



# SEF Alliance Publications

## Public Venture Capital Study



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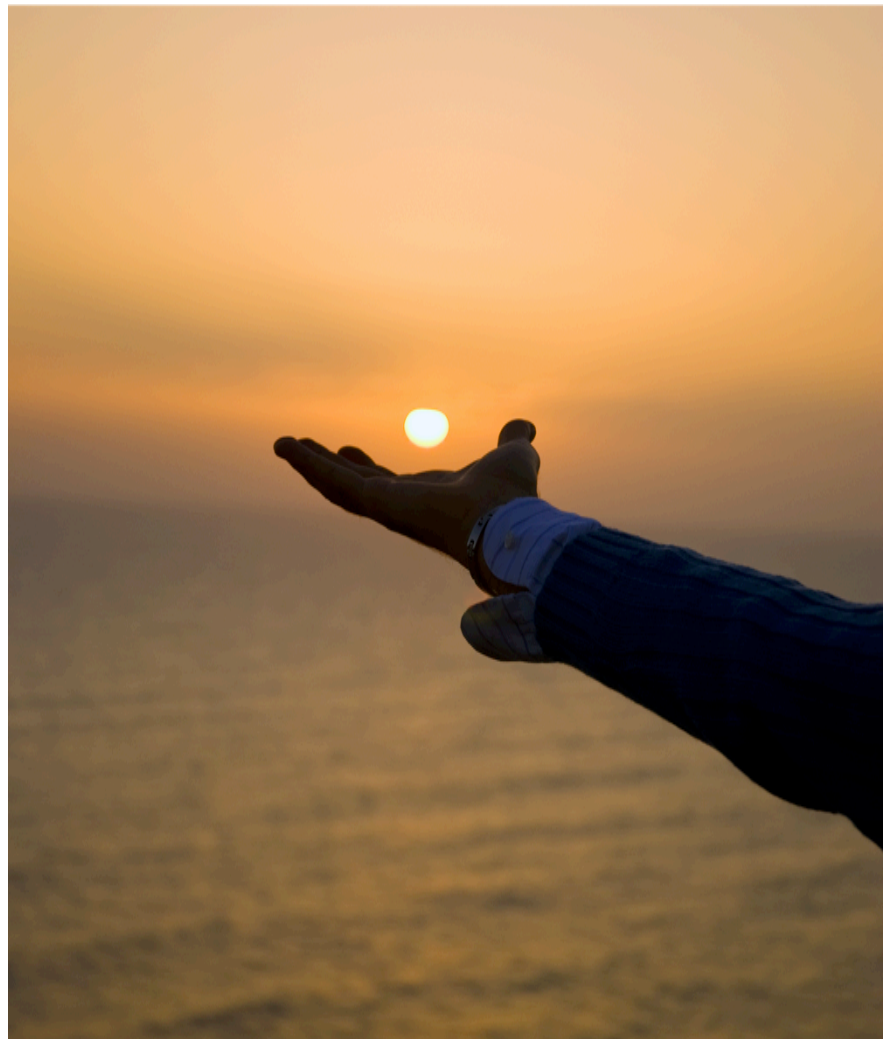
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## **SEF Alliance Publications Public Venture Capital Study**

**Venture capital as a clean energy  
financing tool with specific  
analysis on the role of public  
sector-sponsored venture capital**



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## **About this Report**

This is the first publication of the UNEP SEFI Public Finance Alliance (“SEF Alliance”). The SEF Alliance is a member-driven coalition of public and publicly backed organisations that finance sustainable energy markets and technologies in various countries. It was established in January 2008 and operates under the remit of the Sustainable Energy Finance Initiative (SEFI) of the United Nations Environment Programme (UNEP). The platform is currently funded by the member organisations, UNEP, and the Oak Foundation.

In its first year of operation, the SEF Alliance identified venture capital as an area of high interest for specialised research, based on member input and prior experience. Particularly, preliminary research indicated that there was a special role for public sector involvement in venture investing in terms of filling a conspicuous gap in the financing of pre-commercial development of technologies; stimulating private sector involvement; and adding unique value through the application of public interest thinking. The SEF Alliance therefore commissioned this report from New Energy Finance, a leader in clean energy market research and analysis, to provide an in-depth look at the clean energy venture capital space with a particular focus on the role of public finance.

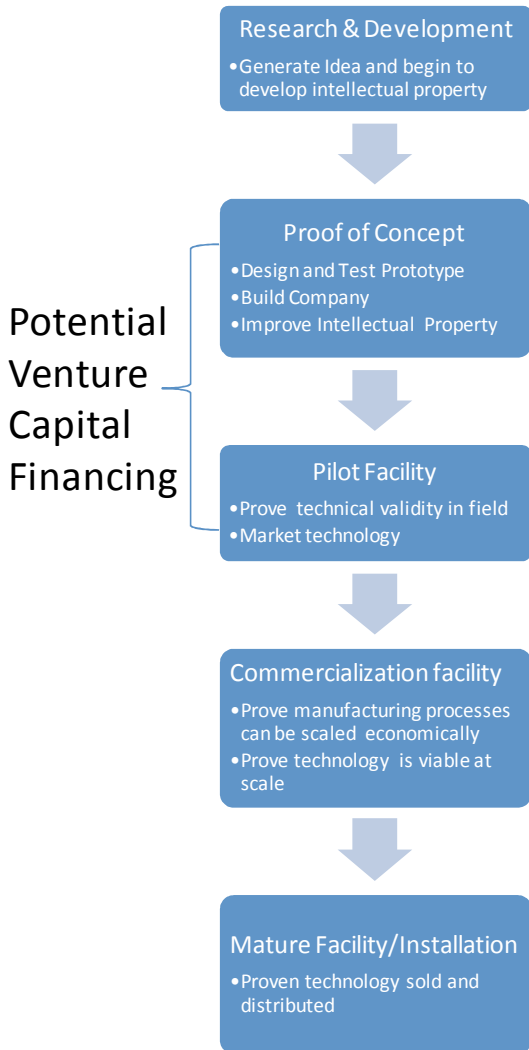


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# Executive Summary

Figure 1: Technology Development Life Cycle



Note: Depending on the technology, the pilot and commercialization facility may accomplish similar development goals.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

Historic highs in energy costs and increased awareness of global climate change by world leaders have increased the world's appetite for clean energy. However, new discoveries and technological advances are required to meet the global economy's needs both in scale and in cost. Such breakthroughs take time and do not come cheaply; many steps are involved beginning with research and development and culminating in commercialization (see Figure 1).

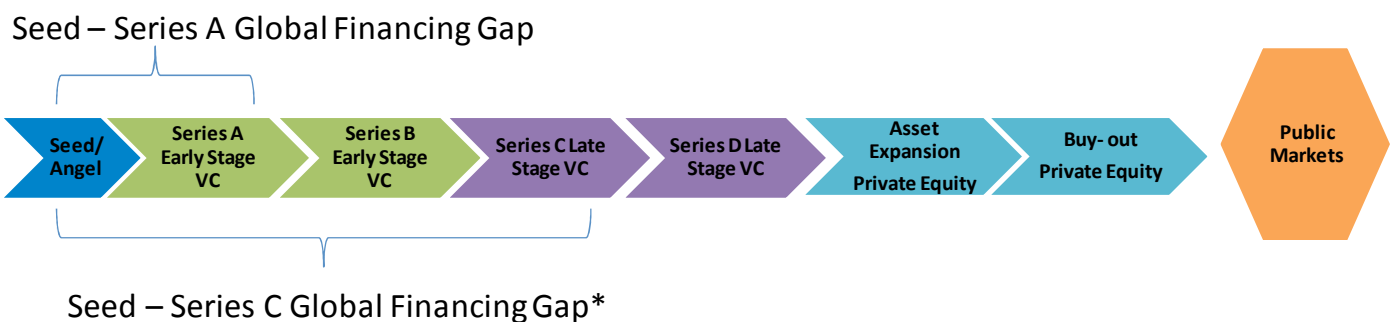
Several financial mechanisms exist to spur and facilitate innovation of this kind, from incubators and grants to loan guarantees and venture capital. With respect to early stages of technology development, public groups have traditionally preferred to use research and development (R&D) grants to fund innovation or provide facilities within national laboratories. Recently the public sector has expanded its focus further down the development cycle to help overcome the obstacles that exist beyond the R&D phase. Looking to add to current market mechanisms for development, interested public groups have taken to using venture capital as a mechanism to encourage and facilitate continued innovation and the ultimate commercialization of novel technologies.

This study, conducted by New Energy Finance for the SEF Alliance, examines venture capital as a clean energy financing tool with a specific analysis of the role of public sector-sponsored venture capital. Using a selection of existing public venture capital clean energy funds the study had three key questions to answer:

1. Whether there is a role for public venture capital in clean energy investment and whether more such funds are needed.
2. If there is a role, where are public venture funds best positioned to help achieve clean energy innovation?
3. What are core commonalities and what differentiates the approaches, structures, and metrics of success for existing public venture capital funds.

New Energy Finance discovered two critical funding gaps in clean energy venture investment which public venture capital could help address (see Figure 2).

Figure 2: Investment Value Chain and Funding Gaps

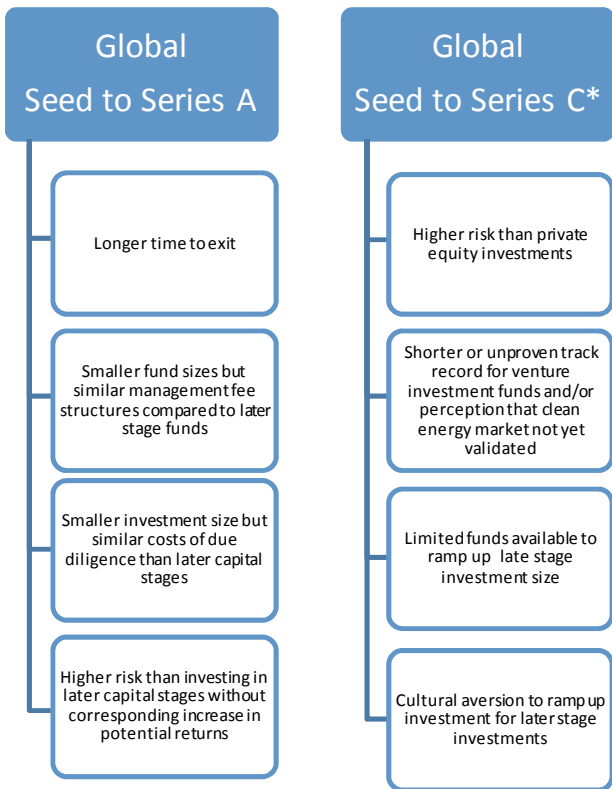


Note: \*The Seed – Series C Global Financing Gap does not apply to clean energy venture capital investments in the United States.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance



**Figure 3: Drivers of Critical VC Clean Energy Funding Gaps**



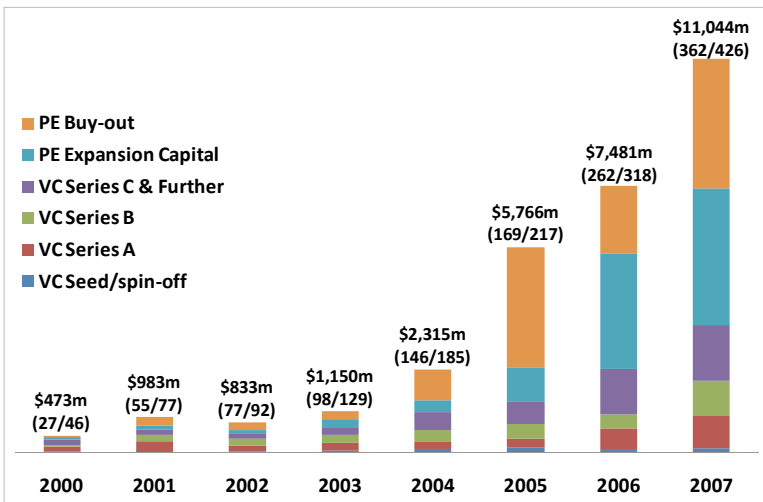
\*The Seed – Series C Global Financing Gap does not apply to clean energy venture capital investments in the United States.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

The first gap exists at the global level where investment data shows a decrease in the proportion of funds going to seed/Series A investment. This gap results from the structure, pressures, and incentives that drive private venture capital (see Figure 3). Private venture capital investment demands a higher return over a shorter time period of time that is not conducive to investment at the seed/Series A stages which often has lower relative return on investment given the longer time to investor exit.

The second gap is also global (except for the United States), where alternative investment funds with the potential to invest in venture capital or private equity choose to focus on private equity stage deals. This results in relative underinvestment at the seed – Series C stages of venture capital, both with respect to the total number of deals and average deal size. The United States does not face this gap, as investors are more willing to double-down or ramp-up their investments in companies that show continued promise for achieving a stellar exit. In Europe and other jurisdictions, including Canada and Australia, a dearth of institutional funds are available to promote the appropriate level of venture capital investment at both the early and late stage. The lack of funds may be driven by a historic relative out-performance of private equity to venture capital investments, cultural aversion to risky investments, or simply the lack of market validation for clean energy venture investments (see Figure 3).

**Figure 4: Global VC & PE Clean Energy Investment in Companies by Type, 2000 - 2007: \$m**



Note: Grossed-up values based on disclosed deals; see Methodology. The figure represents investment by venture capital and private equity players in clean energy companies. Figures in brackets refer to (disclosed deals / total deals).

Source: New Energy Finance

While venture capital and private equity investment in clean energy totalled \$11bn in 2007 (see Figure 4) public intervention is needed because the primary drivers of both gaps stem from market failures, where rational private investor behaviour results in underinvestment. These two funding gaps demand increased efforts on the part of both the public and private sector.

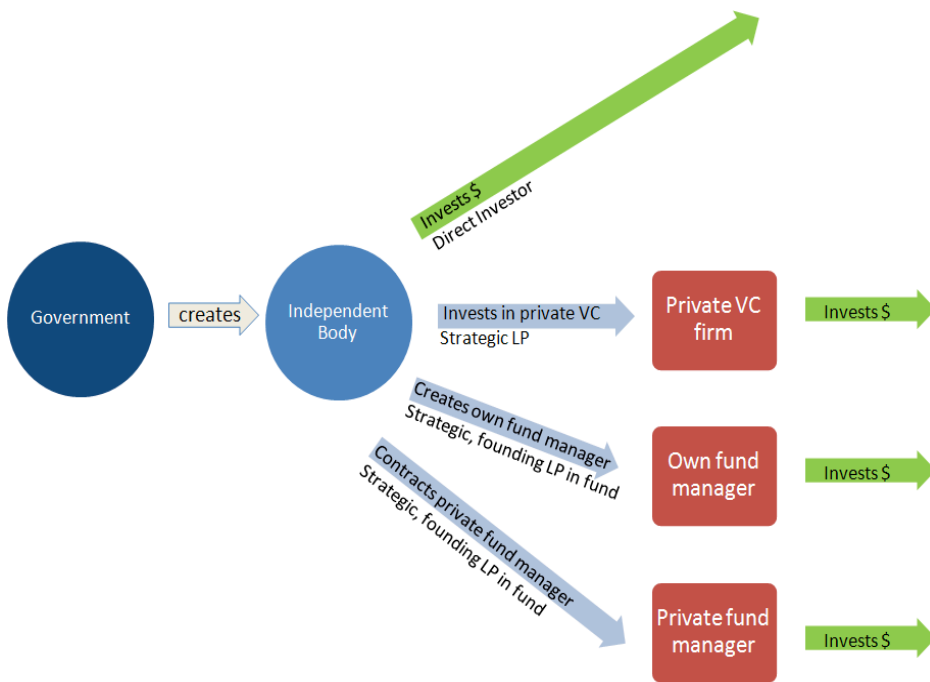
Unlike private venture capital, public venture capital is not required to compete for capital and therefore does not need to maximize return on fund investment in a 5-10 year period. This allows public venture capital to:

- Invest in companies expecting longer time horizons to see returns, and hence accept potentially lower IRR's, at least in some cases
- Undertake due diligence fees and management fees relatively indiscriminate of deal size
- Make investment decisions based on other factors in addition to return on investment such as job creation and environmental benefits
- Provide access to public figures and information, especially interpreting regulatory policy

## Key Findings:

- **Funding gaps exist** in clean energy venture financing; but public venture capital can address the majority of these funding gaps
- While private capital is capable of making seed and early stage investments, public venture capital has the ability to optimize across success factors beyond investment return, making it well-suited to **filling seed and early-stage funding gaps** as well as meeting public goals such as creating environmental benefits or jobs
- Public venture capital can catalyze private investment into clean energy, validate early stage investments in the sector, and create a deal flow pipeline. But public venture capital is **not a substitute** for private venture capital. Private venture funds have the ability to access significant amounts of private capital, tap vast commercial networks and leverage a decade's worth of venture investment experience.
- Creation of an **independent body** is critical to establish the fund structure, support, and capabilities necessary to facilitate a fund's success. Independence allows the funding body the ability to have longer time horizons, hire investment professionals, and create partnerships with private investors. It also ensures that a fund's decisions will not be affected by political influence.
- Ultimately, public venture capital will succeed by **enticing the optimum participation** of private venture capital investment. However, given public venture capital's focus on **spreading investment to as many entrepreneurs** and opportunities as possible, public venture capital can play only a limited role in addressing a fundamental cultural aversion or a lack of sufficient investment capital to quickly ramp up investments.
- Public venture capital **can add value to venture deals** in ways private capital may not. This is especially true with respect to understanding the impact of policy and the increased network advantages inherent to being familiar with public sector players.
- A **small group** of public venture capital clean energy funds exists, with funds under management totalling \$675 million. These funds target financing gaps that exist within their respective geographies.
- Public venture capital firms are capable of making **direct and Limited Partner investments** given their unique structure. The ability to operate independently from government processes in order to attract the talent necessary to make successful investment decisions and to have the organizational flexibility to operate similarly to a private venture firm is paramount.
- Environmental benefits are intrinsic to clean energy investments; however, thus far **few public venture capital funds conduct environmental due diligence** in addition to their commercial due diligence, nor do they quantify the environmental benefits of their venture capital investments. Once initial clean energy and stage of financing and/or geographic location criteria have been met, public venture capital clean energy funds focus on commercial returns. The hope of attracting private venture capital in the future and the desire to create sustainable evergreen funds forces public venture capital to seek close to private venture capital returns on investments
- Properly **identifying finance gaps and public investment goals** is necessary to design fund structures most capable of successfully addressing existing finance gaps.
- **Partnerships between public and private venture capital players are effective** and advised so long as short and long-term interests are aligned.

Figure 5: Public Venture Capital Fund Investment Roadmap

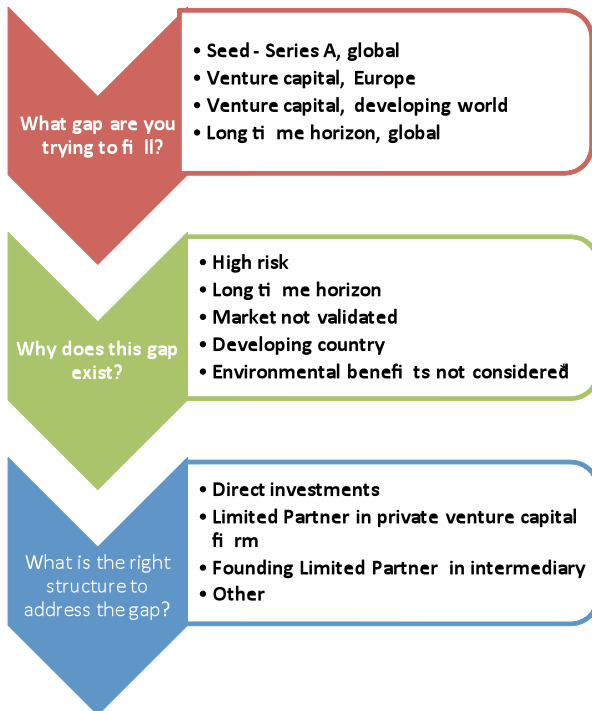


New Energy Finance found that public venture capital organizations focused on clean energy made investments through four basic fund structures (see Figure 5):

1. Direct investment
2. Limited Partner in private venture capital firm
3. Founding Limited Partner; the fund manager is an investment firm you created
4. Founding Limited Partner; the fund manager is a private venture capital firm

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

Figure 6: Decision Framework for Selecting Fund Structure

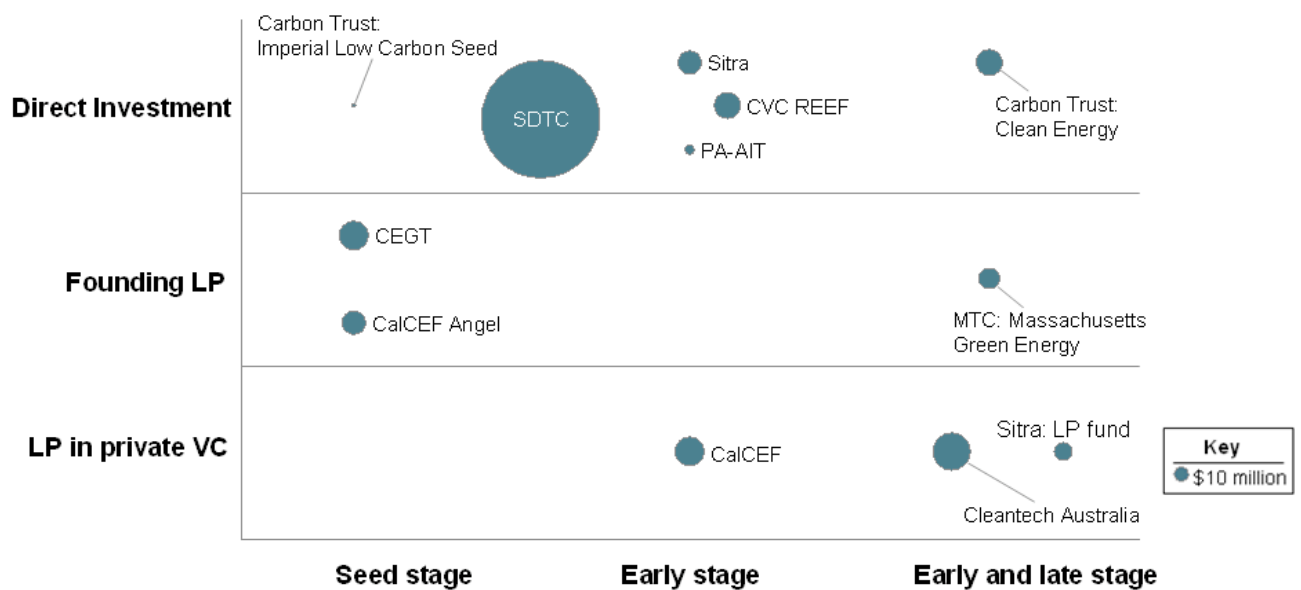


Source: SEF Alliance Public Venture Capital Study, New Energy Finance

The newly created independent body must then decide between one of the four structures, or an alternative approach based on its overarching goals. New Energy Finance has simplified the thought process by introducing a three-step decision framework to walk through when considering fund structure: first, identifying the gap that is trying to be filled, second, pinpointing why the gap exists and third, selecting the right structure to address this gap (see Figure 6). Further considerations include whether the independent body has the necessary in-house investment expertise and whether there will be any actual or perceived conflicts of interest. It is interesting to note that at every step of the process, from the creation of the fund to the deployment of capital to the entrepreneur, there are several points at which to engage private investors, which can offer benefits such as experience, expertise, networks to other investors and entrepreneurs, and additional capital.

