funds. Contrary to those lofty expectations, Cambridge Associates data show that during the twelve-year period from 1997 to 2009, there have been only five vintage years in which median VC funds generated IRRs that returned investor capital, let alone doubled it. It's notable that these poor returns have persisted through several market cycles: the Internet boom and bust, the recovery, and the financial crisis." The above chart from the same report shows that, in eight of the past twelve

[89] Mulcahy, D; Weeks, B.; Bradley, H.S. (May 2012). "WE HAVE MET THE ENEMYAND HE IS US: Lessons from Twenty Years of the Kauffman Foundation's Investments in Venture Capital Funds and The Triumph of Hope over Experience." *Ewing Marion Kaufman Foundation.* URL http://www.kauffman.org/uploadedFiles/vc-enemy-is-us-report.pdf

vintage years, the typical VC fund generated a negative IRR, and for the other four years, barely eked out a positive return."

While the report has been controversial for some, others characterized the report was "groundbreaking" most agree that the Kaufman report, despite its possible short -comings, has been quite valuable in bringing this to the subject to the fore. For instance, in a recent discussion with Google Ventures' managing partner Bill Maris[90] noted that "The past 10 years haven't been very productive," Maris also points out that according to the research firm Cambridge Associates, during the decade ending last September, VCs as a class earned a 2.6% interest rate for their investors--less than you could have earned in an S&P 500 index fund.[91] The numbers look slightly better over shorter periods; VCs have delivered a 4.9% return the past three years and 6.7% over the past five, still far from terrific." In another commentary Andy Rachleff, current President and CEO of Wealthfront, and co-founder and former general partner of Benchmark Capital, recently noted that according to Cambridge Associates, an advisor to institutions that invest in venture capital," that only about 20 firms – or about 3 percent of the universe of venture capital firms – generate 95 percent of the industry's returns, and the composition of the top 3 percent doesn't change very much over time."[92]

Also, some have a somewhat divergent view on various points of the discussion. For example, see Scott Anthony, managing partner of Innosight, and prolific author on the subject of innovation, also comments on the implications of the Kaufman study,[93] in particular, those aspects of the report related to statistics and the need for better ways of teasing out explanations for causality, and not just correlation; though Mulcahy starts to do that with her team's discussion on biases. To this point Anthony briefly discussed the Google model (see above) which puts more science behind their correlations and success indicators than does the VC industry in general. Further, Anthony, noted that competition, where the number of VC firms has exploded over the last decade, along with decreasing barriers to entry and the growing number of disruptive entrants, as one possible (and almost inevitable) reason for some of the reduction in VC returns.

The Kaufman fund is not ignoring venture investments – though they are taking a more rigorous approach to finding and vetting deals along with a broader portfolio approach, as well as more partnering with moderately sized VC firms that have a long and well established history of top tier performance.

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[90] http://www.fastcompany.com/1826876/googles-creative-destruction

[91] See Similar information on returns from: Wilson, F.(Feb. 23, 2013). "Venture Capitlal Returns." *AVC Union Square Ventures*. URL http://www.avc.com/a_vc/2013/02/venture-capital-returns.html

[92] Rachliff, A. "Why Angel Investors Don't Make Money … And Advice For People Who Are Going To Become Angels Anyway." *TechCrunch.com*. URL http://techcrunch.com/2012/09/30/why-angel-investors-dont-make-money-and-advice-for-people-who-are-going-to-become-angels-anyway/

[93] Anthony, S. (June7, 2012). "Is Venture Capital Broken?" *HBR Blog Network*. URL http://blogs.hbr.org/anthony/2012/06/is_venture_capital_broken.html

Appendix F - Access To Downstream Private Growth Equity From Dedicated Private Equity Firms

In comparison to Venture Capital (VC), Private Equity (PE)[94] firms make investments that are typically quite a bit larger and with a longer timeframes for life of their investments. Hence PE firms are an important part of the financial food chain.[95] PE firms, when taken in total, have access to much more capital than do VCs. PE firms largely focus on LBOs, and Growth Equity (GrE) investments; GrE is the most relevant form for this discussion. GrE is most often a minority investment, in later stage, relatively mature entrepreneurial ventures that are looking for capital to expand or restructure their own operations, execute on secured contracts, enter new markets, or finance a significant acquisition. Beyond equity, GrE firms often can provide a portion of debt that can fund working capital or potential minor technology improvements or enhancements mainly focused on product development. Besides access to funds, PE/GrE firms also have quite extensive market development, product strategy and business growth expertise as well as access to investment banking services and preparation for IPOs or M&As events as needed to help accelerate the growth of the business.

