

***Clean Energy In The Capitol Corridor:
Making The Region A Green Powerhouse***

**Final Report of the
McClellan Technology Incubator
Clean Energy Project**



October 2005

Sacramento, California

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TABLE OF CONTENTS

Summary	S-1
Clean Energy Business Formation Process Flow	6
Assessment of Intellectual Capital	10
Assessment of Human Capital	12
Assessment of Financial Capital	14
Assessment of Entrepreneurial Activity	17
Assessment of Business Environment and Infrastructure Resources	20
Summary of Resources and Needs in the Capitol Corridor	22
Alternatives for Filling the Unmet Needs	23
Organized Incubation Service Activity	23
Clean Energy-Focused Regional Business Plan Competition	26
Creation of Targeted Funds to Support Early-Stage Companies	29
Creation of a Tightly-Knit Network of Support with a Clear Focus	31
Recommendations	33
APPENDIX A: Summaries of Incubation Resources	
APPENDIX B: Original Concept Paper Capitol Corridor Clean Energy Business Incubator June 2004	
APPENDIX C: Conclusions from a Report to the Connecticut Technology Transfer and Commercialization Advisory Board by Innovation Associates	
APPENDIX D: Notes	
APPENDIX E: Notes from Meeting with Pacific Incubation Network Hosted by Jim Robbins, June 28, 2004	
APPENDIX F: Example of Successful Incubator Launch	

List of Tables

Table 1	Resource Requirements for Elements in Flow Diagram
Table 2	Assessment of Intellectual Capital
Table 3	Assessment of Human Capital
Table 4	Types of Funding
Table 5	Assessment of Financial Capital
Table 6	Assessment of Entrepreneurial Activity
Table 7	Assessment of Business Environment and Infrastructure Resources
Table 8	Comparison of Abilities of Incubation Service Mechanisms to Meet Regional Requirements
Table 9	Clean Energy Business Incubator Service Mechanism Appropriate for Capitol Corridor
Table 10	CEC PIER Innovation Stage Diagnostic Matrix

List of Figures

Figure S-1	Capital Corridor Resources Available for Clean Energy Technology Entrepreneurs
Figure S-2	The Clean Tech Corridor in the Capitol Area: Summary of Activity by Location and Organization Type
Figure 1	Energy Business Formation Process Flow Diagram
Figure 2	Assessment of Intellectual Capital
Figure 3	Assessment of Human Capital
Figure 4	Assessment of Financial Capital
Figure 5	Number of Companies by County
Figure 6	Number of Companies by Industry Segment
Figure 7	Number of Companies by Business Stage
Figure 8	Assessment of Entrepreneurial Activity
Figure 9	Assessment of Business Environment and Infrastructure Resources
Figure 10	Regional Business Plan Competition Focusing and Stimulating Deal Flow
Figure 11	Significant Gaps Exist in Funding Process Locally

The MTI Clean Energy Project

Summary

The clean energy industry appears to be on the verge of rapid growth with increased attention of problems of price and greenhouse gas emissions associated with the conventional energy technologies. It is already a significant industry and analysts say sales of clean energy products should grow from \$16 billion worldwide now to over \$100 billion in ten years. That prospect of growth has propelled annual venture investment in the field from about \$400 million in 2001 to \$955 million in 2004. If California could grab a fair share of that growth in new enterprises, it could add 52,000 to 114,000 new high-paying jobs in ten years. If the Capitol Corridor as the fourth largest metropolitan region in the state could capture even its proportional 10 percent of that share, it could add 5,000 to 10,000 of those jobs locally. Moreover, returns for successful clean energy companies have been impressive—a median of 300 to 800 percent returns to early investors for those companies that have gone to public share offerings (IPOs), with a high of 2,500 percent.

Early in 2004, a group of experienced start-up entrepreneurs, angel investors, and venture capitalists came together to focus their efforts on helping to create successful clean energy businesses in the Capitol Corridor region. That group, with the financial support of the California Energy Commission and the Sacramento Municipal Utility District, carefully studied how the region could become a “powerhouse” of clean energy industry. This report documents the findings of that study.

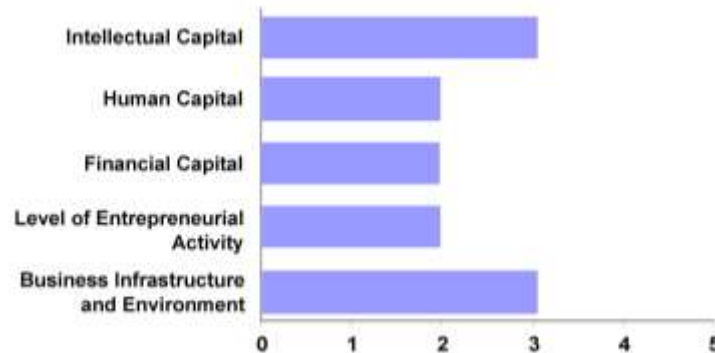
In general, the region is moderately well-positioned to capture a share of the clean energy industry. The region has:

- A growing number of potential Clean Energy Technology (CET) start-up employees and interns
- CET research and regulatory knowledge that leads the country
- A substantial number of willing legal and financial advisors
- Substantial available government R&D funding
- Modest existing base of CET entrepreneurs
- Growing familiarity with business plan competitions
- Abundant inexpensive office space
- High local support and local market demand for purchasing clean energy products

However, the region lacks some important resources in all five major resource areas—intellectual capital, human capital, financial capital, entrepreneurial activity, and business infrastructure (see Figures S-1 and S-2).