Several clean energy public venture capital organizations have been established in the last two years, with one of the earliest formed in 2000. Through mapping the sample set of clean energy funds by focus, the study reveals a trend from the first funds focused on early & late stages of venture capital to more recent funds focused more seed and early stage (see Figure 7). New Energy Finance interviews and case studies revealed differences in initial goals such as market validation and recent goals. For example, as private investors flooded into the later stages of investment, public venture capital funds shifted to a greater concentration of seed and early stage focused funds. Through case studies and an analysis of selected fund portfolios, this study has highlighted the differences in current funds with respect to their focus, structures, as well as provided greater insight on how these clean energy funds operate and make investments.

Figure 7: Map of Public Venture Capital Clean Energy Funds by Target Investment Stage, 2000 – 2008



Note: Date represents Funds inception, size of bubbles represents relative investment fund size. Refer to key for scale of fund size.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

# List of Case Studies and Box Outs

## Case Studies

SDTC's Unique Public Funding Strategy  
Government Connections (CalCEF)  
Funds in Formation (EEEEERF)  
Bridging the Emerging Market Financing Gap (GEEREF)  
How Can Environmental Benefits Be Quantified and Considered? (SDTC and Carbon Trust)  
PA-AIT's Fund Structure  
Three Structures Meeting the Same Objective (Carbon Trust, MGEF and CalCEF)  
The Appeal to Partnering with the Public Sector (Cleantech Ventures, Carbon Trust)  
Walking Through the Decision Framework (CalCEF)

## Box Outs

European Financing Gap: Why Don't US Investors Invest in Europe?  
A Closer Look at North America – the Canadian Funding Gap Commercialization Financing Gap  
Commercialization Financing Gap  
Clarifying "Public Venture Capital" (SDTC, CalCEF, MGEF, PA-AIT)  
Venture Capital: One of Many Programs  
Permanent vs. Temporary Market Failures  
Public Fund of Funds: European Investment Fund  
Notable Considerations (Cleantech Ventures, Sitra)

# Introduction

In 2007, total new investment in clean energy reached \$148bn<sup>1</sup> and accounted for 1% of total global infrastructure investment. Early stage venture capital financing represented only a small fraction of overall investments, totalling \$3.6bn of the \$13.5bn of total venture capital and private equity money invested in companies. While small, it is arguably one of the most important because it forms the foundation of future innovation and market creation.

Early stage venture financing provides capital for clean energy entrepreneurs to build start-ups and develop revolutionary ideas into game-changing technologies, potentially building companies that will advance the development and delivery of clean energy services. These new ventures push the frontier of clean energy development, looking for improved solutions to better exploit renewable resources and drive down the cost of producing and delivering clean energy. Without strong investment in early stage financing, the well of new clean energy ventures will eventually go dry, leaving the industry with no spring board for the technological breakthroughs needed to sustain the clean energy economy.

**Part I** of the Study begins with an overview of venture capital and a discussion of how the mechanism drives technological innovation and provides funding for new ventures to take their technologies to market. While traditional venture capital is capable of facilitating innovation in clean energy, an analysis of current and historical venture capital investment trends reveals funding gaps.

**Part II** identifies the need for public venture capital by evaluating existing public venture funds' ability to address the financing gaps left by traditional venture capital. New Energy Finance maps existing clean energy public venture capital funds by their investment focus and their fund structure. Public venture objectives and success metrics are discussed to highlight how public venture capital differs from private venture capital.

**Part III** focuses on providing recommendations on how to approach public venture capital. While some funds have operated for some time, many have yet to make investments, and some funds are still defining their fund structure. This section provides a framework and considerations for choosing the public venture capital model. In addition, this section explains why it is important that public venture funds operate in an independent and commercial manner to best facilitate long term sustainability and success.

**Part IV** provides a portfolio analysis that outlines basic steps that a public venture capital investor would consider, and walks through several case studies to provide real world examples of how a public venture capital sources, funds, and advises its portfolio companies. Where possible, New Energy Finance highlights individual success metrics from the sample of participating public venture capital funds.

Throughout the study, case studies are used to elaborate on the recommendations and provide tangible examples. Case studies draw not only on clean energy public venture capital funds, but also where applicable and helpful, the case studies include lessons from successful public venture capital firms and other organisations that address relevant issues to clean energy public venture capital.

Finally, this study concludes with a summary of public venture capitals successes and a look to the future on how public venture capital might approach other funding gaps in the path toward commercialization of clean energy technologies.

<sup>1</sup> Total new investment includes venture capital & private equity, asset finance, research & development, public markets, small scale projects, mergers & acquisitions, and management buy-outs. *Source: New Energy Finance*

# Objectives and Approach

In May 2008, the Sustainable Energy Finance Initiative Public Finance Alliance (SEF Alliance) commissioned New Energy Finance to analyse public venture capital approaches to bridging the financing gaps in clean energy private venture capital investment. The initial Scope of Study intended to provide the SEF Alliance with an analysis of the advantages and disadvantages of using different types of public venture capital investment vehicles. New Energy Finance's goal was to provide SEF Alliance members with a study that aimed to:

- Explain the role of venture capital in facilitating innovation and eventual commercialisation of sustainable energy technology
- Identify financing gaps in private venture capital investments in clean energy
- Explain the need for public venture capital
- Map the current clean energy public venture capital fund space
- Analyse existing public venture capital fund structures and strategies
- Provide recommendations on how public venture capital can best be structured to reach its goal
- Provide case studies of funds with current investment portfolios
- Provides case studies of fund structure development

The findings and recommendations in this report were based on an analysis of existing public organisations provided by the SEF Alliance and supplemented by New Energy Finance for a comprehensive look at clean energy public venture capital organisations. Funds that were not specifically created to target clean energy or were initially created as a fund to be managed for commercial gains only were excluded<sup>2</sup>. Special focus was given to areas of special interest of SEF Alliance members and where requested, New Energy Finance included funds that did not match the study's definition of public venture capital but exhibited venture-like qualities, or made a point about early stage financing in clean energy. To the extent possible, New Energy Finance sought to interview and/or correspond via email with fund representatives that fit the study's definition of public venture capital and focused specifically on clean energy. In total, eleven funds represented by nine public organizations were included in the study (see Appendix A). These organisations represented different fund structures, objectives and geographical locations of the total sample. Financing gaps were confirmed anecdotally through interviews as well as quantitatively through analysis of global investment data by stage, deal size and geographic area.

Our interview questionnaire examined the following topics:

- Perceived financing gaps in private venture capital/early stage financing
- Considerations and or thought process during the creation of the fund, including rationale for structuring money dispersal as venture capital instead of other financing mechanisms
- Funding objectives and goal prioritization
- Relationship, or lack thereof, to private investors, whether by co-investment requirements or partnerships
- Attributes that set public venture capital apart from private venture capital

Follow-up interviews were conducted with a handful of funds to further dissect investment decision criteria and analyse their respective portfolios.

Interviews were also conducted with funds that have been recently created or are in the process of finalizing their investment management and fund structure.

<sup>2</sup> This would include such managed funds as CalPERS (The California Public Employees' Retirement System) that manages pension and health benefits for California public employees, retirees, and their families. While CalPERS is a limited investor in many clean energy funds, it was founded to manage retirement funds for commercial gain of its stakeholders, rather than created for purpose of financing clean energy innovation.

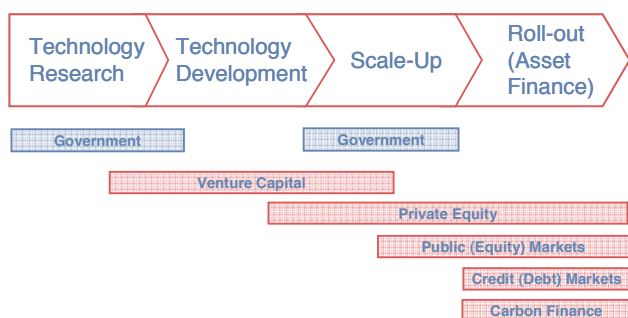
# Methodology and Definitions

New Energy Finance continuously monitors investment in renewable energy and energy efficiency. This is a dynamic process: as the sector's visibility grows, information flow improves. New deals come to light and existing data is refined, meaning that historic figures are constantly updated. Unless otherwise specified, New Energy Finance is the primary reference source for investment statistics and data. Since last year's report – Global Trends in Sustainable Energy Investment 2007 – investment totals for 2006 have been restated upwards, with total new investment of \$92.6 billion (up from \$70.9 billion). The total new investment in 2007 is \$148.4 billion.

Deal values are rigorously back-checked and updated when further information is released about particular companies and projects. The data uses historic figures, showing confirmed / disclosed investment, where disclosed investment depicts the number of the transactions where investment totals were disclosed. Where deal values are not disclosed, New Energy Finance assigns an estimated value based on comparable investment transactions. The investment totals are referred to as grossed-up values in the notes to each chart.

The following geographical areas have been used: AMER for the Americas (North & South); EMEA for Europe (EU and non-EU, Middle East and Africa); ASOC for Asia and Oceania (Australia and New Zealand).

**Figure 8: Technology Development Life Cycle**



Source: SEFI, New Energy Finance

New Energy Finance tracks deals across the financing continuum, covering R&D funding and venture capital for technology and early-stage companies, public market financing for projects and mature companies, and asset financing for capacity projects (see Figure 8). Investment categories are defined as follows:

**Venture Capital and Private Equity (VC/PE):** defined as all money invested by venture capital and private equity funds as equity in companies developing renewable energy technologies. Similar investment in companies setting up generating capacity through Special Purpose Vehicles is counted in the asset financing figure. When venture

investment is grouped into early and late stage investment. Early Stage venture investment includes seed, early technology spin-offs, Series A and Series B investment. Late Stage venture includes Series C and beyond.

**Public markets:** defined as all money invested in the equity of publicly quoted companies developing renewable energy technology and low-carbon power generation.

**Public Venture Capital is defined as:**

- Public money
- Funds that are actively managed, competitively dispersed and looking for investment opportunities
- Takes an equity stake in a company
- Used to develop the company up to the commercialisation phase



# Part I: Private Venture Capital: Role & Financing Gaps

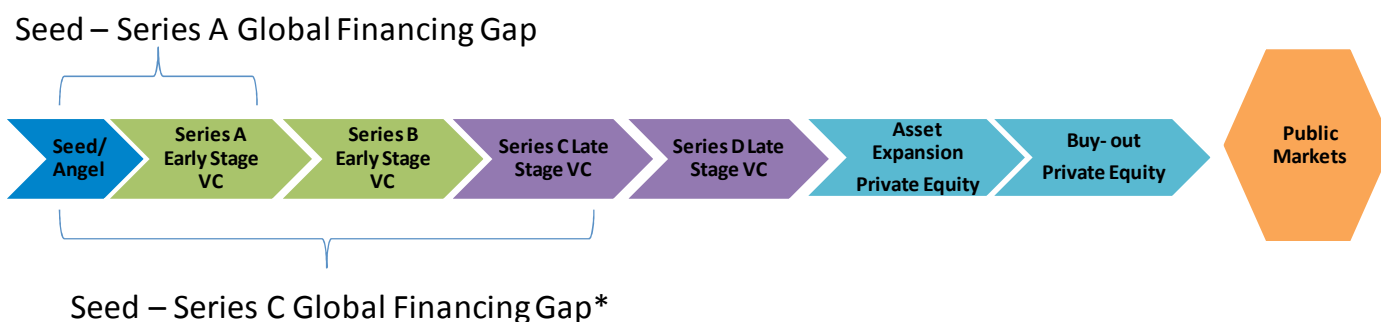
## A. Introduction to Venture Capital

Entrepreneurs require substantial investment capital to develop their innovative technology or service. It is rare that they can reach commercialization of their product or service relying solely on personal investment capital. Founders of new companies have many expenses such as hiring employees, paying for business operations, and buying the materials necessary to build and test their product. Once entrepreneurs have exhausted their lines of credit and monies available from friends and family, they reach a point where the successful expansion of their business requires large injections of financial capital. For entrepreneurs that have successfully developed a viable business idea that includes an operating prototype and protectable IP, venture capital is the usual source of financing.

Venture capitalists are investment professionals that manage funds raised for the purpose of investing in early stage high growth business opportunities. These investments are considered highly risky as the investors must take on technology, regulatory, management, and market risks. To justify the considerable risks of investing in a new venture, venture capitalists only look to invest in companies where there is the potential to receive a 10x and upwards return on investment. While only a small percentage of private investment globally, venture capital plays a vital role in facilitating technological innovation and shaping future markets, as they provide the necessary capital for innovative business ventures at the frontier of technology development and market creation to succeed. Inherent to such high risk, high reward investments have a high failure rate. In a typical venture capitalist portfolio of ten companies, three to five companies fail completely, another three to four companies have small returns approximately equal to the amount invested, hopefully leaving one company to yield a massive 20X to 50X return on investment. Within the venture capital industry, these rare successes are termed “home runs.”

Venture investments are typically structured as equity stakes in the form of preferred stock<sup>3</sup> in the new company. Once the technology has reached the end of the research and development phase and a nascent idea of business exists, venture capital helps develop the technology, business plan, management team and company to the point where they are ready to demonstrate the technological and commercial viability of their product. In addition to developing new breakthrough technologies, venture capital is also used to develop and grow the respective companies. Venture capitalists not only provide investment capital, but also offer business skills, management advice, procurement of human capital, and access to other potentially strategic investors for the venture. A good business is composed of protectable intellectual property, a strong business plan and a good management team.

Figure 9: Investment Value Chain and Funding Gaps



Note: \*The Seed – Series C Global Financing Gap does not apply to clean energy venture capital investments in the United States.

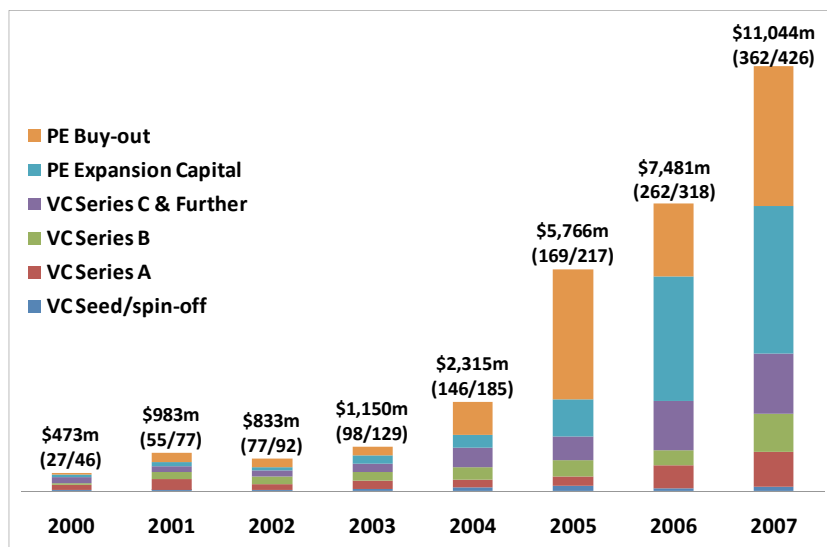
Source: SEF Alliance Public Venture Capital Study, New Energy Finance

<sup>3</sup> Preferred stock is a type of capital stock which takes precedence over common stock with respect to dividend payouts and in the event of liquidation.

The goal is to bring a successful product or service to market and build a profitable company that will eventually be worthy of attracting larger investment rounds up through a successful initial public market offering (IPO). Traditionally, only the public markets have been capable of providing exits for investors above 10X investment; however private buy-outs could offer similar returns. Before reaching this stage, entrepreneurs will likely need to seek multiple venture investment rounds. Early stage financing usually begins with seed capital from angel investors or some early stage venture capitalists. The next stage of investment is considered a “Series A” or first round investment usually through an early stage venture capitalist. Depending on the continued growth of the company, subsequent investment rounds (“Series B, C, D”) tend to ramp up the size of investments and number of venture capital firms involved (see Figure 9). Venture capital brings a nascent company up to the point where they can seek other, non-venture capital, funding to develop a commercial facility that proves technological viability at commercial scale and thereafter, seek private equity funding to build future mature facilities or installations.

## B. Venture Capital Investment in Clean Energy

Figure 10: Global VC & PE Clean Energy Investment in Companies by Type, 2000 - 2007: \$m



Note: Grossed-up values based on disclosed deals. The figure represents investment by venture capital and private equity players in clean energy companies. Figures in brackets refer to (disclosed deals / total deals).

Source: *New Energy Finance*

Clean energy entrepreneurs looking to exploit renewable energy sources and develop entirely new methods of delivering renewable energy services also require capital. These entrepreneurs pitch their technology and business to many types of investors, but in particular, venture capitalists given their appetite for new venture opportunities. One would imagine that a rush of venture capitalists would be seeking the next energy breakthrough. However, while the potential innovation of clean energy technologies caught the attention of venture capitalists, few were willing to make investments in clean energy start-ups. In fact, across the entire investment value chain, few investors were financing opportunities in clean energy prior to 2005 (see Figure 10). Even after 2005, the share of venture capital investment, especially at the seed and early stage has remained small compared to overall private investment into companies (see Figure 10).

While some investors took interest and invested in clean energy technologies, most investors were

hesitant to enter the industry in its earliest phase prior to 2005. The technologies were thought to be innovative, but investors did not believe they could reap a high return on investment in clean energy. Specifically, investors were concerned by the following:

- Capital intensity of the industry
- Dependence on and uncertainty of regulatory policies
- Lack of expertise in the energy industry
- Perceived lack of consumer need
- Low cost of existing competing hydro-carbon energy technologies
- Relatively high cost of clean energy technologies
- No sample of successful investor exits
- Long gestation period from prototype to eventual commercialisation and hence exits
- Lack of government support for roll-out of proven technologies
- Absence of global climate change agreements
- No price for carbon

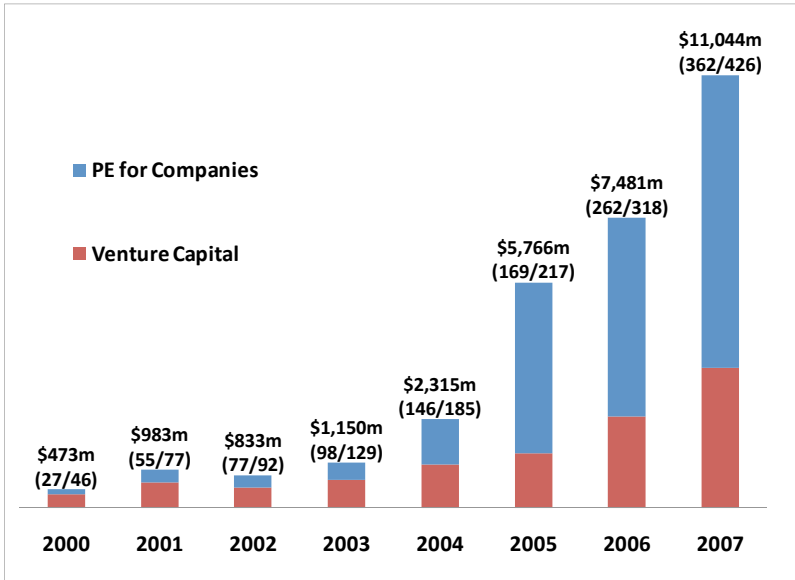
New ventures in clean energy require much more investment capital than other typical new ventures, because the energy industry is inherently **capital intensive**. Typical renewable energy projects cost hundreds of millions of dollars. Before entrepreneurs can even get to the goal of supplying or financing a clean energy project that uses their technology, they must develop and test a viable prototype, build pilot projects, and build commercial manufacturing facilities. For example, the development of a new solar cell requires heavy engineering and the procurement of expensive materials, not to mention an intimate **expertise of the energy industry**. Even with the aid of government programs, such as the National Renewable Energy Lab in the United States, the cost of testing a sample solar cell is hundreds of thousands of dollars. Compare this to the creation and testing of an “online peer-peer networking site” that only requires a computer, online access, and a general knowledge of the consumer internet industry to develop and test the product. The necessary capital expenditures of a clean energy venture only increase once the prototype has been developed. New ventures must then construct pilot and demonstration facilities to ultimately build commercially viable products. Not only are these processes expensive, requiring a unique engineering skill set to develop, and the specialization of a national lab to test, they also take years as opposed to months to develop from the prototype to commercial viability. This **long gestation period** is daunting to a private investor as it inherently lowers the potential IRR of an investment. Even once commercialization is reached, successfully marketing a product requires the deep understanding of the often complicated energy industry, which does not gain mass distribution as easily as with a launching of a website or a single contract with a multi-billion dollar pharmaceutical company. The process takes years to develop relationships with material suppliers, developers, and utilities.