However, often many clean energy ventures with innovations do not qualify for private equity (PE).[96] Even those PE firms that specialize in providing Growth Equity (GrE) to growing companies, preclude support for virtually all technology driven, scale-up development. This is due to some fairly restrictive requirements based on perceived technology risks, time to liquidity, and, quite importantly, the general maturity of the venture. More specifically, GrE firms don't take and any significant technology risks (especially with the key technology components).[97] Also, to qualify for GrE funding, the technology based venture typically must have products / services in the marketplace, and in many cases (i.e. especially for LBOs) must have robust cash flow.[98] Further, PE firms that provides GrE funding will most likely as noted above requires at least partial control of the company with the potential to significantly change the direction of the company.

Hence GrE resources, which are most appropriate for downstream investments, are not applicable for the costly and time consuming technology development corresponding to manufacturing scale up as discussed in this white paper, nor in any situations where there are

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[94] Dedicated private equity firms are groups of investors, that use collected pools of capital from wealthy individuals, pension funds, insurance companies, endowments, etc. to invest in businesses. The main difference between venture capital and growth equity investors is their risk profile and investment strategy; e.g. PE firms more frequently use combinations of equity and debt to make their investments and the investment levels are usually quite large relative to VC investments. Hence PE firms make fewer, but larger (sometimes in the hundreds of millions of dollars) and longer term investments.

[95] For example, Silver Lake Kraftwerk focuses on providing growth capital to technology innovators (e.g. SolarCity) with established business models in the energy and resource sectors.

[96] See Herndon, A.; Martin, C. (Jan 15, 2013). "Private Equity Flees Clean Energy as Investment Falls." *Bloomberg News.* URL. http://www.bloomberg.com/news/2013-01-15/private-equity-flees-clean-energy-as-investment-falls-energy.html

[97] Hence, while GrE is an important element of the commercialization food chain it does not address the expensive upstream technology development issues such as those related to scale up of manufacturing for which is discussed extensively above.

[98] If all these hurdles are overcome, then the venture may be an acquisition candidate, such as Abeo was, by GE Lighting. See: Chernova, Y. (Nov. 26, 2012). "Braemar Nails Positive Exit by Selling LED Co. Albeo to GE." Dow Jones VentureWire. URL http://www.braemarenergy.com/news/media/2012/albeo_venturewire_1126.html/

significant technology risks; for example they are not appropriate for, for first-of-a-kind demonstration plants. projects. To this point J. Shah,[99] notes that there are several hundred such innovative technology projects that, even though they have met all of their technology milestones, fall into this category.

We should also note that most individual entrepreneurial companies generally cannot secure funding directly from the limited partners that supply funding for many of the PE/GrE (as well as VC) firms – since these institutional investors (e.g. pension funds, endowments, etc.) most often don't want (and / or have the appropriate resources) to manage the growth and start-up operations of individual companies. Hence the limited partners invest with VC or PE funds, to manage their investments.

Not everything is bad news about trying to access Private Equity financing, and making the transition from VC funding. Beyond dedicated private equity firms, large vertically integrated capital firms have shown a growing interest in, and can in some cases provide an easier transition to GrE.[100] For example VantagePoint Capital Partners (VPCP) – previously named VantagePoint Venture Partners – has a large energy related practice, and has developed a focus on "growth equity", that "goes beyond where venture goes."[101] Large integrated investment capital firms like Kleiner Perkins, and Vantage Point often have robust, experience based, track records working with, a wide spectrum of external advisors, and world-class strategic partners. And they can provide guidance on, and connections to a wide range of other financial services (e.g. investment banking, project financing), human capital, legal, marketing, science, and portfolio management, thus help to further reduce the perceived risk for future investment. Thus, if an entrepreneurial venture is a good fit within one of the large integrated capital firms, then the process of obtaining GrE funding and a host of other support services, may be facilitated greatly as the entrepreneurial company and its technology matures along its commercialization path.