Figure S-1

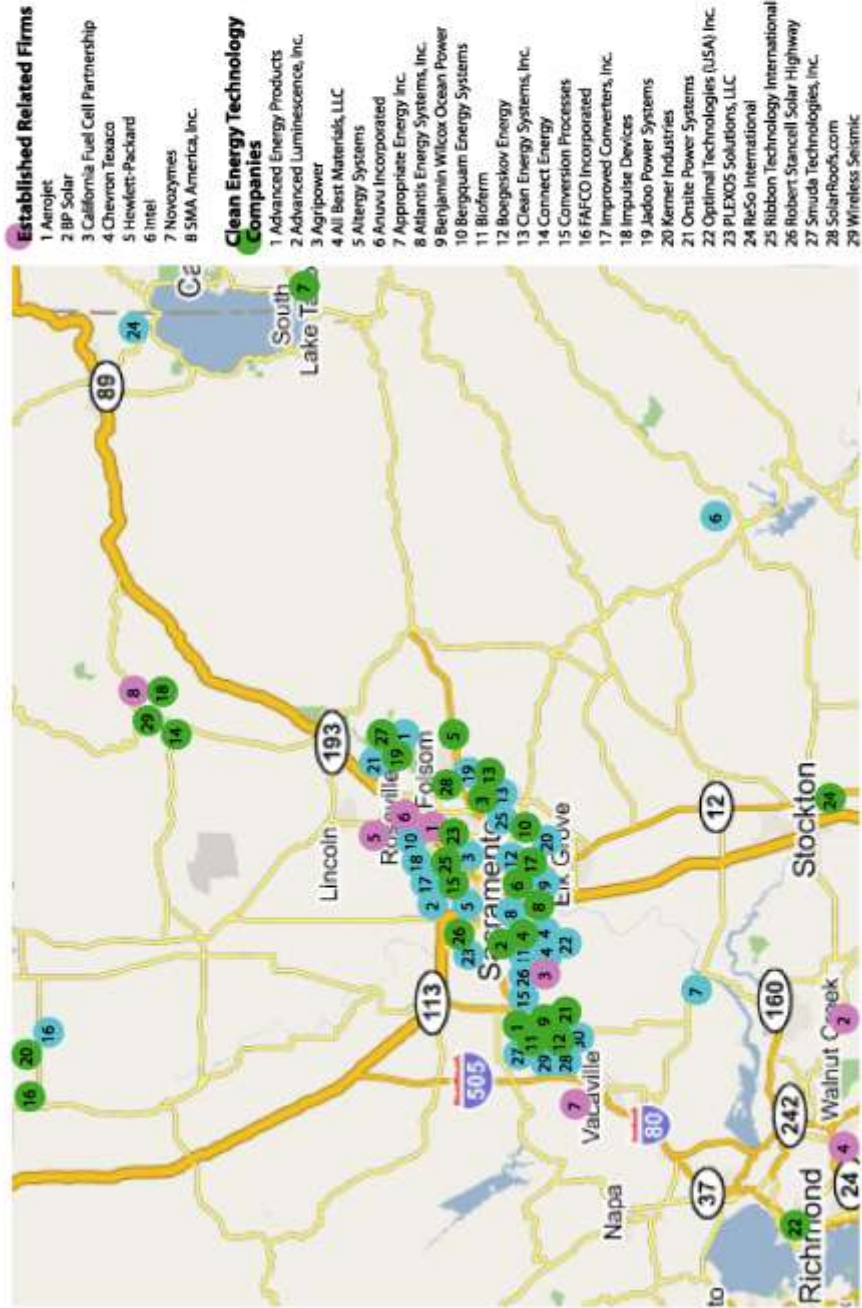
**Capital Corridor Resources Available
for Clean Energy Technology Entrepreneurs**



For the region to become such a “Green Powerhouse”, the group recommends the following actions:

1. **Put someone in charge**—Focus what the region has to offer and take responsibility for what needs to be added to supplement, not duplicate, ongoing activity.
2. **Establish clear goals**—Create a plan and success criteria; establish a “vision” for the region such as an emphasis on biofuels, touching the regions roots and strengths.
3. **Set aside the question of physical space for emerging companies for the time being**—The region has plenty of cheap space and too much effort can be wasted on trying to keep rented space full.
4. **Establish a rallying point that can attract attention, enthusiasm, and support**—Create a well-publicized clean energy business plan competition with a significant first prize.
5. **Create a “beehive of activity” and an extensive network**—Link business creation with events, workshops, venture fairs, and new R&D in the area.
6. **Add funding for incubator services for promising technologies from government R&D contracts**—Increase the chance that the public money already being spent will result in products that reach the market.
7. **Help create a critical mass of clean energy activities in the region**—Seize the opportunity to establish some federal technology testing and commercialization labs here.
8. **Establish an “Investment Club” of those likely to fund early stage clean energy enterprises in the region**—Harness existing early-stage capital sources and evolve later into a specialized regional fund.
9. **Establish other prizes and recognition awards for clean energy innovators in the area**—Prizes are a good way to stretch existing resources and gain the attention of innovators.