The market penetration of renewable energy and low carbon technologies is highly dependent on regulatory policies. These regulatory policies range from covering carbon emissions to incentives for **the roll-out of proven technologies**. The **relatively high cost of clean energy technologies** as compared to **the low cost of existing hydro-carbon energy technologies** makes regulatory incentives critical for the development of renewable energy projects and continued investment in the sector. Similarly, given the nascent nature of the industry, many potential customers are not familiar with the benefits of the technologies and subsequently, perceived consumer demand has not been as high as an investor would like. Historically, incentives have spurred investment, development, and adoption of renewable energy technologies however; the uncertainty of regulation and the “stop and go” nature of some policies have made it difficult to rely on such measures. **Uncertain regulatory policies** complicate and affect investment across the value chain. For example, without incentives such as feed-in-tariffs and investment tax credits, the existing economics of developing solar energy projects are not as attractive as alternate investments. Uncertainty with regard regulatory environment not only reduces demand for projects but it also stunts investment in other parts of the value chain. With respect to carbon emissions, this point is further highlighted given **absence of global climate change agreements** that would facilitate the continued creation of carbon emission policies.

Given all of the above points many investors have been daunted by these perceived barriers. In addition, the fact that **few successful investor exits** had taken place, has made it difficult to sell clean energy as an attractive sector for investments. Of course, the early investors with the expertise, patience, and risk profile to overcome the barriers were well-placed to take advantage of investment opportunities. However, these investors were few and far in between and there was a clear need for more investors and capital to develop the clean energy sector. While some of these factors remain today, such as the lack of a global climate change agreement, many of the aforementioned concerns have begun to be addressed through investor education, improved government support, and an overall improvement in the relative cost of energy technologies.

### C. Financing Gaps/Market Failures

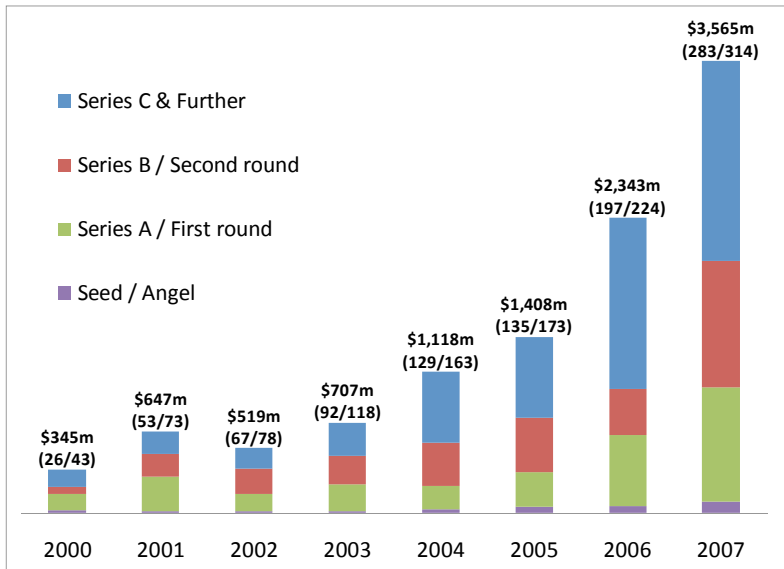
Figure 11: Global VC & PE Clean Energy Investment in Companies by Type, 2000 - 2007: \$m



Note: Grossed-up values based on disclosed deals. The figure represents investment by venture capital and private equity players in clean energy companies. Figures in brackets refer to (disclosed deals / total deals).

Source: *New Energy Finance*

Figure 12: Global VC Clean Energy Investment by stage, 2000 - 2007: \$m



Note: Grossed-up values based on disclosed deals. The figure represents venture capital investment by stage. It does not include private equity investment. Figures in brackets refer to (disclosed deals / total deals).

Source: *New Energy Finance*

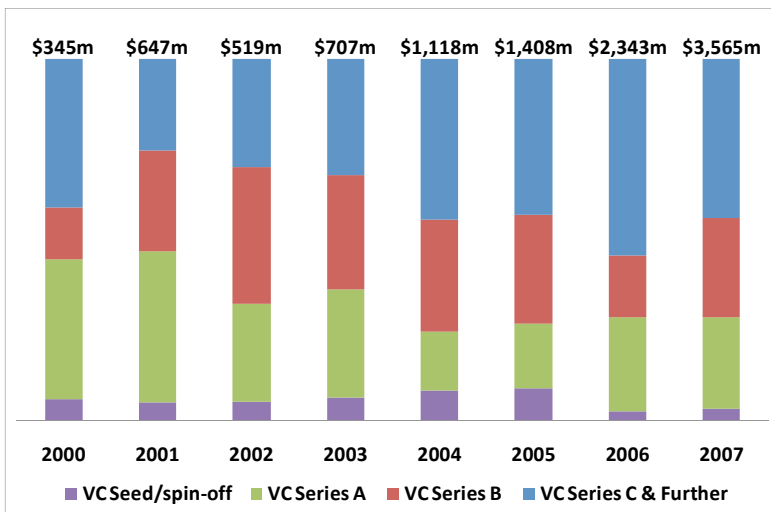
#### 1. **Historical Finance Gap**

In 2000, investor interest in clean energy opportunities did not yield substantial investment in the industry, with global venture *and* private equity investment together totalling only \$473 million (see Figure 11). Total global venture capital investment did not pass \$1 billion until 2004, and while it has grown, the majority of the growth comes from later stages of venture capital investment. There was little seed financing, consisting of only \$200 million of cumulative investment from 2000 to 2006 (see Figure 12).

Compared to later stage venture capital investments, seed investments hardly registered. Without interested investors (Limited Partners) to fund clean energy focused funds, venture firms lacked sufficient capital to deploy. Although venture capital is considered to be on the “cutting edge,” the venture industry usually moves as a pack and requires some initial first mover successes to inspire a true mobilization of investment funds. Many firms and investment funds were necessary to truly create the investment momentum necessary to ramp up investment in clean energy companies.

Investor demand for clean energy opportunities grew slowly from 2000 to 2004. The “venture investment pack” only mobilized once there was some sign that the industry “had legs” and could substantiate high levels of investment. Global venture capital across every sector declined substantially after the unprecedented run-up that peaked in 2000, driven by investments in internet technology start-ups. After the tech bubble burst, it took until roughly the second half of 2003 for venture capital investments to stabilize, led by the life sciences sector. It wasn’t surprising that investors hesitated to invest in new technologies (especially clean energy technologies).

Figure 13: Global VC Clean Energy Investment by Contribution of Stage, 2000 - 2007: %



Note: Grossed-up values based on disclosed deals. The figure represents the relative contribution by each stage as a percentage of the total venture capital raised. It does not include private equity investment.

Source: *New Energy Finance*

## 2. Seed - Series A Gap, Global

These perceptions and attitudes are beginning to change; in 2007, more than \$11 billion was invested in venture capital and private equity. Of the \$11 billion invested, \$7.5 billion went toward private equity investments; including private equity buy-outs (see Figure 11). Venture investment grew from \$345 million in 2000 to \$3.6 billion in 2007 (see Figure 12). However, this does not mean that specific financing gaps have been eliminated. Capital rushed into the clean energy sector, but the bulk of it was focused on **later stages** of venture and private equity. Seed and Series A investment have grown overall, and while the early-stage financing gap used to be even more severe, relative underinvestment at the seed and Series A stages has remained. Seed and Series A investment continue to represent a very small portion of total venture investment. In fact, their total relative contribution has declined since 2000 (see Figure 13). The seed financing gap is much more severe than for Series A. Seed investments totalled only

\$119 million of the \$3.6 billion venture capital invested in 2007, representing 3% of the 2007 venture capital total as compared to 6% in 2000. Though \$900 million was invested in the Series A stage in 2007, it is notable that the share of Series A investment has fallen from 39% in 2000 to 25% in 2007. Of course, the share of total investment should be dominated by the later stage given their larger deal sizes, especially as companies mature and reach later stages of investment. However, the absolute value for seed stage investment (\$119 million) remains quite small, and the relative decline in contribution of both seed and Series A investment is of concern. It is critical to the long term viability of the sector that there are pools of investment for higher risk early stage investments. Otherwise, the availability of opportunities for late stage investment will eventually evaporate.

Interviews with public venture capital organizations also confirmed that a significant, global seed and Series A financing gap existed and continues to exist.

Several characteristics of seed and Series A investments make these deals less popular for private investors than their later stage counterparts. In fact, seed financing is often done by angel investors who typically do not have the resources, expertise or expectations of venture investors. The following characteristics exist regardless of geographic location of the deal, explaining why the gap would exist globally:

- **Returns:** The returns on early stage investments don't increase proportionally by stage. Thus, the potential added gains from entering earlier into a deal do not warrant the increased risk of earlier stage investing. Thus private investors expect similar returns on investment, and prefer later stages of investment.
- **Costs:** Regardless of deal size and stage, an investor must undergo the same amount of due diligence and incur the same fees for a smaller, earlier-stage investment as they would for a larger, later-stage investment. Thus an early-stage private investor would spend more money on management and due diligence per dollar invested than would a later-stage investor, but only expect similar financial returns.
- **Deal size – investor:** The current size of venture capital funds is not conducive to making seed and early stage investments. Venture capitalists look to make larger investments per deal in order to efficiently invest their funds and allow for the optimal number of portfolio companies under management. For example, a \$200m dollar fund does not have the

resources or time to make 200 \$1m investments, thus a fund of this size would seek to make much larger investments per deal.

- **Deal size – investee:** Seed and early stage entrepreneurs often do not require the minimum amounts of equity investments a venture capital firm is looking to make, given their fund size. Thus a deal can not be made even if the business venture is worthy of investment. For example an entrepreneur that is seeking to only raise \$1m in equity would not be able to take money from a fund that has an investment minimum of \$2m. In this situation a target company would have otherwise been a wonderful opportunity, but must be passed up by the investor since the company is unwilling to give up such a large share of their company to be able to take \$2m.
- **Fees:** Venture capital firms are not incentivized to raise smaller fund amounts, as part of their compensation and operational budget is based on management fees that are proportional to total fund size. Typical management fees are 1 to 2 percent of funds under management<sup>4</sup>. Therefore a fund managing a \$15m seed fund would only have \$150,000 to \$200,000 to pay for operating expenses, salaries, due diligence and other associated fees. This amount is much too small for a fund to be fully operational.
- **Dwell time:** Already an unattractive option, the seed or early stage investment is further complicated by the longer time it takes for a technology and company at early-stage to reach maturity and hopefully exit through an acquisition or IPO. An investor must then be willing to wait a longer period of time, and consider factors such as how much money it must hold onto in reserve to sustain its ownership position after multiple fundraising rounds.

### ***European Financing Gap: Why Don't US Investors Invest in Europe?***

As private investors in the US complain that later-stage deal flow is increasingly limited, one might wonder why they don't look for more of their deals in Europe, where insufficient European venture capital investments even at later-stages would suggest ample room for US investment dollars. The reason US investors don't invest as often in Europe as one might expect is because investing in European B and C rounds is different from investing in United States B and C rounds.

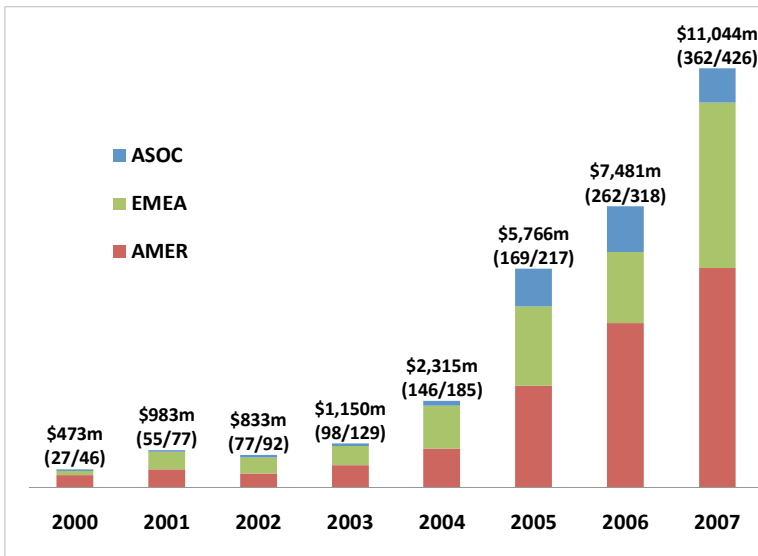
**Geography:** To manage a deal in Europe and reach the level of hands-on involvement that venture capitalists prefer requires greater time commitment (given travel to be on-site, etc.) or a partnership with a strong syndicate in Europe.

**Company Development:** Companies are forced to spin out earlier in Europe than they are in the United States. In the United States, start-ups have access to public money for research and development (R&D) such as large Department of Energy grants, while attracting the interest of serial entrepreneurs, commercial players and support programs such as the MIT spin-out program. In contrast, European legislation (European State Aid) prevents local governments from distributing as much grant funding to pre-commercialization groups. The lack of European R&D funding means that more money is available to a small to medium enterprises than to a research team, and in order to raise money, groups are forced to spin out of their respective research labs or university as a company 12-18 months earlier than they would have in the United States. As a result, an American investor looking at a series B or C deal in Europe is in reality looking at the equivalent of a series A or B deal by American standards. To an American investor, the start-ups management teams are immature and revenue-produced is too low.

Even if more public money were invested as venture capital, companies in Europe would continue to spin out earlier and lag behind American companies in terms of management teams and time horizon to reach revenue generation. Aside from increasing public money directed towards grant programs and R/D in Europe, educating American investors of this lag would allow American Series A/B investors to understand the difference in European stage of development and look at Europe Series B/C deals.

<sup>4</sup> Management fees drop as fund sizes increase.

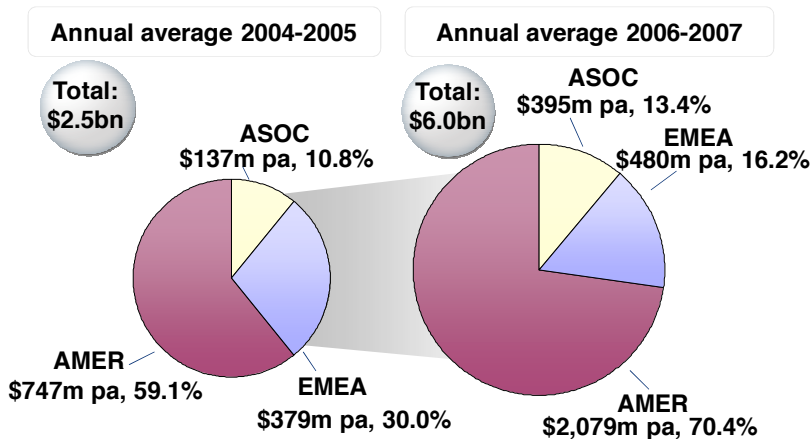
**Figure 14: Global VC & PE Clean Energy Investment by region, 2000 -2007: \$m**



Note: Grossed-up values based on disclosed deals. The figure represents investment by venture capital and private equity players in clean energy companies. Investment is broken down by region defined as: AMER for the Americas (North & South); EMEA for Europe (EU and non-EU, Middle East and Africa; ASOC for Asia and Oceania (Australia and New Zealand). Figures in brackets refer to (disclosed deals / total deals).

Source: *New Energy Finance*

**Figure 15: Global VC Clean Energy Average per Annum Investment by Region (\$m) & (%)**



Note: Grossed-up values based on disclosed deals. The figure represents the average venture capital investment by region defined as: AMER for the Americas (North & South); EMEA for Europe (EU and non-EU, Middle East and Africa; ASOC for Asia and Oceania (Australia and New Zealand). Labels denote total amount raised per annum and its corresponding percentage of global total. Total represents the combined total amount invested across date range, i.e. 2004 -2005 and 2006-2007, respectively.

Source: *New Energy Finance*

### 3. Seed - Series C Gap, Global Excluding U.S.

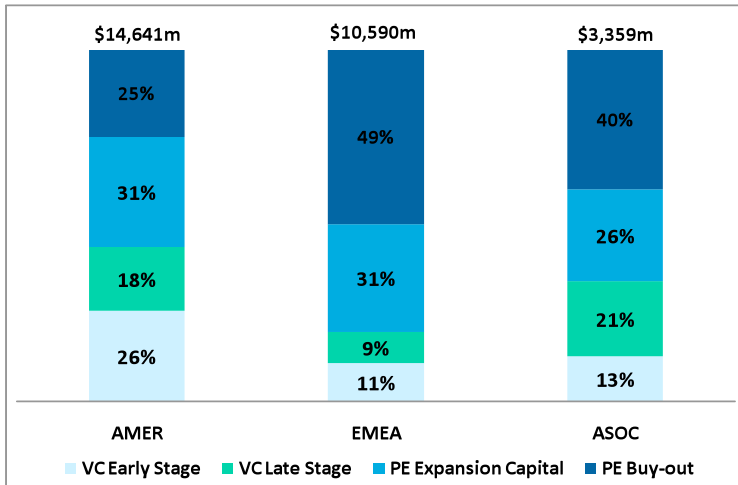
The global financing gap extends beyond the seed - Series A to include the Series B and C stages of venture capital, though to a lesser extent. Globally, total venture capital and private equity investment into companies is largely dominated by the Americas and Europe<sup>5</sup> (see Figure 14). A focus on regional venture capital investment by investment type shows that Europe and Asia lag behind the Americas with regard to venture investment (see Figure 15). Moreover, the dominance of venture investment in the Americas has proven to be largely driven by the United States, with Canada displaying investment trends analogous to Europe and Asia (see “A Closer Look at North America – the Canadian Funding Gap.”)

Over 2004 and 2005, total global venture capital investment in clean energy was \$2.5bn. The Americas represented about 59.1% of the annual average as compared to Europe with 30.0%, and Asia & Oceania with 10.8% (see Figure 15). Compared to 2004-2005, venture capital grew by 140% in 2006-2007. While Europe’s aggregate total increased, its growth was not proportional as its global share fell nearly in half to 16.2% while the Americas grew to 70.4% of the total and Asia & Oceania grew to 13.4% share of total global investment. The largest driver of the explosive growth in venture capital investment in clean energy can be attributed to the surge of private American venture capital firms raising funds and entering the space. Comparatively, there exists a relative venture financing gap in the remainder of the world as compared to the increase in venture investment within the United States.

Global venture investment in EMEA didn’t grow at a rapid pace compared to AMER with respect to venture capital, however, it has grown significantly with respect to venture capital and private equity overall (see Figure 16). In fact, with respect to total venture capital and private equity investment EMEA’s 2007 growth in investment was over 105% increasing from \$2.1bn to \$4.3bn, a much higher growth rate than AMER’s 36% which grew from \$4.3bn in 2006 to \$5.8bn in 2007. ASOC had a 12% contraction in total venture capital and private equity investment in 2007, however, since 2002 it has grown significantly.

<sup>5</sup> EMEA investment also includes the Middle East and Africa, but the latter regions represent little investment activity such that it “EMEA” is generally considered a good proxy for Europe.

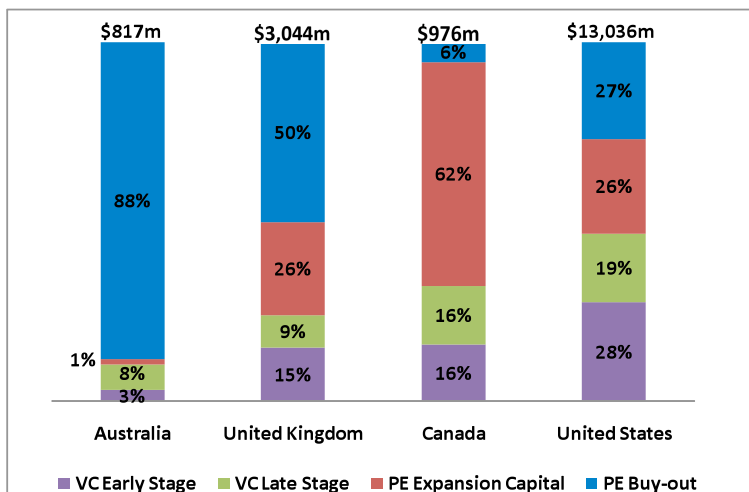
**Figure 16: Global VC & PE Clean Energy Investment by Region & Contribution of Stage, 2002 -2007: %**



Note: Grossed-up values based on disclosed deals. The figure represents the relative contribution by each stage as a percentage of the total venture capital raised.

Source: *New Energy Finance*

**Figure 17: VC & PE Clean Energy Investment by Selected Country & Contribution of Stage, 2002 -2007: %**



Note: Grossed-up values based on disclosed deals. The figure represents the relative contribution by each stage as a percentage of the total venture capital raised for selected countries.

Source: *New Energy Finance*

Historically, institutional investors in Europe and similar jurisdictions prefer to invest in private equity funds that not only are less risky, but also have typically managed to outperform local venture capital funds. When European investors do allocate money for venture investment, they tend to invest in American top quartile venture capital firms that have a strong track record of high returns.

Our conversations with European public venture capital investors indicated agreement with regard to these drivers and also yielded an understanding that historically, venture capital in Europe has not yielded the success necessary to warrant substantial growth of the venture sector locally.

This is not to say that strong performing venture funds don't exist in clean energy. As a whole, however, it has been easier for American venture firms to transition into clean energy investment, and/or raise new funds focused on clean energy investment from their Limited Partners compared to their global counterparts.

Given these growth rates investors in ASOC and EMEA are not dormant and are putting capital into play, but the money is not being focused on venture capital at similar proportions to AMER. The majority of ASOC and EMEA funds have been focused on private equity investment. While private equity investment should be a majority share contributing to total venture capital and private equity, across 2002-2007 EMEA and ASOC's share of private equity investment is high at 80% and 66%, respectively, as compared to the AMER region at 56%. The trend holds true at the country level, showing higher proportions of private equity investment in Canada, the United Kingdom, and Australia (see Figure 17).

It is interesting to note that Australia seems to also have a disproportionate amount of private equity buy-outs to both private equity expansion capital and venture capital with 88% or \$721m of its total \$817m of venture and private equity investment focused on buy-outs.