Finally, while recognizing the importance of GrE the National Venture Capital Association (NVCA)[102] recently announced the formation of the NVCA Growth Equity Group,[103] "that is tasked to help specialized growth equity investors support companies, which are growth engines for the economy," by focusing on "this final part of the venture investment life cycle." Moreover, there are a number of other options for PE/GrE that are starting to emerge from foreign firms,

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[99] In fact there are a good, and growing number of existing companies that have received venture and other early stage financing, but that are stuck in the resource gap as described above. For example see: Shah, J. (July, 2012). "Why diluted investments are diluting cleantech's impact." URL http://gigaom.com/2012/07/11/why-diluted-investments-are-diluting-cleantechs-impact/

[100] But not, as discussed above for the expensive upstream technology development issues such as those related to scale up of manufacturing for key technology components.

[101] See Appendix E2 which discusses the broad base of partners working with Bright Source, one of VPCP's portfolio companies. Similarly, Appendix E1 discusses the commercialization journey of Bloom Energy which is a portfolio company of Kleiner Perkins Caufield and Byers (KPBC).

[102] See: National Venture Capital Association (Jan 28, 2013). "NVCA Recognizes Growth Equity As Critical Part Of Venture Capital Landscape: Newly Formed Member Sub-Group Focuses On The Capital Needs Of Later-Stage, Emerging Growth Companies." NVCA. URL http://www.nvca.org/index.php?option=com_docman&task=doc_download&gid=935&Itemid=93

[103] Mentioned as board members of the NVCA Growth Equity Group, are representatives from Summit Partners, Element Partners, Silver Lake Kraftwerk, and growth equity industry liaisons from Catalyst Investors, and Technology Crossover Ventures.

including some investor owned utilities (e.g. E.ON which is discussed briefly in an Appendix), but they can be difficult to identify, navigate and secure funding.

Appendix G – The Bloom Energy, Commercialization Journey

A successful Bloom energy could be a testament to the viability of capital-intensive, VC-funded cleaner energy breakthroughs and the virtue of distributed power generation.[104,105,106] Underlining the potential for Bloom's success, Scott Sandell, a partner at NEA and a Bloom board member, was quoted recently by Reuters as saying that Bloom will likely attempt an IPO late this year or early next.[107] Also, there are reported hints that this this could be the year for its first quarterly profits. The valuation of the company has recently been estimated to be nearly $3.0B.

Success has not come easy. Bloom fuel cell technology has had many commercialization challenges similar to the other technologies described in this white paper; and some of these challenges are still being experienced. These challenges (which considered in total, can deter or even preclude many VCs to become engaged in similar investments) include a the combination of complex technology, new material materials and configurations, a need to demonstrate manufacturing scale-up of critical of key components (e.g. electrodes, electrolytes and catalysts)…..Bloom has also needed to address long investment horizons, and very large investment requirements, all while simultaneously needing build market channels and distribution networks. Moreover the fuel cell industry for commercial scale power, is both highly competitive and littered with many money loosing (to date) ventures.

The concept: Bloom, previously known as Ion America until 2006, was founded in 2002 K.R. Sridhar. Bloom builds solid oxide fuel cells. The fuel can come from a variety of inputs (including liquid or gaseous hydrocarbons produced from bio sources) to generate electricity on the site where it will be used; natural gas as fuel is most common in the states. Bloom Energy fuel cell systems may be up to twice as efficient as a gas-fired power station; some twenty percent of the Bloom Energy Server cost savings depend upon avoiding transfer losses that result from energy grid use.

The company has seen increasing demand for its electricity-led Energy Server fuel cells in the last four years, first in California and now across the USA. The technology platform can serve many needs but is particularly focused on distributed power needs, as well as premium and high reliability applications (e.g. server farms, and telecommunication power requirements). One significant technical achievement is that Bloom Energy's system doesn't use expensive materials, notably platinum, which is used as a catalyst in many types of fuel cells. While Bloom Energy won't say exactly what it uses, it does say that their fuel cells use a ceramic made from sand as the electrolyte and special inks for the electrodes - researchers have long been trying to make fuel cells without platinum.