Figure S-2
 The Clean Tech Corridor in the Capitol Area:
 Summary of Activity by Location and Organization Type



The MTI Clean Energy Project: Final Report

Early in 2004, a group of experienced start-up entrepreneurs, angel investors, and venture capitalists came together to focus their efforts on helping to create successful clean energy businesses in the Capitol Corridor region. The clean energy industry is getting increasing attention worldwide as problems of greenhouse gas emissions and the soaring price of oil make abundantly clear that it is time to look at new energy technologies both in supply and efficient consumption. Sales of clean energy products and services now top \$16 billion worldwide and are poised to grow to \$102 billion in ten years.¹ That \$85 billion market potential is stimulating a huge interest in new energy technologies. Global Clean Energy Venture investing has more than doubled in four years, from \$394 million in 2001 to \$955 million in 2004.² Of that total, in 2004 \$520 million was invested in the US.³ Interestingly, California is not commanding the share of these investments the way it has in biotech for example. In biotech, California has been receiving about half of all venture investment. In clean energy and environmental technology, it has been receiving about 29%. It was the sense of the group that commanding a greater share of all that venture investment was a worthy goal.

- California gets about 29 percent of all US clean tech investment—\$339 million in 2003.
- That share could grow to 40 percent with a little help.
- Statewide, added investment in clean technology (not just energy) could add 52,000 to 114,000 new jobs in ten years.

Source: E2—Environmental Entrepreneurs, *Creating the California CleanTech Cluster*, October 2004.

However, they immediately were confronted with a problem: There were few emerging clean energy companies in the region that were ready for investment. There were some very clever ideas. There were some struggling companies that had managed to subsist on grants and a few demonstration projects. But there were not many clean energy companies with strong business plans and management teams ready to hit the ground running. Given the region's long history of interest in clean energy and energy efficiency, that reality came as a surprise.

¹ Joel Makower, Ron Pernick, and Clint Wilder, *Clean Energy Trends 2005*, Clean Edge, Inc. (www.cleantech.com).

² Michael Liebrich and Bozkurt Aydinoglu, "A Bright Future—Or Bust in the Making?", *Environmental Venture Finance*, March 2005, pp viii-ix.

³ Makower, et al., *Clean Energy Trends 2005*.

What are Clean Energy Businesses?

For the purposes here, “clean energy” is defined rather broadly to include:

- **Renewable energy**—solar, wind, bio-energy, and environmentally friendly hydroelectric technologies
- **Energy efficiency and demand response**—electricity end use, buildings, and grid applications
- **Environment-enhancing technologies**—advanced flue gas clean-up, ultra-low emissions generation such as fuel cells, environmental remediation, exceptionally efficient generation
- **Enabling technologies**—power electronics, storage, low-loss cables and wires, sensors and instrumentation, control systems, materials and manufacturing technology, and integrated clean energy applications

As a result, that group set out to find out why the field was so barren, and whether anything could be done about it. That inquiry focused on two questions.

- First was a general question: What is missing in the process of making successful clean energy products that could accelerate that process if provided?
- Second was a more specific question: How best could those missing ingredients be provided in the Capitol Corridor?

The group first looked at the general process of forming new clean energy enterprises and commercial products. Great enterprises are born of the kind of great research talent that a university and a commercial R&D firm has, and they area seems to have that talent in abundance. However it is a tough process to go from idea to enterprise.

“Research is the mother of industry, and thus a necessity for any thriving country. Technology, for the most part, does not occur by accident... It is created by brilliance, fed by visionaries, and only succeeds when nothing is left to blind faith. So many brilliant ideas have died in the garage because technologists didn’t have the know-how to find resources to assure their survival in a competitive landscape.” (Sally Richards, *Inside Business Incubators & Corporate Ventures*, 2002.)

The means to find the resources to hatch a good idea into a business are not hard to describe. It is generally recognized they are:

- A product with a lot of market potential
- A good management team
- Early-stage capital
- Appropriate infrastructure (offices, lab space, communications, legal support, accounting services, PR help)

However, one does not simply go to the Yellow Pages (or now the Internet) to find these resources. It is usually a grueling journey with many false starts. Unfortunately, it often relies on the ability of a visionary inventor to ferret out the needed resources, an ability which inventors rarely possess.

A “business incubator” or a “business incubator service provider” is an organization whose mission it is to provide business resources and professional services to a select number of high-potential infant businesses in order to bring them to a stage where they can stand on their own and be successful enterprises. The incubator service provider is paid for these services partially in fees and partially in shares of the companies they nurture. There are now over 800 such organizations in the US, with every variation of services on offer, technology focus, and geographic reach that one can imagine.