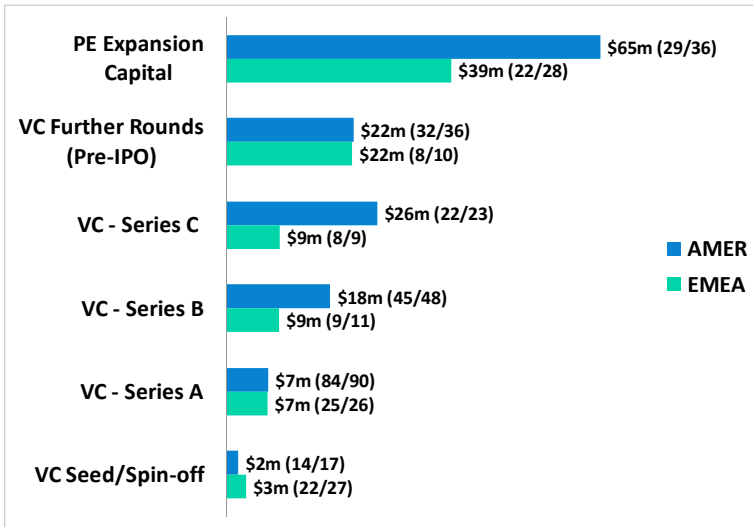
Why are investment funds in EMEA and ASOC focused so disproportionately on private equity than venture capital as opposed to the AMER region or more correctly, the United States?

First, as a consequence of decades of successful venture investing, American investors tend to have a stronger appetite for higher-risk, higher-return investments compared to their global counterparts, not only in clean-energy, but across all sectors. Success and familiarity with venture capital as an alternative investment vehicle has created a market for continued flows of institutional and high net worth capital to support a greater number of venture capital funds. Venture investing is less established in other areas and to date, fewer venture funds exist in Asia, Australia, Canada and even Europe.

Second, there isn't as much capital available to venture capital firms outside of the United States.



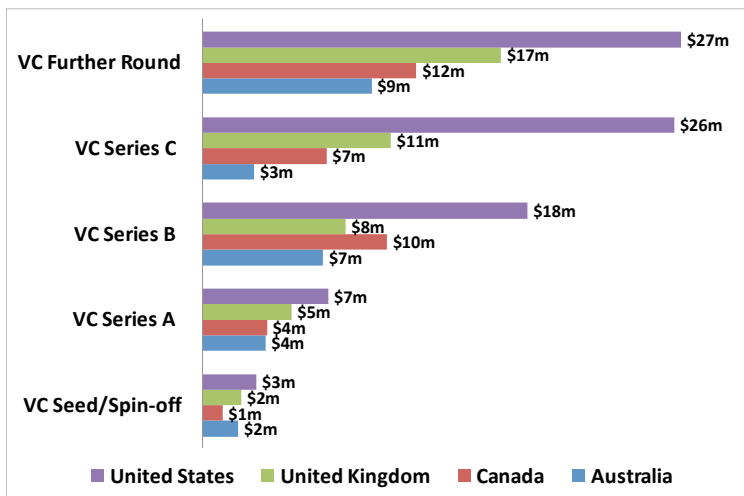
**Figure 18: Average VC & PE Clean Energy Investment Deal Size by Region & Stage, 2007: \$m**



Note: Average calculated based on disclosed deals only. This figure shows the average investment by region broken down across investment type. Labels denote total amount raised (number of disclosed deals/total number of deals recorded).

Source: New Energy Finance

**Figure 19: Average VC & PE Clean Energy Investment Deal Size by Selected Country & Stage, 2000 - 2007: \$m**



Note: Average calculated based on disclosed deals only. This figure shows the average investment by region broken down across investment type. Labels denote total amount raised (number of disclosed deals/total number of deals recorded).

Source: New Energy Finance

Beyond a preference for private equity investment, but related in the sense that the cause could be driven by either venture strategy track records or a cultural aversion, another driver of the late stage financing gap within the global model of venture investment is that of a failure to “ramp up” investments. Excluding the United States there exists a reluctance to provide significant amounts of capital by deal size at critical late stages of investment, or “ramp-up” investment in a company.

To illustrate this issue, NEF compared EMEA and AMER investment deal size trends. With respect to clean energy, the American and European late stage venture model is starkly different. While average deal size in the two areas is roughly similar in early stages, by the Series B round, American firms substantially increase their investment with average deal size nearly twice that of their European counterparts. For example in 2007 the average deal size was \$18m for the Americas but only \$9m in Europe (see Figure 18). An even more stark difference comes in Series C investment with the Americas nearly three times that of Europe at \$26m as compared to \$9m (see Figure 18). The divide does not continue beyond Series C into Pre-IPO venture rounds and private equity investment, suggesting that the issue is concentrated on the late stages of venture capital rounds where companies may still be pre-revenue.

Once a company has moved beyond early stage venture financing, European venture capital funds continue their smaller investments while American investors “ramp up” or “double down” on their investments. European investors are not willing to “double down” on their late stage venture opportunities, even when the new venture is in most need of growth capital, balking at investing in companies that are not yet revenue-generating let alone profitable. Discomfort with larger investment amounts closes out potential European venture investors from clean energy opportunities that inherently require much larger investment rounds. It is important to note that historically, European

companies have gone public earlier than the United States, especially on AIM, rather than raise expansion money from European private equity investors. This trend could help explain the limited ramp-up investments, as companies who might have otherwise been good opportunities for late stage venture capital or private equity expansion capital, have gone to the public markets and thus their fundraising is not accounted for in our venture and private equity values.

The existence of these two different late stage investing strategies can be seen globally, as Australia, Canada and the United Kingdom follow suit with the greater European trend (see Figure 19). While the three countries have similar investments sizes to the United states at the seed and Series A stage, the gap grows quite wide, especially with respect to Australia in Series C investments, notching an average investment size of \$3m or more appropriate for seed stage than later stage investment. The gap in deal size globally as compared to the United States could be attributed to differences in cultural “risk perception” and the availability of investment funds, rather than a sign that the clean energy market needs further validation before European investors trust this as an attractive form of investment.

At the start of the decade, American investors were also wary of investing in unproven clean energy companies but after sufficient money was invested and early investors realized returns, the market was "validated" for the American investor. In the United States, investors are more willing to double-down or ramp-up their investments in companies that show continued promise for achieving a stellar exit. Due to a long history of venture capital investing, and a strong track record, American investors have recognized the need to sufficiently fund their investments through to commercialization. Whereas, in Europe and other jurisdictions, including Canada and Australia, a dearth of institutional funds are available to promote the appropriate level of venture capital investment at both the early and late stage. The lack of funds can be driven by a historic relative out-performance of private equity to venture capital investments, cultural aversion to risky investments, or the simple lack of market validation for clean energy venture investments.

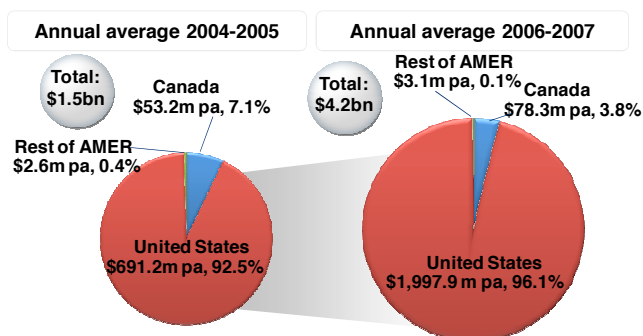
### A Closer Look at North America – the Canadian Funding Gap

As discussed in the main text, the AMER region represents the majority of global venture capital with an average per annum investment share of 70% in 2007 (see Figure 15). Breaking out the AMER investment portion shows that AMER investment values are largely driven by the United States, with an average per annum investment share of 96% across 2006-2007 (see Figure 20). Making up nearly the entire AMER share, it is clear that any investment trends drawn from AMER act as a clear proxy for the United States. However, this may not apply to the rest of the AMER region. Canada represents the second largest investment share with an average per annum investment share of 3.8% across 2006-2007. Making up such a small share of total AMER investment, AMER's investment trends are not a clear proxy for Canada, and thus a closer look at Canada is necessary to discern whether clean energy investment in Canada follows suit with the United States.

To better compare investment trends between the United States and Canada, Canada's values were prorated to make up for the difference in economy size (see Figure 21). This comparison yielded interesting investment trends, specifically, highlighting an increase gap in total venture investments in Canada as compared to the United States from 2003 to 2007. With respect to early stage venture investment, Canada's pro rata investment was very close to the United States, but dropped off in 2006 and 2007 to reveal a need for further investment in early stage opportunities. From 2004 to 2007, Canada's share of private equity investment as a proportion of its total investment has increased going from 43% in 2002 to 87% in 2007, showing a preference to private equity investment similar to the EMEA and ASOC region.

Canada's venture financing gaps are analogous to EMEA and ASOC, and are likely caused by the same drivers discussed in the main text, namely a dearth of institutional funds available to promote the appropriate level of venture capital investment at both the early and late stage.

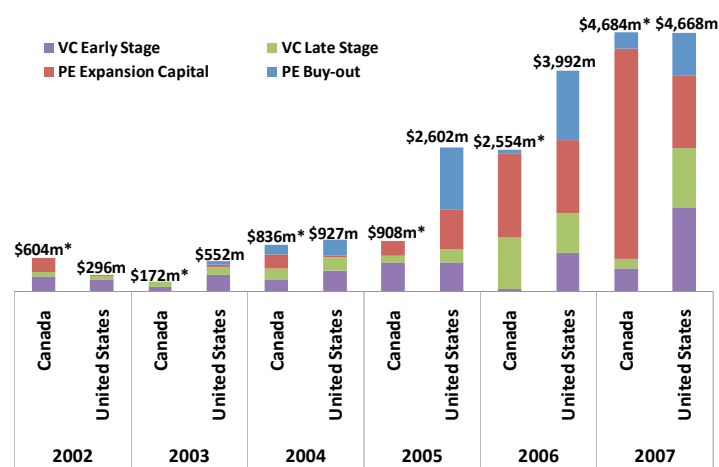
Figure 20: AMER Venture Capital Clean Energy Average Per Annum Investment by Country: \$m & %



Note: Grossed-up values based on disclosed deals. The figure represents the average venture capital investment by region defined as: AMER for the Americas (North & South). Labels denote total amount raised per annum and its corresponding percentage of global total. Total represents the combined total amount invested across date range, i.e. 2004 -2005 and 2006-2007, respectively.

Source: New Energy Finance

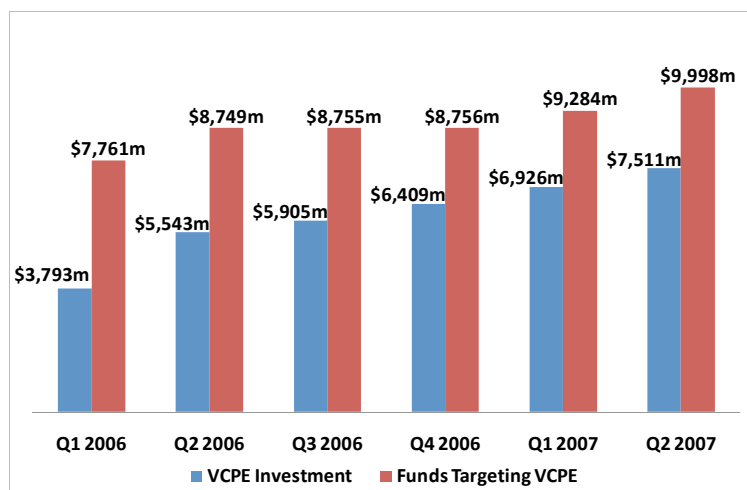
Figure 21: Comparison of Pro-rated VC& PE Clean Energy Investment by Stage Canada vs. United States, 2002-2007: \$m



Note: \* Canada values multiplied by factor of 10 to represent difference in economy size according to SDTC methodology. Grossed-up values based on disclosed deals. The figure represents venture capital and private equity investment in the United States compared to pro-rated investment in Canada by stage.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

**Figure 22: Cumulative VC & PE Clean Energy Investment & Funds raised, 2006 – H1 2007: \$m**



Note: Estimated VC/PE investments are from clean energy funds which are classed as pure play funds. Includes disclosed funds only targeting VC/PE investment as main asset class.

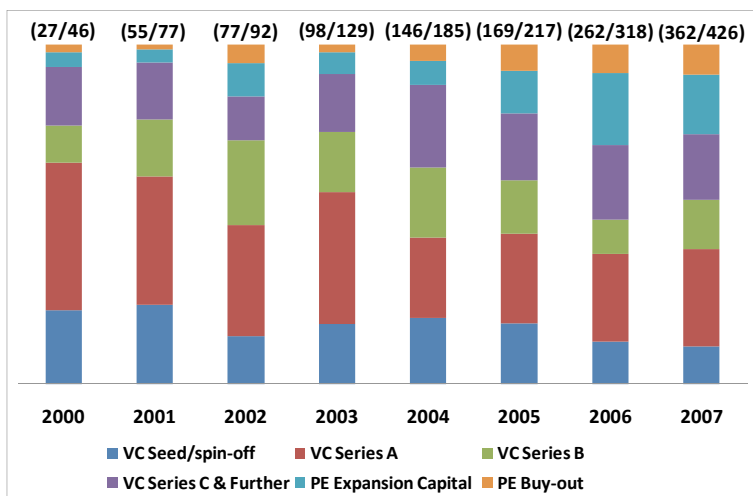
Source: New Energy Finance

#### 4. Priming the Pipeline of Opportunities

Opportunities for late stage venture and private equity investors depend on having a pipeline of companies making it to the next round of funding. Since not every company advances to the next stage of funding, there needs to be a healthy base of companies so that there will be enough opportunities at the end of the investment value chain. Stagnating early venture capital investments will slow deal flow into later venture and private equity stages, making the venture capital stage financing gap of critical importance.

Globally, private venture investors are already complaining of a dearth of investment opportunities. In a study undertaken by New Energy Finance in Q3 2007, fund data from 2006 and 2007 shows more money is being raised than deployed (see Figure 22) potentially indicating a lack of opportunities for later-stage investments as some raised money never makes it to an investment.

**Figure 23: Total Global VC & PE Clean Energy Deals by Contribution of Stage, 2002 -2007: %**



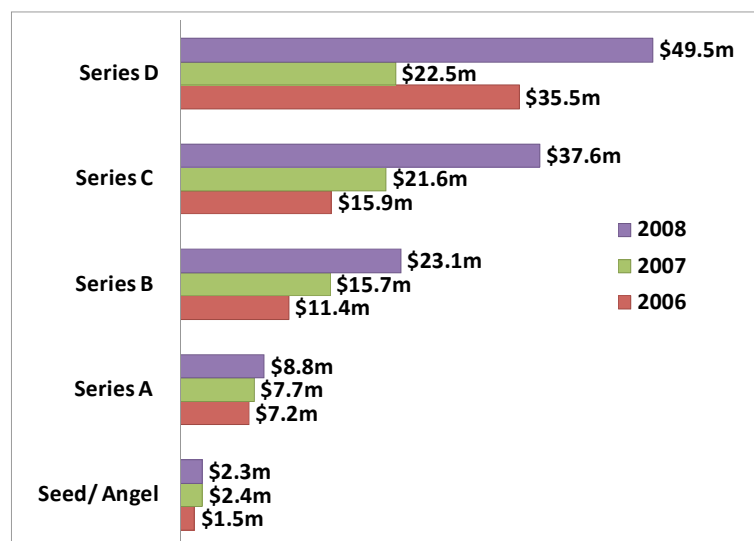
Note: Based on total deals. The figure represents the relative contribution by each stage as a percentage of the total number of deals completed. Labels denote (number of disclosed deals/total number of deals recorded).

Source: New Energy Finance

Since only a certain percent of companies funded make it to the next round of development, a bigger base of deals in the early stage of development is necessary to ensure the pipeline for late stage investment. Otherwise, the availability of opportunities for late stage investment will eventually evaporate. With the assumption that investors would be more likely to move down the investment chain as they become more comfortable with the sector, the share of deal number should remain constant or increase. It is of great concern that here is a global decline in the share of early stage investment by number of deals as both seed and Series A deals have fallen to their lowest contribution in 2007 (see Figure 23).

While later stage investments demand greater investment sizes, the average size of investment rounds has grown substantially in the later Series C and D rounds with average Series C investment growing from \$15.9 million in 2006 to \$37.6 million in 2007 and Series D investment growing from \$35.5 million in 2006 to \$49.5 million in 2007 (see Figure 24). This increased growth in average investment size suggests increased competition among investors for limited investment opportunities, as investors vie for investment opportunities by offering sums of money larger than the next investor.

**Figure 24: Comparison of EMEA Average VC investment 2006 - 2008: \$m**



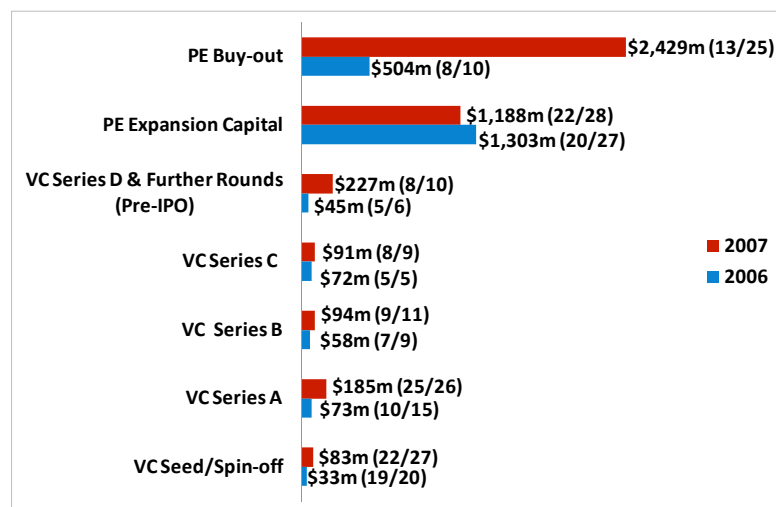
Note: Average deal size calculated using disclosed deals only. This figure compares average deal size by investment type. Labels denote total average deal size.

Source: New Energy Finance

In Europe we see that few deals have been closed in the later stages of venture capital (Series B through to Series D rounds), totalling only 19 disclosed deals in 2007 compared to the 23 disclosed private equity expansion deals (see Figure 25). To date this does not seem to have impacted private equity investment opportunities, as Europe has had an increase in private equity expansion capital and private equity buy-outs. The growth of private equity deals and relative stagnation of late stage venture capital may signal that only the last stage of VCPE investing, private equity, currently has viable investor opportunities. In 2007, PE Buy-outs exploded with respect to capital invested, growing five times from \$557m to \$2,429m, while the number of deals only increased by 2.5 times. It is possible that European private equity investors were fighting over limited opportunity through buyouts, rather than pursuing new opportunities to grow companies through private equity expansions.

This could represent a limited pipeline of late stage venture backed companies looking to move to the next stage of private equity financing. If true, we can expect the dearth of opportunities in Europe will only be exacerbated by the continued under investment in early and late stage venture capital. While total and proportional investment by stage is important, especially in the early stage, it is also important that companies are able to raise large enough later stage rounds to fulfil their need for capital. Fundraising is a costly and time consuming endeavour for a company focused on executing on its business plan. Often as it gets closer to the commercialization stage, the need for capital is much larger, yet traditional forms of financing such as debt may not be available and the balance of risk to reward prospects for potential investors may still not be able attractive to private equity investors. Thus it is critical to have access to proper amounts of venture capital financing.

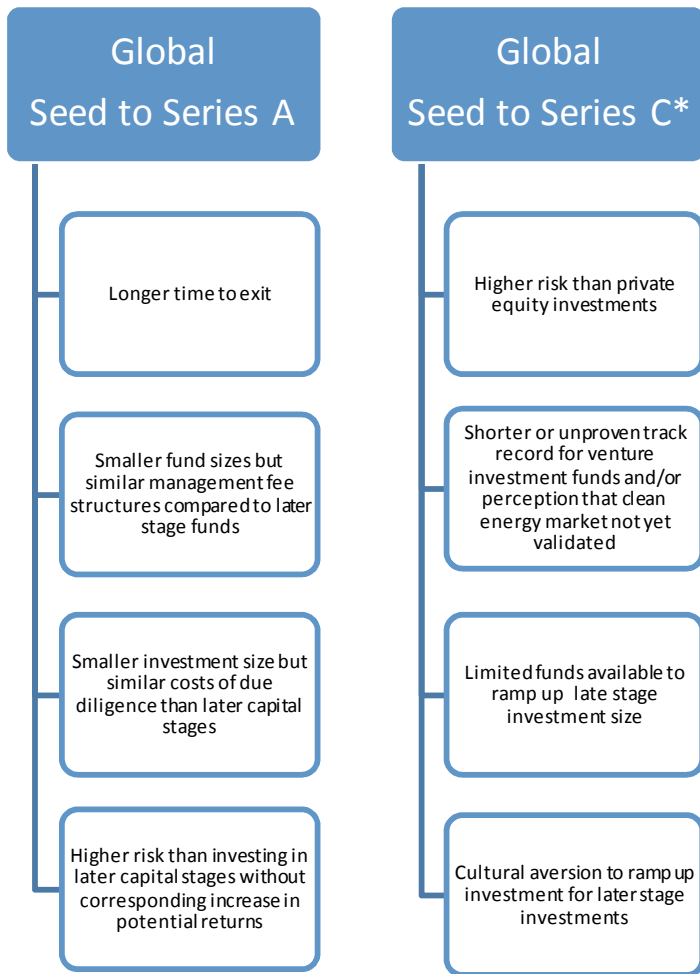
**Figure 25: Comparison of EMEA VC & PE investment 2006 & 2007: \$m**



Note: Grossed-up values based on disclosed deals. This figure compares total venture capital and private equity investment in EMEA by type of investment. The EMEA region defined as: Europe (EU and non-EU, Middle East and Africa). Labels denote total amount raised (number of disclosed deals/total number of deals recorded).

Source: New Energy Finance

**Figure 26: Summary of Drivers of Venture Capital Funding Gaps**



Note: \*The Seed – Series C Global Financing Gap does not apply to clean energy venture capital investments in the United States.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

**5. Longer Time Horizons**

Historically, exits (IPO or acquisition) occur within 5-7 years and as a result, terms are established at the creation of the fund that state the final distribution of investment and profits back to the Limited Partners will occur after 10 years, if not sooner. Investments that are expected to take a longer period of time to exit are less attractive to investors, as their capital would be locked up for a longer period of time and they would be unable to access it for other purposes.