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[104] Ashley, S. (Nov. 18, 2011). "Next-Generation Flex-Fuel Cells Ready to Hit the Market." *Scientific American.* URL http://www.scientificamerican.com/article.cfm?id=next-generation-flex-fuel-cells-ready

[105] Fehrenbacher, K. (May13, 2013). "Report: Bloom Energy raises another $130M." *GIGAOM.* URL http://gigaom.com/2013/05/13/report-bloom-energy-raises-another-130m/

[106] Martin LaMonica, M. (March 1, 2010). Parsing fact from fiction with the Bloom Energy box. *CNET NEWS.* URL http://news.cnet.com/8301-11128_3-10461359-54.html

[107] Wesoff, E. (JUNE 12, 2013). *Greentech Media*. URL http://www.greentechmedia.com/articles/read/E.ON-Worlds-Largest-Investor-Owned-Utility-Invests-100M-in-Bloom-Energy

Raising Money. Bloom has been constantly been raising investment. For example Bloom Energy has received $400 million of start-up funding from venture capitalists, including Kleiner Perkins and Vinod Khosla. Over the last decade years Bloom raised more than $1.2 billion in venture capital from investors including GSV Capital, Apex Venture Partners, DAG Ventures, Kleiner Perkins Caufield & Byers, Mobius Venture Capital, Madrone Capital, New Enterprise Associates, SunBridge Partners, and Goldman Sachs. Beyond just financing, of course, Bloom has an all-star and well-connected board that provide insights and is able to open many doors.

More recently (May, 2013) Bloom raised about $100M from the German based utility, E.ON., which is the world's largest investor owned utility; Credit Suisse added another ~$30M to the round. What makes this investment quite interesting is that this investment is a significant endorsement by one of the world's largest utilities of the distributed generation model (where Bloom has a focus), and also because E.ON., unlike most US based utilities, makes technology development based investments. Also E.ON. has ongoing relationship with micro combined heat and power fuel cell manufacturer Ceramic Fuel Cells and its flagship wind-to-hydrogen plant, currently under construction in Falkenhagen, Germany, which uses Hydrogenic electrolysers to demonstrate the power-to-gas concept.[108] The investment in Bloom makes sense for the company (according to one analyst), which is trying to reduce its carbon intensity. Another interesting twist is that such a substantial investment by E.ON. may mean that the door to Europe is now open for Bloom; though (as of this writing) Bloom has not installed units in Europe to date.[109]

Regarding other funding, Bloom Energy has not received any Department of Energy grants directly. However, in October 2012, the US government awarded Bloom Energy $70,710,959 under its section 1603 energy awards program. Moreover, Bloom, through its market and sales program, has often been quite successful in leveraging PPA opportunities for getting rate payer subsidies in states like CA (predominantly) and Delaware. Thus, initial customer demos have been often subsidized – by local regions.

Bloom's business model, exploits multiple applications which builds on its flexible fuel cell platform. Bloom's business model also exploits for instance, opportunities to create beachhead markets with high margins such as applications for which fuel cells such as premium power for the military, remote sites, construction industry, travel, and sites needed very high reliability and clean power. In other markets for cost competitive, non-premium power, Bloom Fuel cells must be paired with state incentives such as those from California which Bloom has done.

The Bloom flexible-fueling (natural gas and hydrogen) advantage has enabled Bloom to sell some 120 natural gas–fuel SOFCs, stand-alone heat and power units that produce both electricity and heat for a local site, to green-minded Fortune 500 corporate plants and state university facilities—notably, subsidized distributed power demonstration projects in California. The company is even building a new plant in Delaware and will sell 30 megawatts of its Bloom Box fuel-cell units to the local utility, Delmarva Power. Bloom's lower cost leasing program appears to be one key to their success.

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[108] Several groups in Germany are looking at fuels cells that would replace the whole power generation block with a fuel cell system using a combination of hydrogen (that would be produced by electrolysis using regional excess wind power), and natural gas for fuel.
[109] We should also mention that Bloom has also recently received two investments, totaling some $200MM, from the New Zealand Super Fund.