Growing a business is a complex process and not everyone is going to be successful in growing their own business. In fact, most brand-new companies fail. An incubator exponentially increases the odds of success of those companies it helps, by providing the nurturing and the “fertilizer” to grow a good idea into a great product and a viable company.

An incubator or incubator service provide can offer:

- **Access to resources just-in-time**—Rather than each entrepreneur spending time trying to locate people or firms or outsource services, the incubator can provide “pre-packaged” arrangements that each entrepreneur can customize. These resources may include office space, Internet access, e-commerce support, office equipment, legal and accounting services, management and staff recruiting, pilot manufacturing, lab space, packaging design, alliance development, and marketing help. Providing such resources allows the entrepreneur to focus attention on core activities for growing the company, reducing the burden of having to find all the non-core support activities.

- **Qualified mentoring, coaching and training**—Entrepreneurs in incubators are offered the value of wisdom and experience, either by individual mentors, advisory groups, training programs, board creation, or direct part-time staffing by experts in various business functions. Some incubators even have “alumni” programs to bring successful “graduate” companies back to share experiences and lessons with the current clients.
- **Consulting on market and product development**—Often an entrepreneur has not spent a great deal of time in making a product manufacturable or in defining and testing the specific offerings to the market. An incubator can provide access to technical experts that give the company a good “scrub-down” in these areas, improving the offering.
- **Synergy and support for the entrepreneur**—Members of incubators benefit by peer-level relationships, mutual support, and a chance to keep aware of developments in related areas. Many incubators have regular seminar-style internal presentations from their companies. Creating a growing a business can be a lonely effort. Incubators combat that isolation and despair. An incubator can provide opportunities for synergies with other incubator clients, will champion its clients, and will support and encourage the successful execution of each company’s business plan.
- **Industry knowledge**—Since there are few truly unique ideas, the staff of the incubator often can provide a useful perspective to a new entrepreneur that can help avoid common pitfalls and can provide critical information so hard to find any other way.
- **Business and management skills**—Most entrepreneurs need training in basic business management. Good incubators have a process to hold their companies accountable to a predefined series of financial and product milestones, and provide access to experts to fill gaps in company teams. That process is a kinder-and-gentler version of what the company will face after it graduates from the incubator and must face the market head-on.
- **Previous success record**—Good incubators will accept only companies that have a good chance of success. In order to do so, incubators need a good “admissions” process to screen applicants. On the other side, when a company “graduates” from the incubator and is seeking outside funding, a good recommendation from the incubator that the company is “ready for prime time” is invaluable in gaining outside investor confidence. That “seal of approval” grows in value as more and more “graduates” become successful.

- **Access to capital**—Whether by providing direct investment and access to growth capital or by establishing sound channels for financing, incubators provide a critical component for enterprise growth. It is the rare incubator that can provide direct access to capital. More commonly, the incubator trains the growing enterprise in sharpening its business plan and helps the enterprise gain access to investors highly likely to be interested in what the enterprise has to offer. For the earliest stage companies, the incubator can help secure research and development funding from government agencies, providing proposal writing help and developing a relationship with major funding sources that improve the chances of an award.

Can Incubation Work? What Can it Mean?

- Georgia Tech's Advanced Technology Development Center has created over 100 firms since 1980 and in 2004 these firms generated more than \$1.75 billion in revenue and 4,900 jobs.
- At MIT, probably the most successful in commercializing technology, 150 firms are founded per year, an average of 22 are funded, and a total of 5,000 have been launched. These provide 1.1 million jobs and revenues of \$230 billion per year.
- In ten years, UCSD CONNECT assisted 203 companies in starting and funding their businesses, of which the survivors raised \$550 million in capital and 120 are still doing business in the San Diego region.
- In three years, Pennsylvania Early Stage invested \$70 million in 41 companies, leveraging an additional \$350 million. Seven companies were sold for \$1.4 billion and now employ 1,500 people.
- A recent study concluded that 87 percent of incubator graduates stay in business, and that incubator businesses grow up to 22 times faster than businesses that have not gone through an incubator (*Impact of Incubator Investment*, 1997, National Business Incubator Association).

Clean Energy Business Formation Process Flow

As an aid to analyzing the two questions posed by the group, consider a generalized process flow for forming a successful technology business. That process begins with the developing an idea for a potential product or service. The process for developing an idea has been reasonably well characterized as:

- **Basic research**—the discovery of a concept or a technique
- **Applied research**—the verification of the concept in practical terms in the laboratory
- **Demonstration**—the development of the verified concept into a pilot-scale prototype that can confirm the possibility the concept can be put to commercial use

However, the process of building a bridge for these concepts to the marketplace is not so widely understood, or even that simple. More importantly, one must distinguish the notions of *invention* from those of *innovation*. *Invention* is the process outlined above. It is the process of discovering an idea and confirming that it has some possible application. *Innovation*, on the other hand, is not about what inventors do; it's about what customers *adopt*. "Innovation isn't about crafting brilliant ideas that change minds; it's about the distribution of usable artifacts that change behavior. Innovators...don't change the world; the users of innovation do."⁴ The core focus of this study is therefore on the process by which one gets useful artifacts into people's hands—at least through the early stages of bringing a product to market successfully.