**6. Summary of Drivers of Funding Gaps**

Figure 26 illustrates the various drivers behind the private venture capital funding gaps. Fundamentally, all of these drivers exist because private venture capitalists are expected to make as much money off of their investments as possible, within the 5-10 year period when the majority start-up companies are expected to be able to exit, either by making an Initial Public Offering (IPO) or by getting acquired. Thus, they have reasons to pursue larger deals, look for shorter time to exit, and pursue less risky deals.

**Commercialization Financing Gap**

Without question, addressing the commercialization gap is critical to the ultimate commercialization of next generation clean energy technologies. While this financing gap is important, it is beyond the application of traditional venture capital financing, which goes from the seed stage to the point prior to the commercialization stage, and thus sits beyond the scope of this venture capital focused study.

Even with the large growth in VCPE funding, a financing gap exists at the commercialization stage. Companies need substantial amounts of capital to build a first-of-its-kind commercialization plant. Today, these investments are considered too capital-intensive for a venture capitalist but the technological risk is too high for private equity investors. Historically, this type of capital investment is not a core focus for either type of investor. Thus, a “valley of death” of funds has always existed regardless of the industry. However the gap is exacerbated in the clean energy sector by the sheer size of investments needed. Commercialization facilities are critical to be able to prove that manufacturing processes can be done at scale and that the output technology is as effectively operated at commercial scale. Some highly capitalized venture investors or private equity and venture hybrid funds have been able to leverage investments in commercialization projects, but a proper financing mechanism to balance the inherent risks and the capital intensity is required to overcome this final step in the commercialization process.

## Part II: Public Venture Capital

### **Clarifying "Public Venture Capital"**

SDTC's SD Tech Fund meets our definition of "public venture capital" in every respect except it does not take an equity stake in a company (nor does it require repayment of funds).

The California Clean Energy Fund arose from the bankruptcy settlement negotiated by the California Public Utilities Commission (CPUC) and the Pacific Gas and Electric Company (PG&E). The Massachusetts Green Energy Fund was set up by the Massachusetts Renewable Energy Trust which was in turn created the Trust was established as part of the Electric Utility Industry Restructuring Act, which took effect March 1, 1998. The money for the Trust comes from a systems benefit charge paid by ratepayers of investor-owned utilities in Massachusetts.

The Reinvestment Fund's Sustainable Development Fund (SDF) was created by the Pennsylvania Public Utility commission in its final order in the PECO Energy electric utility restructuring proceeding, through the creation of Exelon and a public benefits surcharge. SDF, in turn, set aside money for the creation of the PA-AIT Fund.

While technically CalCEF, MGEF and PA-AIT were created with private money, the money was directed towards public good and as such these funds were included in this report.

### **Venture Capital: One of Many Programs**

Many of the venture capital funds are only one part of a broader range of programs. While Carbon Trust and Sitra directly make investments and the fund remains closely linked in practice and name to the organization, others such as the Massachusetts Green Energy Fund and the PA-AIT Fund were established by founding LPs (Massachusetts Renewable Energy Trust and The Reinvestment Fund's Sustainable Development Fund) who are involved in other programs and are much more arms-length from the fund.

### **Public Venture Capital**

Public finance mechanisms, as defined by the Sustainable Energy Finance Initiative (SEFI), are "publicly backed interventions, financial and non-financial, that help close financing gaps, catalyze private investment and accelerate market uptake of renewable energy and energy efficiency measures." Given the number of options such as contingent grants, soft loans, incubator programs, mezzanine and equity funding and guarantee programs, why distribute public money as venture capital?

Venture capital, whether public or private, is especially suited to supporting the development of technology and the company, taking it from the end of the R&D phase up to the commercialization phase. Incentives for private investors, however, have created market failures leading to several financing gaps: seed-Series A gap globally, venture capital altogether in Europe and the developing world, and investments with longer time horizons to profitability. Public venture capital can be effective at opening bottlenecks in deal flow, whether this is the early-stage bottleneck globally or the venture-capital bottleneck in Europe and the developing world. It can also support companies that take longer to get returns and would not attract private investment, but have a net benefit to the world.

Unlike other financing mechanisms, public venture capital not only engages the public entity and entrepreneur, but also provides reasons for private investors to notice and engage in venture capital investments:

#### **Entrepreneur**

Unlike "non-dilutive" grants or loans, the entrepreneur gives up part of their company and is held accountable by the public entity with the equity stake. The rigorous due diligence process that includes submission of a business plan and scrutiny of both management team and product also ensures the entrepreneur has the pertinent issues at the forefront of his/her mind.

### ***SDTC's Unique Public Funding Strategy***

Taking an equity stake has several advantages over traditional grants and loans, as described in the main text. By design, venture capital prompts the entrepreneur to consider its future in business terms and motivates the public entity to engage with the entrepreneur. Furthermore, depending on the situation, the venture capital mechanism can validate the market, provide due diligence for the private investor to piggyback off of, signal seriousness to the private investor, and means that less private capital is needed for the deal. In contrast, grants have the advantage of not diluting a company's equity, but such "non-dilutive equity" may not require the same degree of commitment and seriousness by the entrepreneur and public entity. To a private investor evaluating different companies, receiving a grant may be perceived as a weaker vote of confidence compared to receiving venture capital investment, simply because a venture capital investor is expected to have followed a rigorous due diligence process that includes commercial success as its primary consideration.

SDTC's funding technique is unique because it addresses the seed/early stage VC financing gap and the risk of proving a technology worthy of private investment, but does not require the dilution of a company's balance sheet. SDTC demonstrates how a carefully crafted hybrid between grant and venture capital can offer benefits of both grants and venture capital. SDTC does not take an equity stake; rather it funds a company's proof of concept and demonstration "projects." SDTC follows a rigorous in-house due diligence investment process comparable to that of a private investor (with additional screening to optimize environmental benefits). Applicants go through a 4-gate review process, and are then put before an Investment Committee with venture capital backgrounds who forward their recommendations to the Board. SDTC also uses third-party venture capital advisors (who are not putting money into the company under review). In essence, SDTC acts as a venture capitalist but uses the financial distribution mechanism of a grant.

SDTC provides capital for projects that are undertaken to prove out the performance of a technology that is at a pre-commercial and pre-revenue stage. While being an early stage company is not a requirement, SDTC has predominantly funded projects for companies that were at the seed round or series A round. SDTC's dollar transactions are larger than those typically funded by angel investors. The goal is that the successful completion of proof of concept projects will encourage private investment into the company, as SDTC has eliminated a great portion of the technical risk and has also added value in helping the company develop its operational and management capabilities. SDTC financing brings these companies to the point where they can attract regular private VC funding; the added bonus of the non-dilutive capital makes these companies doubly attractive. Additionally, by requiring every SDTC dollar to be matched, on average, by two dollars from other project partners (in cash or in kind), SDTC ensures the entrepreneur must seek out relationships with private investors and industry partners, considering the financing steps beyond SDTC's investment. These relationships are formed with corporate partners who have a stake in the success of the technology and can often provide the company additional guidance and help in the development of its technology, as well as in kind material and labor support. While SDTC estimates that \$450 million of its SD Tech Fund will be directed to venture stage opportunities (as represented in Figures 8, 29 and 31), this figure rises to almost \$1.5 billion managed by SDTC when the additional consortium partner contributions are included.

SDTC's strategy exemplifies how taking aspects of different financial mechanisms can be very effective. Read this report with an eye to what you hope to accomplish, to assess whether you ultimately decide on a non-venture-capital mechanism, a venture-capital mechanism, or some combination of the two.

## Public Entity

Owning an equity stake in the entrepreneur's company creates a vested interest in the company's success, providing the public entity a greater incentive to monitor and involve themselves in the entrepreneur's efforts.

## Private Investors

Depending on the geographic area and situation, the public investment can

- a. Validate the market (over time)
- b. Enable private investors to piggy back off due diligence conducted by public investment vehicle
- c. Allow private investors to contribute smaller amounts of capital that still allow the entrepreneur to raise sufficient capital
- d. Signal "seriousness" and understanding of venture capital to private investors

Fundamentally, public venture capital can't completely replace or substitute for private venture capital; however it can often overcome market barriers that otherwise would go unaddressed

As discussed earlier, a historical financing gap existed in the nascent stages of the clean energy industry. Investment in the entire clean energy market was low and required validation. The motivations behind the creation of venture funds by the Carbon Trust, the Massachusetts Clean Energy Fund, and CalCEF were both providing badly needed capital, but also validating the clean energy venture market by investing money that could demonstrate venture returns from investing in clean technology start-ups. While grants could have provided the necessary capital, they would not have demonstrated the returns necessary to attract private investment. Additionally, returns from venture capital investments can be returned to sustain an evergreen fund, so that a constant flow of public money is not required to perpetuate the fund's mission. Rather than being a sink to public money, venture capital can be structured so that returns recycle into the fund and ideally create a self-sustaining fund.

Public money is important to correct market failures in venture capital investments. When operating to address these market failures, public venture financing *does not duplicate* the role of private money. Between geographic areas, there are different capital stages where insufficient money enters, either because private players require market validation or because the opportunities do not warrant venture investment.

### A. How Does "Public" Differ From "Private" Venture Capital?

Should the public organization choose it to be, public venture capital can be as simple as public money invested in a private VC firm. However, unlike private venture capital firms that need to seek highest possible return in limited time periods, public venture capital can:

- Be patient and support companies that are expecting to exit in 10-15 years, a time horizon too distant for private venture capital
- Manage smaller funds capable of smaller investments that are not popular in private venture capital due to the private venture capitalist management fee compensation structure
- Undertake the due diligence and management fees associated with deals that would otherwise make early-stage deals unattractive to private players that are limited in time and resources given the pressure for maximizing their Limited Partners ROI
- Seek to maximize attributes other than return on investment, such as environmental benefits or job creation
- Provide access to networks of public officials and information on policy issues



## **Government Connection**

CalCEF's Board of Directors is very well-connected; among its members are the president of the California Public Utilities Commission, a commissioner at the California Energy Commission and the Director of the Environmental Energy Technologies Division at the Lawrence Berkeley National Lab. These connections make CalCEF unique from a standard investor, and appealing for private VC firms interested in staying up to date on policy happenings and how it might affect the companies it has invested and is considering investing in, who all must inevitably operate in a world where the markets are influenced by policy. For an entrepreneur, there is the attraction of knowing that the private fund backing them has connections to CalCEF and can provide some advice regarding where policy is headed.

The information would be publicly available anyways, and the government regulators are not going to shape policy to favour their own investments; the venture capital firms and the entrepreneurs could acquire similar information from well-informed academics or former policymakers. However, this connection provides a direct and straightforward route to current information. Still, for CalCEF it was advantageous to act as an LP in a private venture firm rather than directly investing, as it helped to minimize the perception that government regulators in a non-profit company were directly involved in making for-profit investments.

### **Permanent vs. Temporary Market Failures**

Some market failures are “fixable.” For instance, a public fund can provide capital to validate a market so as to facilitate increased participation from private investors. Similarly, public capital can fund new venture funds to encourage participation in venture capital. If successful, private investors will react through greater participation and will meet the funding gap, thus public venture capital's role in addressing these issues will be temporary, until the market failure is fixed. For example it is likely that the gap in later stage venture capital investing in Europe and similar jurisdictions will be addressed once more funds are available to increase venture participation.

Other market failures are permanent. Under current compensation structures it unlikely private venture capitalists will choose to focus on seed stage investments, investments with long time horizons to returns, or those with great environmental benefit but less commercial return. These situations will require an investor that is willing to maximize beyond economic return, and therefore will require permanent public venture capital presence.

Public venture capital organizations have the freedom to do these things which a private venture capital firm cannot, because public venture capital organizations are not pressured to seek maximum returns, nor are they required to have the money be readily available after a 5-10 year period to return to its investors. Private venture capital firms have a fiduciary responsibility to the Limited Partners, who expect decisions to be made that are in their best interest and expect time horizons of 10 years or sooner. Investments with “green” benefits that might be in the public's best interest and worthy of investment are not necessarily the investments that are the most attractive to a private venture capital firm. Public money is regularly distributed as grants not requiring repayment, or as loans, so public money does not come with similar expectations (or demands) to maximize returns. Unlike private venture capital, public funds do not attempt to pick home-runs and then ramp up investment into the entrepreneur they believe will be the winner. To spur innovation and encourage technological growth with the limited funds available, a public fund prefers to spread money across more entrepreneurs rather than concentrate their investment into a single entrepreneur.

Public venture capital's distinctions from private venture capital mean it is unaffected by most of the reasons driving the private funding gap. In **Figure 27**, the white boxes represent those drivers of private venture capital funding which do not affect public venture capital, the grey box is the driver which public venture capital has difficulty addressing due to the

**Public Fund of Funds:  
European Investment Fund**

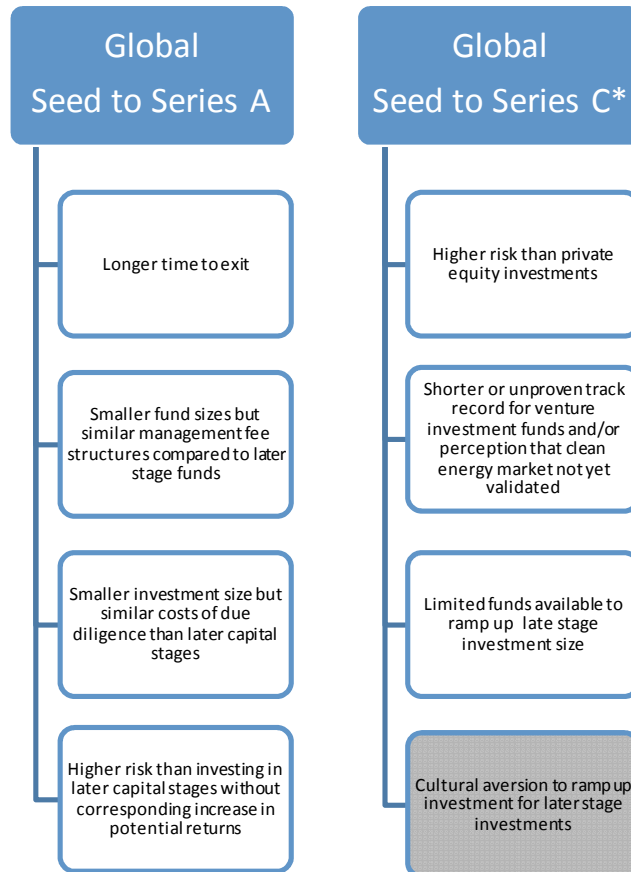
Recognizing the dearth of institutional investors funding venture funds, EIF acts as a fund of fund for various private venture firms, specifically those that operate in support of SME finance in the fields of innovation, research and development.

EIF operates multiple fund of funds, and two have a clean energy /environmental remit at present to encourage more funding into the sector. However the constraints set on the EIF investing by the European Union, specifically, no more than 10-30% per fund per investment, could explain why some early stage European funds cannot structurally invest enough in the sector. When limited in investment size, it is much harder for funds with public funds to ramp up investments.

need to focus on spreading investment and not concentrating/"doubling down". Public venture capital can invest in smaller deals even if due diligence fees mean it "makes more financial sense" to pursue larger deals. It can accept riskier deals and those with longer time to exit because in the end, it is public money that is meant to provide public benefit and does not need to maximize returns over a 5-10 year period. One limitation to public venture capital is its inability to address the cultural aversion in Europe to ramping up for later-stage investments, due to its focus on encouraging innovation rather than on picking the home-run investments.

Apart from filling the funding gaps, public money can also add value to venture financing through its connections to the government and public bodies. As the clean energy industry is highly dependent on regulation, venture capitalists are increasingly aware of the importance of public policy. There is a need to understand policy changes and new legislation, as well as the potential access to non-dilutive capital in the form of grants. A public venture organization offers the opportunity to provide "policy diligence" to its investees and/or private venture capital partners.

**Figure 27: Drivers of Venture Capital Funding Gaps Public Venture Capital is Capable of Addressing**

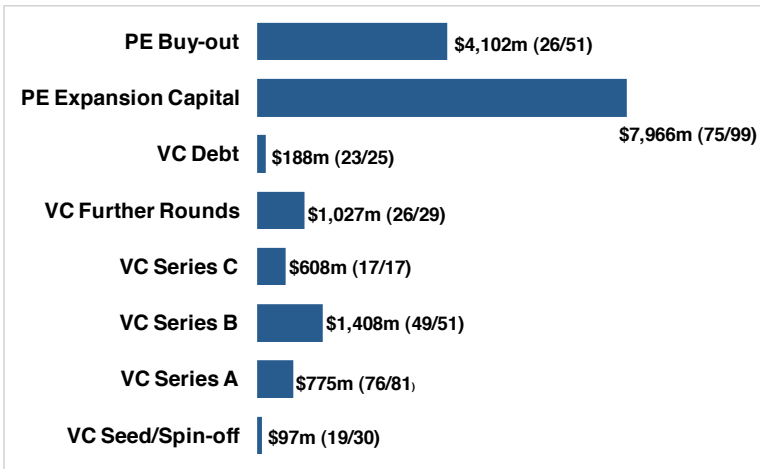


Note: Non-shaded boxes can be addressed via public venture capital. Shaded is difficult or not possible for public venture capital to address directly. \*The Seed – Series C Global Financing Gap does not apply to clean energy venture capital investments in the United States.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

**B. Existing Public Venture Capital Organizations**

**Figure 28: Global Year To Date VC & PE Clean Energy Investment By Type Q4 2007 - Q3 2008: \$m**



Grossed-up values based on disclosed deals. This figure compares total global venture capital and private equity investment by type of investment. Labels denote total amount raised (number of disclosed deals/total number of deals recorded).

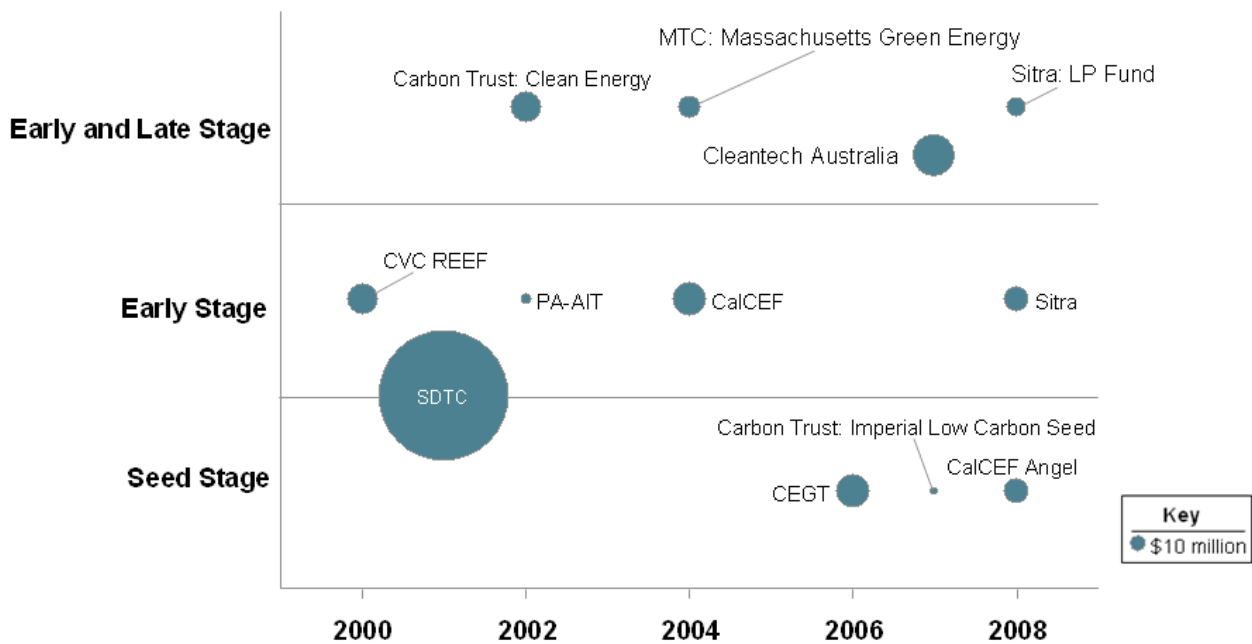
Source: *New Energy Finance*

Public venture capital organizations are still few in number, but new organizations have entered the space on an almost yearly basis. 6 of the 9 (12 funds) existing organizations started in the last two years (2007-2008), with an increasing focus on seed funds and very large funds. The fund sizes suggest an increased interest in addressing the seed - Series A financing gap, and larger players entering to address clean energy venture capital investments.

Currently public venture capital funds can be divided into three investment stage focuses: seed, early stage, and early & late stage (see Figure 29). It is important to note the chronology of fund inception, as this is telling with regard to fund focus. As discussed earlier, in the early part of the decade every stage of venture capital investing represented a funding gap. However, today, it is interesting to note that the gap is biggest at the seed stage (see Figure 28). Not surprisingly, recently launched public funds are

targeting seed and earlier stage investment, especially the new funds of veteran public venture investors (Carbon Trust, CalCEF, Sitra). Having achieved the initial goal of “validating the market,” these veteran managers are moving to invest in the frontiers of the financing gap.

**Figure 29: Map of Public Clean Energy Venture Capital Funds by Target Investment Stage, 2000 – 2008**



Note: Date represents Funds inception, size of bubbles represents relative investment fund size. Refer to key for scale of fund size.

Source: *SEF Alliance Public Venture Capital Study, New Energy Finance*

### C. (Existing) Objectives and Success Metrics

Within clean energy, public venture capital as a financing tool is still in its infancy. While some veteran funds of four to eight years exist, most funds are still being raised, have just closed, or have only recently invested in portfolio companies (see Figure 9). This reality makes it difficult to collect individual funds' success metrics, as many are not at a point where they can truly evaluate their progress. Public venture funds were asked to define their primary objective (the defining purpose of its creation) and their success metric. Most funds' objectives were driven by a perceived financing gap or market shortcoming. Once defined, the objective was addressed in the choice of fund structure, target investment stage, and average investment size. While each fund is targeting a unique financing gap and has its own differentiated structure, every public venture capital fund interviewed to date mentioned return on investment as the primary success metric. That is, once an investment qualifies as a clean energy investment and is within the funds' targeted investment stage, the differentiating factor between qualified opportunities is the ultimate potential return on investment.