Bloom Energy has a service to allow customers to buy the electricity generated by its fuel cells without incurring the capital costs of purchasing the six-figure devices.... Under the Bloom Electrons service, customers sign 10-year contracts to purchase the electricity generated by Bloom Energy Servers while the company retains ownership of the fuel cells and responsibility for their maintenance.

Moreover, these Power Purchase Agreements allow Bloom Energy to have a high touch approach to address and improve maintenance, as well as evaluate and upgrade reliability, as well as cost / performance of key components, using a learn as you go approach, all while not engendering concern by the customer. Bloom Energy argues that the service can help customers save up to 20 percent on their bills. What's also notable is that the Electrons service could give Bloom Energy steady, predictable recurring revenue that can be used for expansion.

Bloom has been developing a strong customer base as well as market channels and distribution networks, for a long time now. For instance those more than 120 application 120 natural gas–fuel SOFCs, stand-alone heat and power units that produce both electricity and heat for a local site, are intended for commercial and industrial applications, and the firm boasts an all-star list of customers, including Adobe, Apple, FedEx, Staples, Google, Coca-Cola, and Wal-Mart. and eBay, as well as US communications network AT&T, Bank of America, and Safeway.

Bloom Energy argues that the service can help customers save up to 20 percent on their bills. What's also notable is that the Electrons service could give Bloom Energy steady, predictable recurring revenue that can be used for expansion.

While Bloom began installation in commercial buildings or large retail outlets, they have one large installation under way to provide power to a utility directly. One reason they own the facilities is the tax incentives but the other might be the technology has not been around long enough for consumers to buy and own the boxes so Bloom is forced to own and maintain them. Bloom also built a manufacturing plant in I believe Maryland (Delaware??) recently to take advantage of tax incentives from the state.

Appendix H: Crowdfunding - Requirements For Equity Investments Are Still Evolving

In the body of this White Paper we discussed ongoing Crowdfunding activity, and the potential for equity investments using web based Crowdfunding platforms. In this Appendix we provide some highlights from a recent Hamilton Clark **Research Report**,[110] which emphasize that while there is rapidly growing interest, this mechanism for financing is not yet fully developed, as SEC investment requirements have not been finalized - though comments on initial requirements put forth by the SEC are currently being reviewed and the resulting requirements should be finalized sometime in early 2014. Following, are a few highlights, based on this Research Report, that should be considered by those seeking funding using this mechanism.

Purpose of the Hamilton Clark Research Report. There is a lot of confusion in the financing market about recent changes brought about by the Jumpstart Our Business Startups Act (the "JOBS Act") in the way that companies can use the private placement exemption to finance their companies in the venture capital and private equity markets. This research report addresses the difference between traditional Rule 506(b) offerings that do not permit "general solicitation", new Rule 506(c) offerings that permit general solicitation, and crowdfunding transactions.

Rule 506 Private Placements – Background. In 2012 the JOBS Act was enacted to reduce barriers to capital formation, particularly for small businesses. Among other provisions, the JOBS Act required the SEC to create new exemptions for small businesses to raise capital without SEC registration under the Securities Act of 1933 (the "Securities Act"). In July 2013 the SEC adopted amendments to Rule 506 of Regulation D and Rule 144A of the Securities Act to implement the requirements of Title II (Section 201(a)) of the JOBS Act.

These amendments were effective in September 2013, and in November 2013 the SEC's Division of Corporate Finance updated its Compliance and Disclosure Interpretations to explain these new rules.

Private Placement Financing – Why is an "Exemption" So Important? In the U.S. companies can only raise capital from investors if they either register their offering with the SEC or they offer securities that are exempt from registration. Section 4(a)(2) of the Securities Act exempts from registration "transactions by the issuer not requiring any public offering". Rule 506 is a rule under Regulation D that provides conditions that an issuer may rely on to meet the requirements of the Section 4(a)(2) exemption. One of these conditions, and normally the one that causes most problems with issuers, is that the issuer must not use any "general solicitation" to market the securities. "General solicitation" includes advertisements, TV or radio communications, general purpose seminars and the use of a company's website to either offer securities or condition the market to the offering of a security. Investors and the issuer's Board of Directors are especially concerned that the securities being issued are "exempt", because if they do not meet the test of "exemption" there is the possibility that investors will seek rescission (get their money back). Consequently, the closing of most private placements require an "opinion of the issuer's counsel" that the offering is exempt. In our 20+ years' experience with private placements, the

[110] See Complete Hamilton Clark Research Report December 2013 www.hamiltonclark.com

most serious trip-wire has been that the issuer inadvertently "advertised" the offering and therefore cannot close.