The technology business formation process can be presented as a flow diagram (see Figure 1). While no process can be as clean and simple as shown, consider this diagram as a useful starting point.

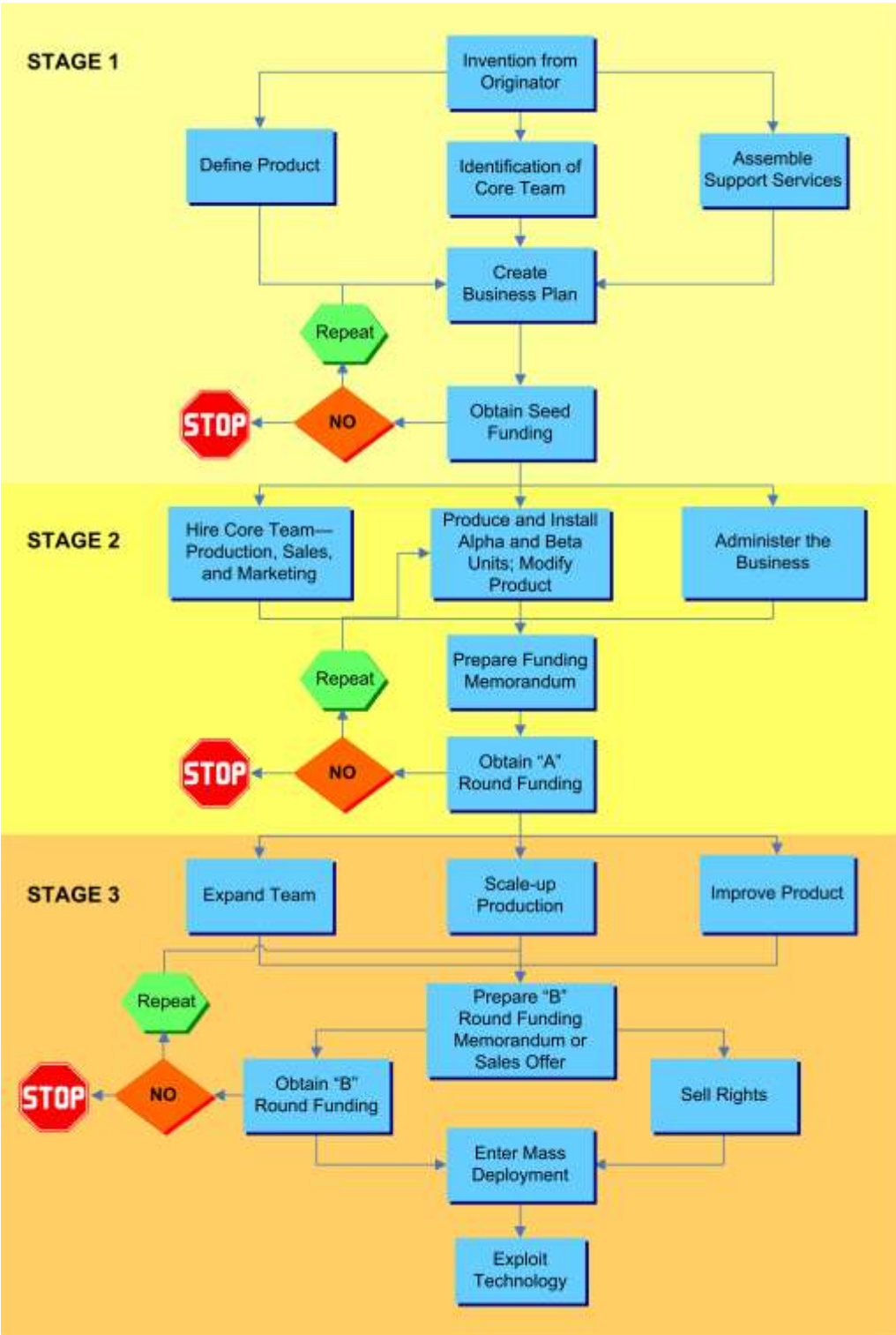
In the first stage, the conversion of an invention into an artifact that can be produced and delivered to customers requires a considerable amount of attention to three tasks simultaneously:

- Defining the product in a way that it is useful to customers
- Identifying the core team for production, sales and marketing
- Assembling the support resources for administering the business

These three tasks then feed the development of a business plan that can serve as a basis for further funding. The funding in this stage is of the character of "seed" money—probably less than \$2 million. If such funding is not forthcoming, one must iterate the process until funding is secured. Failure to secure funding terminates the process.

⁴ Michael Schrage, "Innovation Diffusion," *Technology Review*, December 2004, p. 18. "...I believe the dominant global issue of our time is accelerating the diffusion of innovation.... The diffusion of innovation—not the "spread of ideas," or the "clash of civilizations" or even "globalization"—is the dynamic driving today's world and tomorrow's."