#### ***Funds in Formation***

At the time of publication of this report, two new clean energy public venture capital funds are poised to enter the clean energy market in the next year or two.

##### **Eastern European Energy Efficiency and Renewable Energy Investment Fund**

The Eastern European Energy Efficiency Fund (EEEF) is a part of the Financing Energy Efficiency Investments for Climate Change Mitigation Project of the United Nations Economic Commission for Europe (UNECE). The purpose of the project is to facilitate the market formation and future investment in energy efficiency and renewable energy projects in Eastern and South-Eastern Europe and Central Asia. The fund will attempt to overcome a funding gap, market barriers, and a fundamental lack of awareness on the part of public entities and private investors that have prevented the funding of energy efficiency and renewable energy projects with potentially high internal rates of return (IRR). The purpose of the fund is to make equity and mezzanine investments in profitable and competitive energy efficiency and renewable energy projects companies developing, manufacturing, distributing or installing energy efficiency and renewable energy equipment or services.

The fund is targeting capital commitments of approximately EUR 250m with an initial close of 100m Euros at the last quarter of 2009. The fund is to be capitalized through 70% private investment and 30% public investment. Public funding will be raised through international financing institutions, western governments, and governments from the respective geographic focus. The fund is still finalizing its structure and plans to begin investing in the last quarter of 2009.

The UNECE intends to hire a private company with a proven track record in the energy efficiency sector as the fund manager. While the majority of investments will be focused on large projects with proven clean energy technologies, a part of the fund may be dedicated to providing capital to renewable energy and energy efficiency Energy Service Companies (ESCOs) and other similar Special Purpose Vehicles (SPVs). The UNECE also operates the EUR 354m European Clean Energy Fund which provides capital for clean energy projects that reduce greenhouse gas emissions in Central, Eastern and Western Europe and has been in operation since last year.

### ***Bridging the Emerging Market Financing Gap (GEEREF)***

While this study has focused on the financing gaps within developed countries, similar financing gaps exist within developing countries. In fact, the financing gaps are more severe and difficult because venture capital & private equity instruments are less commonly used. Recently, funds focused on the emerging markets have begun to surface, but often these new funds have a hard time raising capital from private investors, especially investors within the respective developing or transitioning economy. In other circumstances, large investors may be interested in gaining exposure to emerging markets through high risk capital investments, but are not able to find the fund managers with appropriate track records and experience in clean energy.

Familiar with venture financing gaps in clean energy, the European Commission sought to facilitate investment in renewable energy projects and companies in developing and transition economies. Together with the governments of Norway and Germany and the European Investment Fund, the European Commission designed the Global Energy Efficiency and Renewable Energy Fund (GEEREF). The GEEREF is a public-private partnership that will operate as a global fund-of-funds, investing into private venture and private equity structures focused on making investments in energy efficiency and renewable energy projects and businesses, from early stage venture capital through later stage private equity and project finance. The GEEREF is focused on supporting regional funds sub-Saharan Africa, including the Caribbean and Pacific Island States, Latin America, Asia, North Africa and other EU neighbouring countries. The fund has a target size of EUR 150-200 million with already a substantial portion secured and will begin funding operations by the close of 2008.

GEEREF also seeks to develop the infrastructure and validate the market for private sector engagement. By limiting participation to 5-20 million Euro or 10-30% level, exceptionally up to 50% within each target fund, the GEEREF can best maximise the leverage of funds invested. GEEREF also qualifies as Official Development Aid (ODA) under the rules of the OECD, which should enhance its attractiveness to the public sector. Furthermore, GEEREF is expressly authorised to co-invest with other structures or International Financial Institutions. For example a venture fund in Asia, might in addition to GEEREF also receive financing from the Asian Development Bank, sovereign funds, other public investors and philanthropies. The concept of GEEREF foresees a reasonably attractive return for private investors, partially at the cost of public investors (asymmetric funding); this provides an innovative feature by which a public mission can be leveraged by private finance. The fund will be managed on market terms by a management team established by the European Investment Bank and its affiliate, the European Investment Fund, thus combining the European Community's specialised finance institutions' in-depth experience in venture capital and private equity structures on one side and energy and development financing on the other side.

GEEREF's goals have five areas of focus: Energy, Sustainable Development, Distribution, Environment, and Financial Return and specific success metrics will be gauged by ability to:

- Increase access to sustainable energy services.
- Generate financial leverage from public/private investors
- Increase access to capital for projects and companies
- Stimulate the creation and expansion of regional funds
- Contribute to the world-wide reduction of green house gas emissions

#### **D. Environmental Metrics**

By the nature of focusing investments on the clean energy sector, the majority if not all of the investments made by clean energy public venture capital funds encompass environmental benefits. While all clean energy venture capital funds seek to maximize environmental benefits and profitability, it is rare that these environmental benefits are quantified in the same way as potential monetary benefits. That is, once a company passes the initial clean energy or energy efficiency screening, most public venture capital funds base their due diligence and investments decisions on commercial metrics. It is important to note that this does not mean that environmental benefits are unimportant, just that the environmental benefits are not quantified or used to choose between two comparable companies. At the end of the day, profitability comes first; an example of this is the Massachusetts Green Energy Fund. Carbon Trust, too, does not quantify environmental benefits beforehand but instead hires a third-party to quantify emissions saved annually through investments. In fact, the Carbon Trust quantifies the emissions saved across all of its operations and works with the public and private sector in quantifying and reducing their respective carbon footprints.

There are reasons for funds to use an environmental screen and to not quantify environmental benefits in their decision-making process, as the latter can complicate the process and even possibly hinder objectives of validating the market. Screening first for environmental benefits, and then focusing on maximizing return on investments, allows funds to fill financing gaps without worrying about how to approach and execute the additional steps of quantifying environmental benefits and weighting the results. Furthermore, for funds such as CalCEF and Carbon Trust whose primary objective is to validate the marketplace, showing that attractive ROIs can be achieved in the clean energy sector to attract private venture capitalists, it is in their best interest to maximize ROIs and fully validate the market. For funds seeking co-investors or who hope their investments will receive follow-on funding from private investors in the future, it is also important to evaluate companies on a commercial basis, as any private investor would do. The ultimate success of the company will require profitability measures to be met and thus public venture firms can't ignore this fundamental driver in its investment criteria.

As noted earlier in "How Does 'Public' Differ From 'Private' Venture Capital?" public, and not private, venture capital can maximize attributes other than return on investment. While thus far the majority of public venture capital funds have not made the choice to trade-off a lower return on investment in return for greater environmental gains, perhaps once the initial funding gaps have been met, future clean energy venture funds can be established that can make that trade-off. These funds could be focused on solely advancing clean energy technologies and would be able to accept lower than venture returns for increased environmental benefit, thus allowing investments to be made that private venture capitalists would otherwise pass over due to lower ROIs.

## ***How Can Environmental Benefits Be Quantified and Considered?***

Public VCs seek to maximize environmental benefit and profitability. As discussed in the main text, the majority of VCs do not have an environmental due diligence process in place to quantify the environmental benefits of their potential investments.

### **The Carbon Trust**

The Carbon Trust performs an annual organization wide evaluation of its programs and receives third party verification with respect to its emissions reductions. Given its mission statement, the Carbon Trust seeks to fund technologies that would lower carbon emissions. Before pursuing a company more seriously, a sanity check with respect to environmental benefits is conducted. Specifically, the investment professionals consider the individual carbon reducing capacity of the product; next it considers the size of the potential market, and finally the products potential penetration of the market. For example, a technology that may reduce emissions by 50% but only have niche applications is not as attractive as a technology that may have half of the savings but have a large market potential. Once the base environmental screen is passed, the investment professionals focus on commercial metrics of return before ultimately deciding to make an investment. Emissions reductions are not subsumed in the calculation on return on investment because of both the uncertainty of total emissions reduction and the difficulty in monetizing the value of the reductions. To use emissions reductions as critical investment criteria would require knowledge of carbon prices and the products' aggregate emissions reduction potential over 10-20 years in the future, the point at which the product would reach full market penetration. Attempting to do this analysis based on a 3-5 year business plan is both an extremely lengthy and difficult processes. In this respect, the commercial assumptions of market size and the potential uptake of the product becoming the leading driver of the analysis and since they are part of commercial due diligence, the Carbon Trust considers its environmental check to be sufficient in filtering potential investments. Finally, the Carbon Trust believes that a product that offers significant emissions reductions, will inherently offer commercial benefits such as improved efficiency benefits, which will likely be acknowledged by the market. Thus, commercial and environmental benefits are intertwined.

### **Sustainable Development Technology Canada**

In order to maximize profitability and environmental benefit, Sustainable Development Technology Canada (SDTC) also does an extensive environmental due diligence process to quantify the environmental benefits offered by a potential investment project. SDTC's screening is stage gated such that it becomes more rigorous and thorough as the potential project progresses from initial selection through funding recommendations, approval, contracting and ultimately delivery and post-project completion reporting. The commercial and environmental due diligence is conducted by SDTC staff and is complemented by external experts with respect to technology, business, and environmental validation. The potential company receiving project funding must quantify its environmental benefits not just for its greenhouse gas emissions, but also particulate matter, clean air, clean water, etc. where relevant. To best compare potential projects and ensure that a company's assessment is based on a rigorous, transparent, and acceptable analysis a process called a SMART report which incorporates ISO 14064 standards for quantifying green house gas reductions is used. If a company does not have the internal expertise to perform the analysis, SDTC helps the company become connected with third party verifiers that can help standardize their calculation. In the eyes of SDTC, long-term sustainability of environmental benefits are critical to its investment strategy. SDTC considers potential environmental benefits on equal footing to the potential economic returns calculated in its commercial analysis. Like the Carbon Trust, SDTC also considers the per unit improvement and the potential market roll-out to project aggregate environmental benefit. SDTC agrees that environmental benefits are often complementary to commercial benefits and does takes great care with its commercial due diligence finding a balance between profitability and environmental benefits.

# Part III: How to Approach Public Venture Capital

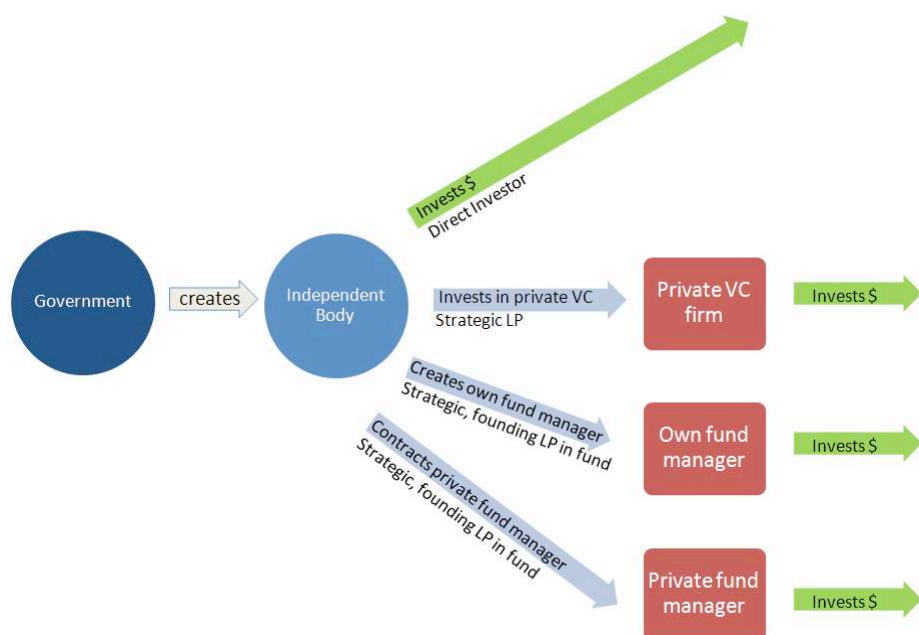
## A. Overview

It is important to note that it is often difficult to begin a public venture capital program, as venture capital is perceived by public officials to be “more risky” than that of “non-dilutive” grants, since their success will now not only be judged by the total of funds disbursed alone, but also whether or not returns were realized. If however, a public body interested in public venture capital investment decides to use this financing mechanism; it can approach it in a variety of ways, depending on its objectives and its particular situation (see Figure 30). Regardless of its approach to investing (which often has yet to be decided), the government must create an independent body after money has been set aside for investments. During the creation of the independent body, the public body can make stipulations with regard to how the money is invested, such as requiring it to provide benefit to a designated geographic region or that the fund benefits entrepreneurs at a certain stage (e.g. early-stage).

### Creation of the independent body is important for several reasons:

- Experience – it is highly unlikely that public employees will have the expertise and ability to select and mentor entrepreneurs compared to more veteran investors with years of relevant experience / private sector exposure

Figure 30: Fund Investment Roadmap





Once created, the independent body can then take any directives from the public body, whether they are more general statements such as “help the clean energy sector where necessary” or “make early-stage investments that benefit this location,” and decide what the target investment will be. If the public body has been very specific, then the target investment is already, for the most part, decided but in other cases the independent body will need to decide what type of investment they want to make.

Fund structures can fall into four categories, though some outliers have established more creative and/or complicated structures that also have great potential. In the following section we will outline these four basic structures. Afterwards, the sections will look at when each structure might be appropriate, points at which to consider engaging the private sector, and a decision framework.

**B. Fund Structures**

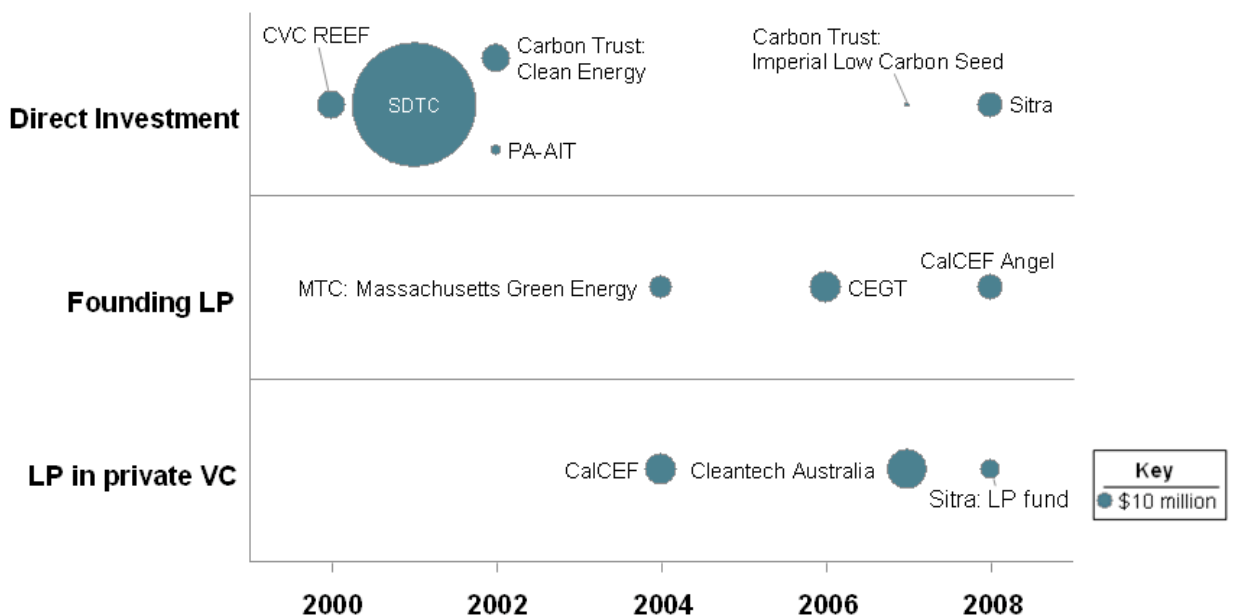
A public entity considering venture capital can directly invest in companies. Alternatively, it can be a Limited Partner in a “middleman” organization to deploy capital at arms-length, through either a private venture capital firm, its own fund manager that it created, or a private fund manager it has contracted (see Figure 31).

A Limited Partner (LP) is the term that refers to an investor in a venture capital fund. Traditionally, Limited Partners are not very involved in investment decision-making and trust (or are forced to accept that) investment decisions to be made for maximum returns. Asserting greater involvement as an LP can be achieved through providing the necessary initial money in fundraising for a fund and thus being a founding LP, and/or providing the majority of the money fundraised for a fund. However, this “active” level of LP involvement is often rare in the private sector and would require the relationship to be contractually stated.

In the following section, we will describe the four basic fund structures (see Figure 30):

1. Direct investment
2. Limited Partner in private venture capital firm
3. Founding Limited Partner; the fund manager is an investment firm you created
4. Founding Limited Partner; the fund manager is a private venture capital firm

**Figure 31: Map of Public Clean Energy Venture Capital Funds by Fund Structure, 2000 - 2008**



Note: Date represents Funds inception, size of bubbles represents relative investment fund size. Refer to key for scale of fund size.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

### **1. Direct Investment**

The simplest structure is having the independent body directly invest in the entrepreneur or company. This structure can be especially suitable when venture capital is part of a host of other programs, when the independent body has a limited target investment focus, and/or when there exists (or can be acquired) in-house venture capital investment expertise.

Two examples of this direct investment fund structure are Carbon Trust, which was set up as an independent company by the UK government, and Sitra which was established 40 years ago with money from the Finnish government. Both Carbon Trust and Sitra had the in-house expertise to make venture capital investments, and provide many other support programs for an entrepreneur, therefore making direct investments allowed them to simplify coordination between programs.

### **2. Limited Partner in Private Venture Capital Firm**

The independent body can act as a Limited Partner in a private venture capital firm. In this situation, the public money essentially acts as another source of capital for the private fund but the independent body has less influence over how they want this money to be invested, making it of the utmost importance that they carefully select the private venture capital firm.

CalCEF acts as a strategic limited partner in three clean energy private venture capital firms: Vantage Point Venture Partners, Draper Fisher Jurvetson, and Nth Power. Sitra recently became a strategic limited partner in the Capricorn Cleantech Fund and is pursuing investment in other clean energy private venture capital firms. CalCEF met its objective of investing money into the clean energy market and validating the sector through its investments, while Sitra seeks to develop relationships with private venture capital firms in order to create cross-border syndication, follow-on investment and M&A possibilities for Sitra's early-stage.

### **3. Founding LP; the Fund Manager is an Investment Firm that it Created**

The independent body can act as the founding Limited Partner in its fund; in other words, they provide the initial capital used to create the fund. Once this capital is set aside, they can create an investment firm to act as their fund manager. An investment firm consists of one or more fund managers and support staff. Together, they would establish the terms and guidelines of the new fund, thus allowing for stipulations that might be unpopular with a private venture capital firm. If desired, the investment firm can then work to raise additional capital from private investors willing to agree to the terms of this new fund.

CalCEF was the founding LP in the CalCEF Angel Fund and remains a leading strategic limited partner, through its contribution of capital as well as the CalCEF brand. CalCEF Angel Fund's general partner calls the fund a "hybrid" between a direct angel model and a venture firm<sup>6</sup>. Private LPs were made aware from the beginning, as term-takers, that the fund would be focused specifically on seed/angel stage investments to help fill the financing gap in early-stage seed investing. CalCEF has a permanent seat on the Angel Fund's investment committee and one additional seat for the first two years of the Fund's investment cycle. Cleantech Ventures' CEGT (Centre for Energy and Greenhouse Technologies) Fund, on the other hand, is a fund that consists entirely of CEGT money.

<sup>6</sup> Because the Angel Fund is a for profit limited partnership, CalCEF's participation could also be classified as "a founding partner in private venture capital firm."

### ***PA-AIT's Fund Structure***

The Reinvestment Fund is a community development financial institution that has been around since 1985, works in the mid-Atlantic states and is financed by social investment dollars. Its Sustainable Development Fund was formed from a public benefits surcharge in PECO service area capped at \$13.5 million, and \$20 million from the merger of PECO and Unicom to create Exelon. Stakeholders behind the public benefits surcharge wanted some of the money to go towards early-stage financing in the renewable energy area. However, The Reinvestment Fund's core competency lies in providing loans and financing to projects and companies. After setting up equity committees, they found they lacked the deal flow and expertise to make investments. Their criteria was narrow - clean energy companies that provided benefit to the five counties in southern Pennsylvania where the PECO service territory was - and the staff lacked experience with venture capital investments. TRF worked with affordable housing options, non-profit, real estate and other areas, but not entrepreneurs.

The Reinvestment Fund looked to work with a partner who saw more transactions, and established a fund with Blue Hills Partner acting as fund manager. TRF put in \$2 million, and Blue Hills Partner put in the other \$0.2 million; Blue Hills Partner also provided technical services such as marketing, business development work, legal support, space for entrepreneurs, etc. Blue Hills Partner can also invest money from the other funds it manages and form a syndicate. The Reinvestment Fund brings a strong relationship to publicly motivated dollars and makes introductions to lenders of public money.

#### **4. Founding LP; the Fund Manager is a Private Venture Capital Firm**

Like the situation above, the independent body acts as the founding Limited Partner in its fund. However, instead of creating its own investment firm it may decide instead to hire a private VC firm to act as the fund manager for this new fund. Again, the two would establish the terms and guidelines of the new fund, including any specific stipulations. As a founding Limited Partner, it is likely that more control can be exerted with respect to the funds' direction. This strategy has the advantage of using an already-established investment firm, but can also mean that this is one of several funds which the investment firm is managing.

The Massachusetts Green Energy Fund acted as the founding LP of their fund, contributing \$15 million of what would eventually be a \$16 million fund. After a competitive process, they hired William Osburn of Common Capital to act as their fund manager. The fund was set to maximize return on investments but required that investments benefit the Commonwealth of Massachusetts (most easily accomplished by locating the business in Massachusetts). They then raised an additional \$1 million from private investors for the fund.

The Reinvestment Fund's Sustainable Development Fund (SDF) acted as the founding LP in the PA-AIT Fund, contributing \$2 million of what would be a \$2.2 million fund. SDF hired Blue Hills Partners to act as the fund manager, and after setting the terms requiring investments to benefit southeast Pennsylvania, raised an additional \$0.2 million of capital from private investors for the fund.

The Cleantech Australia Fund was established by a \$30 million contribution from VicSuper, one of Australia's largest superannuation funds, which was then matched by \$20 million from the federal Australian government's Innovation Investment Fund. Cleantech Ventures was hired to act as the fund manager for this \$50 million fund, with the requirement that investments had to benefit Australia.