506(c) Changes the Game – But Watch Out. So if a company follows the precise details of Rule 506(c) *(companies need to consult their securities counsel for details of how to qualify for and document a 506(c) offering),* it is able to offer securities only to accredited institutional and individual investors (including VCs, high net worth individuals and family offices) with or without a placement agent.[111] And the issuer can advertise the offering by whatever means including the company's website. Companies have started doing this but we have not seen any 506(c) cleantech, sustainable or energy-tech transactions close as of December 2013. However, what we (at Hamilton Clark) have seen is that companies are attempting to self-develop and self-market transactions that, in our opinion, may not be fair[112] to investors for a number of reasons (the proposed pre-money valuation may be substantially higher than a typical VC or private equity financing, or the terms of the offering may not be reflective of typical venture capital or private equity terms (for example, offering common stock rather than a senior series of convertible redeemable preferred stock, or issuing cheap stock to the founders)). In addition, disclosure pursuant to SEC Rule 10b-5may not be as comprehensive in the case of a self-developed and self-marketed transaction as it would be if a placement agent were to be used. These factors may place risk on the company's management and its Board of Directors.[113]

	Rule 506(c)	Crowdfunding
Is it currently legal	Yes	No
Are there individual investor limits	No	Yes, but the guidelines have not yet been issued
Is advertising allowed	Yes. Companies can use any type of advertising including their website	No. Guidelines have not yet been issued but likely will only allow companies to direct investors to a funding portal
Is there a limit to how much can be raised	No	Yes, $1,000,000 per year
Who can participate	Accredited investors only	Both accredited and non-accredited investors
Is a placement agent required	No. But many companies will likely continue to use a placement agent to mitigate "fairness" issues for their Board members.	A funding portal or a traditional broker dealer will likely be required.
Key issue to be resolved	Fairness of the transaction from a financial point of view. We are likely to see the use of a fairness opinion like in M&A transactions in order to mitigate exposure to members of the Board of Directors if a placement agent is not used.	Less of an issue if a funding portal or broker dealer has accepted responsibility for due diligence, disclosure and valuation

Figure K-1. Summary of Key Requirement Differences corresponding to Rule 506(c) and Crowdfunding

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[111] **Accredited investors** include institutions (venture capital and private equity), and individual investors that have a net worth of at least $1,000,000 (not including their primary residence), or annual income of $200,000 (or $300,000 with spouse) and some assurance of continuing such income. The SEC has indicated that it may change these rules in 2014 to allow financially sophisticated investors to qualify. Rule 506(c) offerings require that the issuer verify this status.

[112] A **fairness opinion** is a professional evaluation by an investment bank or other third party as to whether the terms of a transaction are fair. It is rendered for a fee. They are typically issued when a company is being sold or entering into a merger or divesting themselves of a substantial division of their business. They can also be required in private transactions not involving a company that is traded on a public exchange. Controversy in financial and management circles surrounds the question of the objectivity of fairness opinions, as one aspect of the duty of care in the fairness of a transaction. In response, in the U.S., the Financial Industry Regulatory Authority ("FINRA") issued its Rule 2290 to require disclosure by its members to minimize abuses and this was approved in 2007 by the SEC.

[113] **Rule 10b-5** Employment of Manipulative and Deceptive Practices, states that It shall be unlawful for any person, directly or indirectly, by the use of any means or instrumentality of interstate commerce, or of the mails or of any facility of any national securities exchange, to employ any device, scheme, or artifice to defraud, to make any untrue statement of a material fact or to omit to state a material fact necessary in order to make the statements made, in the

light of the circumstances under which they were made, not misleading, or to engage in any act, practice, or course of business which operates or would operate as a fraud or deceit upon any person, in connection with the purchase or sale of any security.

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