Figure 1
Energy Business Formation Process Flow Diagram



If the first “gate”—seed funding—is traversed, then the next stage is to proceed to develop actual alpha and beta test units for field deployment. This stage requires simultaneous work again—actually assembling the team, manufacturing early quantities of the product, and finding customers for the deployments. The endpoint of this stage is either securing the ability to fund early commercial production or the licensing⁵ or acquisition of the proven practical technology to an existing business.

The third stage is the extensive deployment of the technology. While superficially similar to the last stage, this third stage confronts the business with the challenges of scale. Manufacturing 100,000 units is not just 1000 times the problem of manufacturing 100. Costs must be reduced, mass manufacturing processes need to be applied, permits and certifications need to be obtained, sales and marketing become enormously more important and in general the administration of the business becomes more complicated. Accordingly, this stage is likely accompanied with an Initial Public Offering of stock, a major investment by a well-funded enterprise, or the acquisition of the entire business.

This study will focus primarily on the first two stages. However one must keep an eye on the needs of the third stage in order for the business to make it to that stage. In each stage, the emerging clean energy business will have certain needs in order to pass through the end “gate”. Those needs are summarized in Table 1.

To meet the needs in each element of the process depicted in Figure 1, a number of resources will be needed. Those resources can be sorted into five categories:

- Intellectual capital resources
- Human capital resources
- Financial capital resources
- Entrepreneurial activity resources
- Business environment and infrastructure resources

The adequacy of the region’s resources in each category was assessed.

⁵ Licensing of a technology can occur at many stages. For this diagram, we are considering that licensing a technology before it is demonstrated as a viable product is likely to be unsuccessful. Another important distinction needs to be made. Licensing a technology from an inventor may be a way of starting the whole process. Therefore “licensing” as it is used here means acquiring the rights for further product development.

Table 1
Resource Requirements for Elements in Flow Diagram

Process	Explanation	Requirements
Define Product	Customer surveys Research related products Do market research Define three key distinctions of product in market	Library of market analysis materials Samples of customer surveys Sounding board to test ideas on product definition
Identify Core Team	Locate skilled individuals for production, sales and marketing, technology development slots	List of available talent in area Network of contacts
Assemble Support Resources	Find financial forecasting, accounting, legal, HR, and PR sources	Network of contacts Suggested list of sources
Prepare Business Plan	Look at standard models Get feedback on drafts Decide licensing vs. venturing route	Library of business plan preparation material Example plans Reviewers, mentors, and coaches
Obtain Seed Funding (Grants or Investments)	Identify sources of funding Prepare grant applications Prepare business plan and 10 minute pitch presentation Practice giving presentation and get feedback Facilitate due diligence Review term sheets	List of potential seed money sources Examples of prior winning grant applications Examples of good presentations Reviewers, mentors, coaches Introductions Legal help on term review
Assemble Core Team	Hire or contract individuals identified previously	HR assistance Mentors and coaches
Produce and Test Prototype Units	Build units or contract to have units built Have units tested and verified	Physical prototype assembly space or access to contract prototype makers
Administer Business	Create policies and procedures to use seed funding well and achieve all promised milestones	Examples of procedures from other businesses Reviewers, mentors, coaches
Prepare "A" Round Financing Memo	Update business plan with new information from seed phase	Reviewers, mentors, coaches
Obtain "A" Round Funding	Identify sources of funding Make presentations Facilitate due diligence Review term sheets	Lists of appropriate sources for A round funding Introductions Challenger sessions Legal help on term sheets

Table 1 (continued)

Resource Requirements for Elements in Flow Diagram

Process	Explanation	Requirements
Scale Up Production	Locate and hire appropriate manufacturing talent Work out manufacturing process to produce units in quantity Establish new policies, procedures and financial tools to manage business well	Lists of appropriate talent Network of contacts Space to experiment with manufacturing Examples of appropriate policies, procedures, and financial tools Mentors and coaches
Expand Team	Add to management team to handle larger scale production, sales & marketing, customer service, administrative controls, and cost analysis. Hire additional technicians and manufacturing employees	Pool of prospects Assistance in identifying good candidates Examples of good management procedures New Board members Specialty engineers
Improve Product	Collect information on performance of alpha and beta units that will eliminate problems and add to sought-after features Conduct user surveys	Examples of instruments to collect good product feedback. Product design consulting
Prepare "B" Round Funding Memo	Revise prior business plan with information from manufacturing phase	Examples of good B round plans Reviewers, mentors, coaches
Obtain "B" Round Funding	Make presentations Facilitate due diligence Review term sheets	List of appropriate sources Introductions Challenger group Legal help
Sell Rights to Larger Enterprise, or	As one option, negotiate sale of product rights to larger enterprise	Advice on negotiating sale Legal help
Prepare for Mass Deployment	As another option, prepare for substantial scale-up of production, sales and marketing.	Advice on manufacturing scale-up