#### **C. Objectives and Their Suggested Structure(s)**

Certain objectives can be reached more naturally through certain fund structures. It is therefore important to identify the private venture firm's objectives and see if it naturally suggests

establishing one fund structure or another. These are not hard and fast connections, and the sections following will show how additional considerations can further shape the decision of which fund structure to choose. Objectives could include:

**Validating the Market:** Validating the market requires putting money into clean energy investments to show that returns can be made from such investments. The critical component is the investment, and any structure can accomplish this. However, there may be a slight advantage in being an LP in a private venture capital firm as it means that private, not public investors will be realizing the returns.

**Return on Investment:** Any structure can be utilised to maximize return on investment. While a private VC firm will always do this, it is also possible to make return on investments a priority for the independent body.

**Environmental Returns:** If the investment body considers that private venture capital firms are passing over environmental deals with lower returns on investment thereby creating a funding gap, then it is possible to address this in the decision-making process. While it is highly unlikely that a private venture capital firm would accept this stipulation, this could be accomplished by directly investing in companies or by establishing a fund with a fund manager and setting it as one of the terms of the fund.

**Addressing Financing Gaps:** Directly investing or acting as a founding Limited Partner are the simplest ways to focus investments on a specific capital stage. It is possible to selectively pick private venture capital firms that focus on early-stage deals; however, there will still be entrepreneurs that are considered too early for a private investor.

**Job Creation and IP Protection Within Defined Geography:** If the investment body wants to ensure that intellectual property and new ventures developed within its borders remain local, then it is incentivized to limit its investment focus by a defined geography. Essentially, it wants to make it attractive for entrepreneurs to stay and develop their IP and firm locally rather than seek investment overseas or in neighbouring regions.

Similarly if the investment body wants to attract entrepreneurs so as to bring jobs to their state/country from surrounding areas it is also incentivized to limit its investment focus by a defined geography. Direct investing or acting as a founding Limited Partner are the most likely ways of being able to limit investments by geography. Private venture capital firms have no incentive to accept this restriction on deal flow as they are happy to seek the best opportunities regardless of borders. It is also important to be aware that the more filters a potential investment must pass, the more limited the deal flow will be.

Figure 32: Summary of Objectives with Suggested Structure

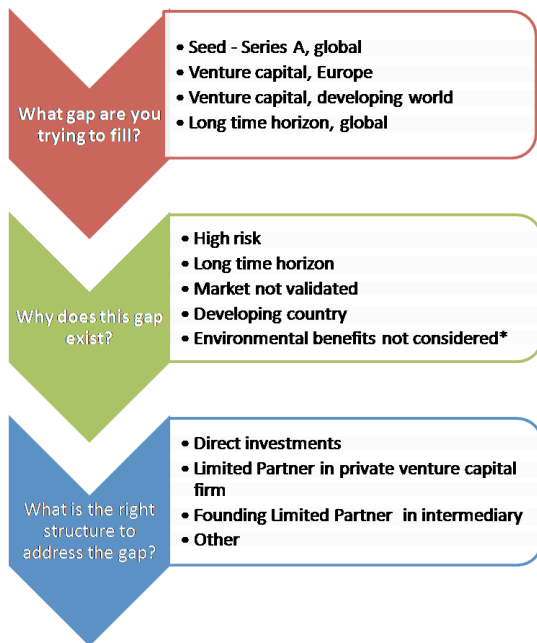
	Direct Investment	LP in private VC firm	Founding LP Intermediary Fund Manager
Validate market		X	
Return on investment	X	X	X
Environmental returns	X		X
Addressing capital-stage financing gaps	X		X
Geographic limitations	X		X

Note: X = relevant fit

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

#### D. Decision Framework

**Figure 33: Decision Framework for Selecting Fund Structure**



Source: SEF Alliance Public Venture Capital Study, New Energy Finance

The following decision framework can help guide public entities interested in dispersing public money as venture capital (see Figure 33).

**What Gap Are You Trying to Fill?**

First and foremost, you must know what gap you are trying to fill (see Part I for more details). For instance, are you primarily concerned with the lack of seed and early-stage investments happening world-wide, as this will be a potential bottleneck that limits later-stage deals for both private and public venture capital players? Are you worried about the difference in the degree of venture capital investing in the United States as compared to Europe or developing countries?

**Why Does This Gap Exist?**

Once you have identified the type of funding gap, then you must consider underlying reasons driving its existence. Part I discussed this in more depth, but such reasons can include cultural discomfort in investing in a pre-revenue company, early-stage companies being higher risk, the market not yet being validated in the eyes of private investors, etc.

**What is the Right Structure to Address the Gap?**

Finally, you need to identify the structure most appropriate to addressing the gap. Depending on the gap and other considerations described in the previous section, you may find it more suitable to make direct investments, become a Limited Partner in a private venture capital firm, or a founding Limited Partner in a fund where the fund manager is an investment firm that either you hired or created.

### ***Walking Through the Decision Framework***

At the time of its formation in 2004, investment into the clean energy market as a whole was low. CalCEF sought to address this overall funding gap, which it identified to exist because the market had not been validated. Without proof of companies on track to succeed, private investors were reluctant to commit investments to clean energy entrepreneurs. Once CalCEF had decided the gap it was trying to fill and why it existed, it had to target the right structure to address the gap. In this situation, any of the four basic fund structures would have been appropriate, as they all would have put more money into play to back entrepreneurs that could grow and be successful. Looking to other considerations, it lacked in-house venture capital expertise, there was potential question of conflict of interest due to its very well-connected Board of Directors, and it did not intend to house other support programs for entrepreneurs. In this situation, the simplest and most direct way to meet its objectives was to act as a strategic LP in private venture capital firms.

By 2008, however, overall investment into the clean energy market had increased due to increased investment in later-stage deals but early-stage and especially seed stage investment had not seen similar increases and remained very low. Under the CalCEF model, as an LP in a private venture capital firm, CalCEF was unable to attach stipulations to its money and direct that it be invested in earlier-stage deals. (In any case, the capital had either been invested or earmarked for investments). This early-stage/seed funding gap existed because these earlier-stage deals were smaller, yet required equal due diligence as larger deals. Furthermore, they were riskier yet did not yield greater returns to compensate for it, and an investor had to be willing to wait longer for the company to have an exit because it was at an earlier point in its development. Given these factors, it was unlikely that a private VC firm would make investments targeting this area. CalCEF still had disincentives to make direct investments as it did in 2004, and therefore became the founding LP in the CalCEF Angel Fund. This fund was established as a hybrid between angel investing and an early-stage fund, with active involvement from LPs and the requirement that investments would be targeting the seed/early-stage. In this case, CalCEF chose to work with Susan Preston and after the contract was written, have her act as a fund manager independent of CalCEF. Alternatively, CalCEF could have also chosen to take bids for an investment firm to act as fund manager for the CalCEF Angel Fund.

## E. Other Considerations

After considering which structures are suggested by particular objectives, there are other factors to consider when deciding on a fund structure.

### **Notable Considerations**

**Is your fund large enough?** The Australian Victorian government originally created the Centre for Energy and Greenhouse Technologies to act as its independent body that would directly invest in venture capital investments. The \$30 million fund, however, was insufficient for CEGT to remain self-sufficient. Management fees per year are generally 1-2% of the assets under management for that year, and thus the fund must be a sufficient size for the management fees to cover the salaries and overhead costs of the investment firm. With permission from the Victorian government, the management staff of CEGT spun out as Cleantech Ventures so that they could manage additional funds and have sufficient management fees for self-sufficiency. This self-sufficiency has been reached with the Cleantech Australia Fund, a \$50 million fund.

**Have you given yourself enough time?** Prior to their Energy Programme, SITRA ran a 3- year Environmental Programme, but found that most of the first year was taken up by planning for investments and sourcing deal flow, and the last year absorbed with closing out the program. For this reason, their current Energy Programme will span 5 years, 2008-2012. It is important to realize the time it takes, not only to set up a program, but then to properly identify investments and execute.

### **1. Do We Have Necessary In-house Investment Expertise?**

Venture capital has been likened to a specialized art that requires private sector investors who have the experience and training. This is not to say that bureaucrats or public workers cannot also make successful fund managers; however, existing public venture capital organizations that chose to invest through a private intermediary expressed the opinion that private players would be more likely to achieve higher return on investments (ROIs). Carbon Trust, on the other hand, was the market leader in knowing about clean energy and venture capitals, bringing deals to private investors rather than the other way around. In such situations, employing a middleman would make less sense.

### **2. Are There Actual or Perceived Conflicts of Interest?**

Organizations set up to make investments through private middlemen are better able to have people who are drivers of public policy sit on their Board and Management Team who can provide insight into public policy changes. Having public policy driving players in the same organization as the investment team can lead to potential, or at the very least, perceived, conflicts of interest that could complicate directives for both the policy-makers and the investment decision-makers. The LP model allows investors to be relatively detached from a politically driven system and focus on investments for the fund. If public know-how is of especial interest, a direct-investment fund should then look to academics or advisors removed from policy-making to acquire this insight.

**Figure 34: Summary of Other Considerations When Deciding Fund Structure**

	Direct Investment	LP in private VC firm	Founding LP Intermediary Fund Manager
Do you have in-house VC investment expertise (or can you acquire it?)	X		
Are there any actual/perceived conflicts of interest?		X	X

Note: X = relevant fit

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

### ***Three Structures Meeting the Same Objective***

Until 2005, and to some extent, even 2006, investment into the clean energy sector was low, at all stages. At the time, it was unclear whether investments in clean energy would provide returns that were equivalent to investments in other sectors. Without evidence of company successes, private investors were reluctant to make clean energy investments at any stage. Furthermore, the less there was of funding, the fewer companies were around to invest in at later stages. Although an investment would require, on average, 5-7 years to exit, there were still proxies to measure "good" investments such as companies receiving follow-on funding from private investors at higher valuations.

Carbon Trust, CalCEF and the Massachusetts Green Energy Fund were created in 2002, 2004 and 2004 respectively, during the period when clean energy investment was low. All three funds shared the objective (among others individual to each) of validating the market. This validation required achieving favorable results from clean energy investments, but these investments could be made at any stage and through any type of fund structure. Thus, while all three funds were focused on increasing investment, Carbon Trust decided to make direct investments, CalCEF decided to act as a strategic LP in three private venture capital firms, and Massachusetts Green Energy Fund decided to contract with a private fund manager to manage its investments.

Carbon Trust was established in 2001, a year before its Investment arm was formed, so they already possessed in-house knowledge and understanding of clean energy and the market. In fact, the European private sector already had some reliance on Carbon Trust for its knowledge of the clean technology sector. Given this reliance, it made little sense for Carbon Trust to then pay management fees while still being the major player in doing the actual due diligence and sourcing of deals. Carbon Trust therefore acquired in-house venture capital expertise and chose to make direct investments through its own entity.

CalCEF's primary motivation also was to put money into play, but the organization was starting from scratch with funds earmarked for helping the clean energy sector and a staff charged with deciding how to best allocate these funds and structure spending. While it would have been possible to hire the necessary venture capital expertise and bring it in-house, this would have been an additional step requiring time and money, when their goal was simply to increase money going into clean energy investments. There were already several established private venture capital firms, many in California, which focused on clean energy that were well-equipped to carry out rigorous due diligence and select good investments. In fact, by investing through private VC firms, one might argue that successes would be even more compelling to a private investor, as they would see one of their fellow private investors be the one to see the returns.

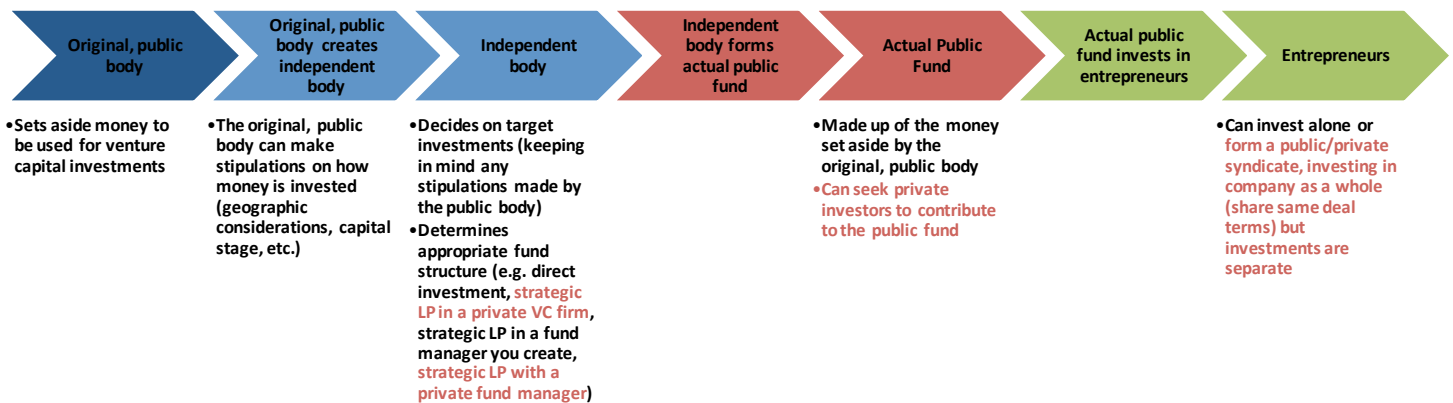
Massachusetts Green Energy Fund had additional objectives to that of validating the market. In 2004, the early-stage financing gap was even more severe than it is today. Without public intervention, this gap will continue to exist due to market failure; however, at least today there are a few private early-stage venture capital firms who choose to go big with a few Series A investments. MGEF needed to provide benefit to the state of Massachusetts, a geographic mandate handed down by the Massachusetts Renewable Energy Trust; they also sought to be a source of early-stage funding. Like CalCEF, they were also starting from scratch and could choose to either build in-house investment expertise or work with an existing private player. The geographic and capital stage stipulation meant they would have to establish their own fund, however, as a private venture capital firm had no reason to be willing to restrict deal flow to their fund. As it turned out, MGEF sought private investors to contribute to the fund, but only raised \$1 million from other investors and contributed the other \$15 million. In this situation, having their own fund manager in a fund where they were the founding LP allowed them to have private investing input and meet their specific objectives.



## F. Engaging the Private Sector

The majority of public venture capital organizations have established relationships with private venture capital firms, whether by requiring investments to be made with private co-investors or by directly engaging with private firms. Public venture capital investors can benefit in many ways from forming relationships with private investors. Private investors can offer expertise/experience in assessing venture capital details. They can also provide deal flow, networks of investors and entrepreneurs, and additional capital. When developing private-partner relationships, however, it is important to ensure that the short and long-term (or at least, for the duration the relationship is expected to last) interests of both sides are aligned.

Figure 35: Summary of Points at Which to Engage with Private Sector



Note: Red text highlights points of engagement between the public and private sector.

Source: SEF Alliance Public Venture Capital Study, New Energy Finance

As illustrated by **Figure 35**, there are several points along the way, from the creation of the fund to the point of investing in the entrepreneur, during which a public investor can engage the private sector. The most common points, highlighted in red text, are at the point of creating the fund, fundraising for additional capital for a created fund, and during the investing in an entrepreneur.

**1. Strategic LP in a private venture capital firm:** As a strategic LP in a private VC firm, the public independent body will reap all the benefits of having private investor involvement, from expertise/experience to networks to additional capital. However, it is important to find a way to align the interests of the LP with that of the private VC firm who ultimately is the most concerned with maximizing returns on investments. Examples of this include CalCEF and Sitra. Sitra specifically looked to become a strategic LP in private European venture capital firms to build relationships and build their network to private investors that might provide follow-on funding, syndication and M&A possibilities to Sitra's portfolio.

**2. Contracting a private fund manager:** By having a private fund manager manage and make the investments with public money, it is possible to tap into the aforementioned benefits. Because the fund consists entirely or predominantly of public money, it is possible to structure the fund with stipulations such as only allowing investments to be made that provide benefit to a geographic location, or have investments be of a certain capital stage. Examples of this include Massachusetts Green Energy Fund and the PA-AIT Fund.

## ***The Appeal to Partnering with Public Investors***

Private investors don't enter these syndicates to dole out favors to the public; a public/private syndicate is appealing to public investors for several reasons. For instance, CalCEF's Board of Directors offers connections to the government and policy information.

### **Cleantech Ventures**

Cleantech Ventures actively tries to get a public/private syndication with every deal, following what could be described as a two-tiered strategy. First, they attempt to syndicate with off-shore investors focused on clean technology due to seeking a more sophisticated investors with a global view of clean energy, possibility of follow-on investment and better due diligence. Afterwards, they look for local investors focused on clean technology. The ability to form a public/private syndicate in earlier deals is a good sign that there will be continued private interest at later stages for follow-on funding. Private investors also bring Cleantech Ventures deals they come across in Australia, looking for a partner in Australia who can better manage it due to population, language and proximity. Cleantech Ventures' link to the government is also attractive for private investors looking for a way to stay updated on the approval process, meet appropriate people and have a sense of the policy realm and current events.

### **Carbon Trust**

Carbon Trust's in-house venture capital expertise enables it to conduct the necessary due diligence and make direct investments on its own. In this sense, it is able to operate as any other private venture capital firm. In fact, many European firms look to Carbon Trust for insight on the clean technology sector and its companies. Carbon Trust's reputation as a legitimate investor that achieves good returns means that private investors interested in deals can trust and decide to piggyback off of Carbon Trust's due diligence if they so wish. One reason private investors are biased against early-stage deals is that these smaller deal amounts require the same amount of due diligence, and hence due diligence fees, as a larger deal. Carbon Trust does not need to worry as much about incurring due diligence fees and take deals of different size. At the very least, when Carbon Trust approaches a private investor about a deal it is considered a credible source of deals.

**3. Private Money in Public Fund:** Alternatively, public players can engage private investors to contribute capital to a fund that has been created, often with stipulations that investments benefit a geographic location or are in a certain capital stage. Private investors that contribute capital to a fund will not necessarily have investment experience but can still provide networks and additional capital to the fund. Examples of this include private investors in the CalCEF Angel Fund, and VicSuper in the Cleantech Australia Fund.

**4. Forming a Public/Private Syndicate:** The public investor (whether directly or as an LP) can invest in the entrepreneur as a public/private syndicate. Because the private investor is also investing in the entrepreneur, the two can either share the task (and cost) of due diligence, or the private investor can act as an additional due diligence check. They can also provide networks useful to the entrepreneur, and clearly lend additional capital to the deal which either allows the public investor to have to contribute less or provides more capital that is useful to the entrepreneur. Examples of this include Carbon Trust, Cleantech Ventures, Sitra, and SDTC.

## Part IV: Portfolio Analysis

While a handful of public venture capital firms have made investments in clean energy, few have fully invested their funds. Most funds are currently in their early stages of capital deployment, making it difficult to compare clean energy funds on a portfolio to portfolio basis. Typically a private fund's performance is measured based on the returns on its investment portfolio. The small number of exits in our respective clean energy venture capital peer group does not allow for a robust venture returns analysis. While aggregate comparisons are not possible, it is still possible to compare the investment strategies and operations of existing clean energy venture capital firms by tracing the various steps in the creation of a fund's investment portfolio. The steps required to make an investment and ultimately exit from it, are not unique to venture capital and are also followed in private equity and other investments. The stages following the close of fundraising are the steps any investor would need to take to make an educated investment decision and ultimately yield a return.

The following section will use case studies to compare existing clean energy focused public venture firms from the initial targeting and sourcing of potential deals, to the structuring and closing of the deal, and the final exit stage.

Specifically the steps are broken down as follows:

### **A) Creation of investment thesis/focus**

The development of a fund structure requires the fund manager to have decided with regard to a specific sector (e.g. clean energy) and a specific stage (early-stage). However there are still further refinements to a fund's investment thesis. Often these refinements are dynamic and change with regard to the investment environment. This could involve focusing on certain sub-sectors (e.g. energy efficiency), targeting a specific geography (e.g. Australia) or focusing on certain components of a sector value chain (e.g. only consumer facing), etc.

### **B) Source potential deals**

In a perfect world, private and public venture capital would have the perfect deals on their desk from day one; however, sourcing deals is not so simple. It often depends on the venture capital firm's network, their exposure to entrepreneurs, and their ability to create a presence. Venture capital firms need to be active and creative with how they unearth the next big idea.

### **C) Narrow viable opportunities and conduct due diligence**

Once an opportunity has gone through initial filters, investors must conduct a due diligence process. This process is very important as it is when a company decides the merits of a company's long term business strategy, its capability on executing on its strategy, its potential exit opportunities, and the viability of the product, just to name a few. Essentially, this is an intense month(s) long process where the fund must decide whether or not to make an investment and enter into a multi-year partnership. Depending on the respective deal fund's internal expertise they might conduct this process in house, hire consultants, or work together with private investors.

### **D) Structure deal and potential formation of investment syndicate**

If a company passes the due diligence process, the investor and entrepreneur must agree on the terms of the investment. This process can be difficult because the process is unique to the

opportunity, the current market, and the various interested investment parties. Public VC firms often seek to co-invest with private VCs, forming an investment syndicate. Each public VC firm has its own way of valuing a company, deciding on co-investors, and ultimately finalizing the terms of the deal.

**E) Advise and overseeing portfolio investment**

An investment in a company is only the beginning of the relationship. Public VCs can decide how actively to be involved with the development of the company's technology and the company. Often this is dependent on the fund's expertise and the decision to have a "hands on" or "arms length" relationship with their portfolio companies. Involvement is also dependent on whether a syndicate was formed.

**F) Exit from investment**

A public investor can only realize a monetary benefit from an investment through an exit event. For the most part, this is out of the hands of the fund, but it is interesting to qualify and quantify the exits of public VC portfolio companies.