Assessment of Intellectual Capital

Intellectual capital consists of the ideas and intellectual property (IP) that form the basis of potentially commercially practical innovations in clean energy. Sources of intellectual capital are:

- Research conducted by energy research institutions
- Research at colleges and universities

- Research in established firms
- Patents held by colleges and universities
- IP held by individuals or in secondary markets

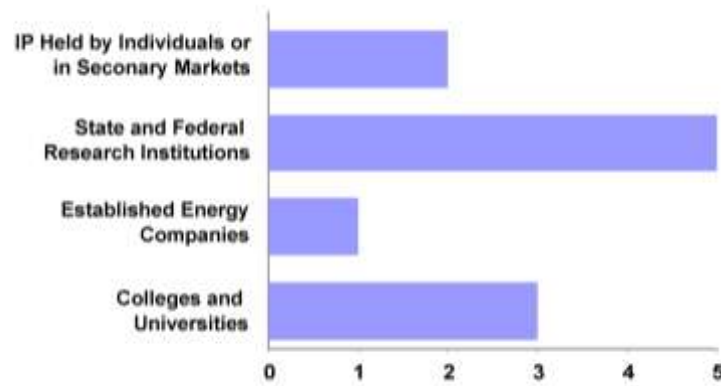
The availability of such resources is analyzed in Table 2 and Figure 2.

Table 2
Assessment of Intellectual Capital

Resource	Availability in the Region	Implications
State and Federal Research Institutions	Four locally headquartered, extremely influential state agencies: <ul style="list-style-type: none"> • California Energy Commission • CARB • CIWMB • Cal EPA 	There is substantial government R&D effort and regulatory knowledge that exists in the region. Streamlining access to this resource will be critical.
Colleges and Universities	UC Davis has many divisions that conduct world-leading research in broad field of CET <ul style="list-style-type: none"> • ITS • CIFAR • Energy Systems Group • Three Energy Collaboratives (Biomass, Wind, Solar) • CLTC CSUS has limited amount of CET research	University research on CET is of high quality and quantity and is growing, though few private sector collaborations and spin-offs have occurred in the past.
Established Firms	Limited number of nearby firms with an interest in CET <ul style="list-style-type: none"> • Chevron Texaco • SMA America • BP Solar • NEC • Aerojet • Anuvu • Novozymes 	Of the firms in the region, there are few that are actively conducting R&D in the CET sector. Expectation based on past history is that two-thirds of all new CET companies will be spawned from established firms. If so, region not well-endowed.
IP Held by Individuals or in Secondary Markets	Outside of institutional holdings of IP, individuals may hold IP or it may have been purchased from a defunct company and held by another party. There are a number of individuals in the region with their own IP. Hard to assess how many.	Another good source of IP but likely limited in the region.

Figure 2

Assessment of Intellectual Capital



Area has:

- CET research and regulatory knowledge that leads the country

Area needs:

- An improved culture of industry-university partnerships
- Streamlined access to resources of the holders of Intellectual Capital (both in the private and public sector)

Assessment of Human Capital

Human capital resources consist of the pool of talent that can support the launching and growth of clean energy technology companies and commercial products. The talents that are needed are:

- Technology experts and research consultants
- Skilled business professionals
- Interns, potential employees
- Mentors and coaches
- Experienced start-up professionals
- Legal and financial advisors

The pool of talent in the Capitol Corridor is analyzed in Table 3 and Figure 3.

Table 3
Assessment of Human Capital

Resource	Availability in the Region	Implications
Technology Experts	Essential for vetting technologies and assisting in developing and testing prototypes. Expertise at local universities and colleges. There is modest evidence that suggest some university faculty are consulting with CET start-up firms, though this is not in any way an institutionalized process. Not much available in private labs.	Difficult for entrepreneurs to find help in advancing their ideas.
Experienced CET Mentors and Start-up Professionals	Experienced venture professionals in the field of CET are scarce on a macro level and as well as a local level.	The region has a low absolute number of entrepreneurs and supporting mentors in general much less for CET applications.
Market Consultants and Skilled Business Professionals	A small number of local business professionals have shown an interest in CET start-ups.	This is a resource that needs to grow and become more formalized. The newly rejuvenated SARTA organization is working towards accomplishing this on a broad sense and would consider supporting the CET sector specifically.
Interns and Potential Employees	All five major universities in the region have programs devoted in one way or another to business entrepreneurship. Some also have CET related coursework. Sacramento Entrepreneurship Academy augments these efforts.	High quality post-doctoral students who are exposed to new venture principles, MBAs, and undergraduate engineering students being produced in the region and may provide quality labor for CET start-ups, from the internship level to the director level.
Legal and Financial Advisors	The region has at least three law firms willing to help start-ups on a volunteer basis and likely a larger number of accounting firms.	The region has adequate resources in this area.