**Background:** Sitra, the Finnish Innovation Fund, is an independent public foundation promoting the well-being of Finnish society under the supervision of the Finnish Parliament. In 2007, Sitra celebrated the 40th Anniversary of its founding. In 2004, Sitra changed its strategy and focused all activities like venture capital into fixed-period programmes that promote business development, social innovation and networking in the business and public sectors. In pursuing its mission, two clean tech relevant programmes have emerged, Sitra's Environmental Programme (2005-2007) and its Energy Programme (2008-2012). Sitra has made a total of 7 venture capital investments in cleantech companies. Sitra also recently became a Limited Partner in Capricorn Cleantech Fund. The following focuses on its CleanTech venture investment strategy

**A) Creation of investment thesis/focus:**

Prior to the creation of its dedicated Environment and Energy Programmes, Sitra's overarching focus on finding innovative companies in Finland, which had already started in the early 90's, led them to make their first clean tech investments as a part of their Industry Ventures activities. From 2005-2007 Sitra operated its Environmental Programme with a focus on developing technology that reduced the load on the environment, with no additional preferences in terms of technology. Under the Environmental Programme, Sitra funded 5 companies for a total of 4.29M Euros. Sitra saw the need to be in the energy phase and currently focuses on renewable energy and energy efficiency investments in Finland under its Energy Programme. According to Sitra, there is a need for public players in early-stage investments as the private market is working well for later stage investments. Sitra prefers direct investments into Finnish companies but would consider a cross border investment if there were a clear link to Finland.

**B) Source potential deals:**

The Environmental Programme and Energy Programme enjoy the familiarity, network, and presence of the greater Sitra organization. Entrepreneurs are quite familiar with the organization, even if its Energy Programme has just begun. A majority of their potential deal flow is unsolicited, coming directly from companies calling or emailing the organization directly. During the Environmental Programme, most of the proposals came via this method or from public players. Few opportunities came from private players. During the Environmental Programme, Sitra had a flow of 150 proposals across the two and a half years when they sought to make investments. Sitra also maintains a database of companies and look to reach out to the most interesting ones.

**C) Narrow viable opportunities and conduct due diligence:**

Sitra's independent structure allows it to operate like a private investment fund. It can hire and attract professional investment managers. These investment managers pursue similar business due diligence to that of a private venture fund. Sitra usually does most of its due diligence in-house, however it uses external consultants in the due diligence process where appropriate (e.g. patent office for intellectual property issues, or if they don't have specific knowledge of technology they hire a consultant with technology expertise). On average, about 4 Sitra professionals conduct due diligence process plus external consultants.

**D) Structure deal and potentially form an investment syndicate:**

Out of seven clean tech investments, Sitra has co-invested with a private partner in five. Sitra may invest alone, but Sitra considers it important to find good syndication partners that provide added value for the target company. Sitra tries to form an investor syndicate before reaching the point of deciding to invest. Sitra is both a lead investor and a co-investor, depending on the situation.

According to Sitra, a good syndicate is always preferred to investing alone. Syndication brings more expertise and negotiating power to the table; it also allows for potentially sharing the cost of due diligence and management. From company point of view, they get more added value when they have two investors that can bring network, expertise, etc. to the use of the target company. The syndicate creates the deal terms as a group when presenting a final term sheet to an entrepreneur. Sitra uses similar kind of Investment Agreements as private investors. Deal terms usually include:

- Preferred stock
- Board seats: typically 1 seat (member or chairman)
- Target holding at first round: about 10-30 %
- Right of first refusal for follow-on investments, anti-dilution rights
- Liquidation preference and other risk controls such as tag-along and drag-along.

For smaller deals, the internal management team of SITRA make investment decisions. For investments larger than 0.8 million euro the proposed deal must go to the board. Sitra can make investments without approval from the Finnish government.

#### **E) Advise and overseeing portfolio investment**

Sitra usually has at least one or two board seats in its portfolio companies. Sitra is an active owner in its target companies. Five investments have been placed under the Environmental Programme, and one investment has been made under the Energy Programme. Specifically, AW-Energy Oy, a marine power company, received funding as part of Environmental Programme and was later moved to Energy Programme. Sitra has funds available via its balance sheet if the opportunity arises for follow-on investments in its target companies.

#### **F) Exit from investment**

Sitra's cleantech portfolio companies have enjoyed two exits. In addition, two companies have received follow-on funding from private investors. Typically, Sitra discusses and plans its exit strategy in concert with its syndication partners so that all investors have a similar exit strategy.



**Background:** Sustainable Development Technology Canada (SDTC) is a not-for-profit foundation focused on financing and supporting the development and demonstration of clean technologies which provide solutions to issues of climate change, clean air, clean water and clean land, and which deliver economic, environmental and health benefits to Canadians. SDTC was established by the Government of Canada in 2001 to act as a catalyst in building a sustainable development infrastructure in Canada. SDTC manages two funds: the \$550 million SD Tech Fund™ and the \$500 million NextGen Biofuels Fund™. For this study, we have focused on SD Tech Fund which supports projects to prove the performance of a technology which is at the pre-commercial and pre-revenue stage. With respect to seed stage and venture stage companies, SDTC does not invest directly into companies, but rather makes investments into projects to prove a company's technology. Of the total \$342m invested across 144 projects an estimated \$280m across 120 projects has been invested in projects at the seed or early venture stage.

**A) Creation of investment thesis/focus:**

SDTC requires its investments to have the potential to provide both long term economic and environmental benefits, specifically with respect to Canada. SDTC identifies priority sectors and technologies using a comprehensive study of specific clean technology market sectors, known as SD Business Case™. In its SD Business Cases, SDTC rigorously analyzes market, economic and technical factors and consults government, industry, academia, NGOs, and the finance community to determine where the optimal investment opportunities lie within clean technology sectors and associated policy implications. Investments are made only for pre-revenue technologies, though the company can be post-revenue. SDTC estimates it will take about 7-10 years from the time of their investment to when the company's technology to enter the market.

**B) Source potential deals:**

Through SDTC's multiple investments, it has created quite a name within Canada. To complement its proactive targeting of opportunities driven by industry through the SD Business Cases, SDTC holds open competitions driven by the market. Each year, SDTC holds two funding calls to solicit proposals from applicants. In addition, SDTC identifies and engages in high priority market sectors by approaching key market stakeholders interested in creating investment consortia. SDTC considers it important to gain early insight into technologies that are still upstream while also generating interest in its funding. SDTC also does the more conventional route of advertising and participating in conferences. High profile investments have gained notoriety for SDTC through recognition and awards. Like other public VCs, SDTC is more likely to provide deal flow to private investors versus receiving potential investment opportunities from the private investment community.

**C) Narrow viable opportunities and conduct due diligence:**

Like Sitra, SDTC's independent structure allows it to operate like a private investment fund. It can hire and attract professional investment managers. These investment managers pursue similar business due diligence to that of a private venture fund. These processes are based on the methods and best practices of VCs and the process is often vetted by third-party private VCs (who

are not investing in the company/project). Even though SDTC is technically not investing in the company, all aspects of technical, market and company composition and financials are reviewed as per a VC process. The areas evaluated included: technology, market entry, business and management, and financial capability, and environmental. Unlike other public VCs, SDTC conducts a rigorous environmental due diligence process that focuses on benefits ranging from climate change to clean air, water, and soil. SDTC considers its environmental due diligence on equal footing to its commercial due diligence process. It is critical that the overall due diligence process be rigorous as it ensures a high-quality investment decision and can serve as a preliminary assessment of the company's potential for future VC and others potential investors. The intensity of the screening process requires SDTC to conduct the process via four stages, such that the process becomes more rigorous as the project moves closer to funding.

**D) Structure deal and potentially form an investment syndicate:**

Once SDTC narrows the field of applicants it works with them on a case by case basis to determine the optimum consortium representatives. Technically, SDTC does not form a syndicate, as it is not investing equity into the company. However, it does help form a project consortium focused on funding a company's proof of concept project. Consortia members are made up of critical players in the value chain (i.e. customers, industry, academia, technology developers etc.). The company is not required to give rights to intellectual property or to receive equity investment from the consortium. The terms are structured such that every participant must make capital or in-kind contributions including the seed stage company. SDTC puts in one dollar which is matched by two dollars from other consortium members, which can be contributed in cash or in kind. This consortium approach yields larger than average deal sizes for companies that otherwise would have to seek angel financing from limited pools of capital. The company is incentivized to keep engaged since the money promised by SDTC is only dispersed through the achievement of milestones.

**E) Advise and oversee portfolio investment**

SDTC provides critical help at the earliest stages that is often not available to a company. While SDTC does not take a board seat with its grant, it treats its companies similarly to that of a VC; arguably, it provides an even greater benefit as SDTC is not focused on solely driving the company toward an exit, but rather trying to build a long term sustainable company. SDTC doesn't just provide proportional funding, it manages the entire project. It does this by coaching its companies, building their value proposition, querying and assessing their market roll-out and helping build their business plan. SDTC managers engage with their company projects on a regular basis. SDTC is also capable of brokering intellectual property agreements between the company with the project and larger corporations.

**F) Exit from investment**

By nature of its financing mechanism, the completion of the project indicates SDTC's exit. However, it is not a "hard exit" as the company is still bound to report on their progress with respect to market entry, market share, etc. for three years after the project is complete. Out of 17 completed projects, four have entered the market, namely Carmanah Technologies Inc, Westport Research Inc, RailPower, and Cellex which was acquired by Plug Power.

SDTC is capable of measuring its success like any other public VC investor, i.e. in the ability to facilitate companies' ability to attract follow-on investments from private institutional investors. 31 companies representing an investment of \$105 million have completed publicly disclosed follow-on investment totalling \$647 million.





**Background:** Established in 2001, the Carbon Trust receives its mandate and funding from the UK government. It is considered an independent company and has its own investment arm, Carbon Trust Investments. The mission of the Carbon Trust is to accelerate the move to a low carbon economy by helping organizations reduce their carbon emissions and by developing commercial low-carbon technologies. The Carbon Trust is an integrated organization with many programs in addition to the investment programme. Other enterprises are tasked with providing carbon reduction solutions for businesses, developing new low carbon technologies, providing energy efficiency loan guarantees, and partnering with clean energy incubators. These programmes are all complementary and seek to minimize the business risks and facilitate the opportunities surrounding climate change.

**A) Creation of investment thesis/focus:**

Launched in 2002, Carbon Trust Investments created the Clean Energy Fund to encourage the participation of private venture capital and private equity funds within the clean energy sector. The £25m fund provides capital to facilitate the commercial potential of clean energy companies based in the United Kingdom. The fund has invested approximately of £10 million across 11 early and late stage companies. Of the remaining funds, an estimated £5m is committed for potential follow-on investments and £10m is available for new investments over the next two to three years. Once the market for clean energy investments in Europe showed signs of early validation, the Carbon Trust saw the need to shift its investment focus to the growing gap in seed investment. In 2007, Carbon Trust Investments launched the £2m Imperial Low Carbon Seed Fund in partnership with the Shell Foundation and managed by Imperial Innovations. To date, the Imperial Low Carbon Seed Fund has made 3 investments and has about £1.5m left to invest.

**B) Source potential deals:**

Carbon Trust Investments is capable of sourcing investment deals from many channels. One key source is its incubator programme, where entrepreneurs can advance their ideas into competitive business plans. Its four incubator partners represent both private and public incubation centres, specifically: Angle Technology, Isis Innovations, Imperial Innovations, and the Technology Partnership. The Carbon Trust has a connection with the companies at these centres and has the opportunity to make investments once the companies are ready to seek financing. Additionally, Carbon Trust Investments' tenure and track record provides a source of deal flow, but also the network effect of its other Carbon Trust programmes. Occasionally, Carbon Trust Investments is presented with an opportunity to invest by a private investor, but often it is Carbon Trust Investments that acts as a source of deal flow for private investors.

**C) Narrow viable opportunities and conduct due diligence:**

Carbon Trust's independence allows it to operate similar to a private venture fund and have the authority to raise private sector funds from external investors. Carbon Trust Investments has approximately five dedicated investment professionals and about 20 technical specialists capable of conducting a thorough commercial and technical due diligence process. In fact, compared to the average early stage investor, the Carbon Trust Investment's access to technical experts far exceeds

the norm, providing a tangible benefit to any potential private investor that joins in the investment round. Potential investments must be capable of meeting Carbon Trust's carbon mission, be located in the United Kingdom, and have a strong potential for commercial viability.

**D) Structure deal and potentially form an investment syndicate:**

Given the mandate to increase the level of private investment in clean energy, Carbon Trust Investments can only invest only up to 50% of a rounds' total value and make commitments between £250,000 to £3 million per investment transaction. The difference is met by forming an investment syndicate with private venture and private equity players. Investment professionals within Carbon Trust Investments are able to leverage their access to high levels of deal flow, proven track record and rigorous due diligence process in order to attract private investment partners.

Carbon Trust Investments structures its deal terms together with the syndicate and is often the lead investor on its early stage investments. When appropriate, Carbon Trust Investments participates in follow-on investment rounds to prevent its position from being diluted.

**E) Advise and oversee portfolio investment**

The Carbon Trust is unique as it can leverage the expertise of its other programmes to offer technical support, legal support, and management support.

Over the last seven years, investment professionals at Carbon Trust Investments have realized that the innovation chain is not just about developing a technology, but also building a well-rounded business. In addition to aiding with technical expertise, the Carbon Trust helps its portfolio companies build their business, expand and develop management teams, increase market awareness, build relationships with potential investors, and build other skills necessary to reach the ultimate commercialisation of a technology.

**F) Exit from investment**

Carbon Trust Investments' portfolio companies have enjoyed two exits via a public offering, namely Ceres Power Holdings plc and CMR Fuel Cells plc. In addition, eight companies have received follow-on funding from private investors. During 2007-2008, Carbon Trust leveraged a total of £23.8 million in additional private sector funding into early stage clean energy technology businesses. Since the start of the Carbon Trust Investments, the total cumulative private funding raised by its portfolio companies exceeds £91 million.

# Conclusions and Looking Forward

The development of sustainable energy technologies is critical to address the challenge of global climate change and meet global energy needs. Breakthroughs in clean energy technology may come from within our academic institutions, scientific labs, and a select entrepreneurial few. Regardless of the source of the idea, early stage innovation needs capital and business expertise to move beyond the ivory tower, lab bench, or garage into the mainstream. This capital often comes in the form of venture capital financing where a fund of private capital invests in a company at the earliest development of an idea or service.

This Study has shown that while a powerful tool, financing gaps exist with respect to the traditional use of venture capital. Private venture capital is capable of funding seed and early stage ventures; however, the narrow commercial success metrics required of a private venture capital fund make it difficult to focus on seed and early stage clean energy investments. These investments are inherently more risky and offer lower returns on investment than their later stage counterparts, thus given a private venture firm's success metric, these stages are far less attractive and ultimately receive less investment from traditional private venture capital investors. Public venture capital's ability to optimize across multiple success metrics, such as return on investment, job creation, and environmental benefits, allow it to better address the financing gap at the seed and early stage. In places like Europe, Canada, and Australia where investors are less comfortable with venture investments and less capital is available for venture funds, a financing gap exists across a wider range of the investment value chain. In this situation public venture capital can act to validate commercial returns on investments and also to absorb the risk that may be unpalatable for private investors. Public venture capital can also be more patient and invest in longer term technological breakthroughs.

Public venture funds with direct investment strategies, like the Carbon Trust, Sitra, and SDTC have developed strong track records sourcing companies with great commercial and environmental promise. These funds have enjoyed both private follow-on investments in their portfolio companies and successful investor exits. These funds operate much like a private venture firm, conducting due diligence, structuring deal terms, leading investment syndicates, and advising portfolio companies. A focus on commercial returns on investment is critical as they must remain high enough to entice the eventual participation of private investors, however a public venture capital fund's broader investment remit allows the focus to remain on optimizing both commercial and public benefits. Quantifying public benefits is often difficult and various funds such as Carbon Trust and SDTC have developed metrics by which to measure benefits both before and after the investment process. Some goals need not be achieved through direct investment. For instance, validation of the emerging clean energy market in California and Massachusetts, respectively, came in part through the early success of CalCEF and the Massachusetts Green Energy Fund as Limited Partners in private funds.

While public venture capital will never substitute for private venture capital, current public funds act as key catalysts to venture investment. What began as a mission to validate the making of investments in clean energy has evolved to sourcing, filtering, and building young companies that are worthy of future private follow-on investments. Public venture capital funds have proven effective in leveraging their own capital and expertise through building partnerships early with private sector investors. One unique approach developed is SDTC's consortium approach to

funding proof of concept and demonstration facility projects with private partner funding at a 2:1 ratio.

Private investors now not only seek to participate in the next stage of a company's growth, but are also willing to engage with public venture funds as co-investors in especially promising early stage investments. The goals of private venture investors will always make it difficult to assimilate the inherent risk and longer time horizon necessary to concentrate on seed and early stage investments. As long as public venture capital seeks returns beyond IRR, public venture capital will be well suited to early and seed stage investments. Therefore, public venture capital has and will continue to play a critical role in financing early stage innovation in clean energy.

Looking forward, addressing the commercialization gap is the next step in bringing next generation clean energy technologies to market. As discussed in the study, the commercialization financing gap lies after late stage venture financing. While some venture investors have dabbled in financing commercial scale facilities, most find the capital intense investments do not provide the appropriate venture rate of return. Unless the company's technology is considering truly game changing and the fund has substantial amounts of capital available, most venture investors decline investing in companies seeking to raise capital for commercial facilities. Venture funds are not in the business of project finance. The typical project financiers, however, are often not willing to take the risk of building a first of its kind commercial facility. This financing gap is known as the "valley of death" and is not unique to clean energy. However, the gap is exacerbated in the clean energy sector by the existing capital intensive nature of the industry.

Given both the goals of public venture funds to develop commercially viable clean energy technologies and their ability to balance return on investment and longer time horizons, public venture capital could be an interesting mechanism to consider with respect to addressing the commercialization gap. Public venture funds have shown they are capable of being first movers into a relatively unproven investment opportunity. Their ability to balance a focus on environmental gains and job creation with higher risk and potentially lower IRRs investments make public venture capital a potentially good fit for the commercialization gap. The risks would be far lower than venture investing, and while IRR might be comparably less, the environmental benefits and employment benefits would be far greater. While in the past highly capitalized venture investors or private equity & venture hybrid funds were able to leverage investments in commercial facilities, a proper financing mechanism has yet to be developed and little competition exists among investors. Given the importance of this gap, some public venture capital funds such as the Connecticut Innovations Fund and SDTC have already allocated funds to finance commercialization projects. Finding the proper mechanism to balance the inherent risks and the capital intensity required to overcome this final step is critical to capitalizing on the hard work at the earliest of investment stages. While an investor can have a successful exit at any part of the development cycle, it is only through the ultimate commercialization of a technology that the general public can reap the full benefits of a clean energy economy. It is truly remarkable that public venture capital has been able to spur innovation at the foundation of technological development; hopefully it can also be a catalyst for addressing the next financing gap on the road to developing a sustainable clean energy market.

# Appendices

## Appendix A: Participating Funds

Fund Name	Location	Fund Size
<b>Carbon Trust: Clean Energy Fund</b>	United Kingdom	£25m
<b>Carbon Trust: Imperial Low Carbon Seed Fund</b>	United Kingdom	£2m
<b>CalCEF: CalCEF Fund I</b>	California (USA)	\$30m
<b>CalCEF Clean Energy Angel Fund I</b>	California (USA)	\$20m
<b>Cleantech Ventures: CEGT Fund</b>	Australia	\$30m
<b>Cleantech Ventures: Cleantech Australia Fund</b>	Australia	\$50m
<b>CVC : Renewable Energy Equity Fund</b>	Australia	\$27m
<b>Massachusetts Green Energy Fund</b>	Massachusetts (USA)	\$16m
<b>Sitra: Finnish Innovation Fund Energy Programme</b>	Finland	€15 -20m
<b>Sitra: Limited Partner Fund</b>	Finland	€5-10m p.a.
<b>Sustainable Development Technology Canada : SD Tech Fund</b>	Canada	\$550m
<b>PA-AIT Fund</b>	Pennsylvania (USA)	\$2.2m

Source: *New Energy Finance*





### **About the SEF Alliance**

The UNEP SEFI Public Finance Alliance, or “SEF Alliance”, is an international coalition of public and publicly-backed sustainable energy financing organisations. Its aim is to improve the effectiveness of member organisations to finance and transform clean energy markets within their own countries, and to assist other governments in establishing similar programmes.

The 2008 founding member funds are the U.K. Carbon Trust; the California Energy Commission; Sustainable Development Technology Canada; Sitra, the Finnish Innovation Fund; and Sustainable Energy Ireland. Each member finances the development of sustainable energy markets in its respective region, and fund managers use this platform to exchange best practices, pool resources, and launch joint projects. The SEF Alliance is under the remit of the Sustainable Energy Finance Initiative (SEFI) of the United Nations Environment Programme (UNEP) but is governed and funded directly by its members.

[www.sefalliance.org](http://www.sefalliance.org)



### **About New Energy Finance**

New Energy Finance is the world’s leading independent provider of research to investors in renewable energy, biofuels, low-carbon technologies and the carbon markets. The company’s research staff of 120 (based in London, Washington, New York, Palo Alto, Beijing, New Delhi, Hyderabad, Tel Aviv, Cape Town, Sao Paulo and Perth) tracks deal flow in venture capital, private equity, M&A, public markets, asset finance and carbon credits around the world.

The New Energy Finance Desktop is the world’s most comprehensive subscription database of investors and investments in clean energy. New Energy Finance’s Insight Services provide deep market analysis to investors in Wind, Solar, Biofuels, Biomass, China, VC/PE, Public Markets and the US. New Energy Finance is co-publisher of the world’s first global stock-market index of quoted clean energy companies, the WilderHill New Energy Global Innovation Index (ticker symbol NEX). The company also undertakes bespoke research and consultancy, and runs senior-level networking events.

New Carbon Finance, a division of New Energy Finance, is the world’s leading independent provider of analysis, price forecasting, consultancy and risk management services relating to carbon. It has dedicated services for each of the major emerging carbon markets: European, global (Kyoto) and US, where it covers the planned regional markets as well as potential federal initiatives.

See [www.newenergyfinance.com](http://www.newenergyfinance.com) and [www.newcarbonfinance.com](http://www.newcarbonfinance.com) for more details.

Venture capital investment will play a critical role in the discovery and development of clean energy technologies. This report examines the current clean energy venture financing landscape with a specific focus on the role of public sector-sponsored venture capital. It finds that public venture capital can catalyse private investment and fill the significant funding gaps that hamper commercialisation of clean technologies. It also looks at the core commonalities and differences in the approaches, structures, and metrics of success for existing public venture capital funds.



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