Figure 3

Assessment of Human Capital



Area has:

- A growing number of potential CET start-up employees and interns
- Substantial number of willing legal and financial advisors

Area needs:

- A deeper bench of mentors and coaches familiar with CET
- A significant pool of talented CET entrepreneurs

Assessment of Financial Capital

Financial capital consists of all those resources that can fund the establishment of a company or the commercialization of a technology. Financial capital is both the normal forms of venture investment plus the funding that could come from existing companies wishing to license a technology. There are several kinds of financial capital needed, according to the table of resources requirements:

- Very early, pre-seed stage money to prove concepts and explore market potentials
- Seed-stage investments to develop prototypes and detailed business plans
- “A” round funding to move to production of near-commercial units
- “B” round funding and beyond to enter mass deployment

The types of funding suitable for each phase are described in Table 4.

Based on the research in this project, these financial resources are available to varying degrees in the Capitol Corridor region, as described in Table 5 and Figure 4.

Table 4
Types of Funding

Type of Financial Resources Needed	Appropriate Sources of Needed Financial Resources
Pre-Seed	Grants from government research agencies (DOE, USDA, CARB, CEC) Advanced Technology Grants from NIST Small Business Innovative Research Grants (SBIRs) Foundations
Seed	Angel Investors Prototype purchases from potential customers Professional seed funds
“A” Round	Angel Investors Professional Venture Capitalists (VCs) Licensing fees
“B” Round	Professional VCs Licensing Fees Public markets (IPOs)

Table 5
Assessment of Financial Capital

Resource	Availability in the Region	Implications
Pre-Seed Capital	Significant access to grant opportunities through locally-based state agencies. Connections to federal agencies.	Grant-writing ability is critical to effectively take advantage of this large resource for CET entrepreneurs. This may require dedicated resource for accomplishing exactly this.
Early Stage and Seed Capital	California Clean Energy Fund is a specialized fund that focuses on early stage CET funds in the broader Northern CA region. There are also two sets of regional Angel investors--the Sacramento Angels (35 individuals, \$4 million invested in 25 deals to date) and the Sierra Angels in Tahoe. None have invested in clean tech yet, though some individuals are showing strong interest. The Golden Capital Network is potentially starting a leveraged regional early-stage venture fund that may have a CET focus.	Overall, the track record of investing in early stage CET firms is minimal and suggests that this is the largest gap in the financial capital resource. The trend is toward improving availability.

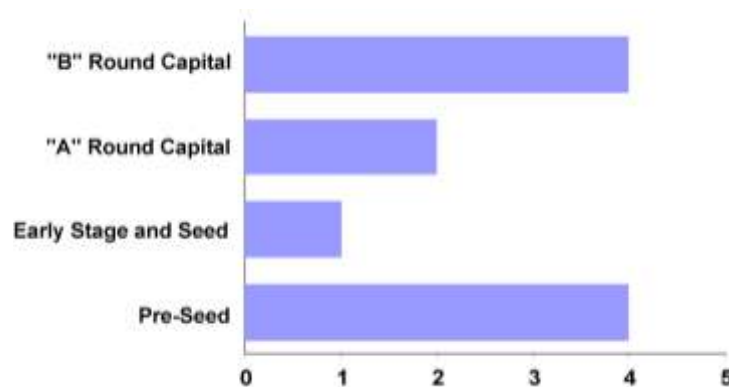
Table 5 (continued)

Assessment of Financial Capital

Resource	Availability in the Region	Implications
"A" Round Capital	<p>A limited number of professional investors and angel investors exist in the area, including:</p> <ul style="list-style-type: none"> ▪ Cal Clean Energy Fund ▪ DFJ Frontier ▪ Akers Capital ▪ American River Ventures ▪ Capital Valley Ventures <p>Reasonable national networks into which companies can be plugged—CleanTech Venture Forum, NREL, Energy Venture Fairs</p>	<p>This early stage also appears to have a gap in funding for CET companies, despite the existing investors. This may be a sign that CET companies need more coaching and also may reflect a need for other forms of capitalization at this stage (including corporate partnerships).</p>
"B" round capital	<p>All of the above funds would have interest at this stage. In addition, capital would likely be attracted from outside the region.</p> <p>Funds also available from CalPERS and CalSTRS in Green Wave Initiative through VCs that invest this money.</p>	<p>At this level of funding, a CET firm would have access to a broader set of interested funders located across the country. Having a local source is not as critical, especially since the broader market has a large amount of available capital targeting the CET sector at these later stages.</p>

Figure 4

Assessment of Financial Capital



Area has:

- Substantial government R&D funding available

Area needs:

- Support capital for pre-seed and seed stage CET ventures
- Grant-writing assistance

Assessment of Entrepreneurial Activity

Analysis of the database collected in the CEC study shows a stock of about 30 companies struggling to succeed in this region, and evidence that 8-10 new ideas are advanced per year. Both may underestimate the activity, since much of it occurs without publicity. The actual level of activity may be four to five times what was uncovered (see Figures 5 through 7).

Professional investors in the clean energy area indicate that the region would need to see 50 to 100 new or refreshed deals each year in order to find two to three in which to invest. If one really needs 100 or more new ideas for investors to review each year, this region may not have that level of activity yet. However, there appears to be a rising trend of emerging clean energy companies. This is likely an area where efforts can boost the number of groups putting businesses together (see Table 6 and Figure 8).

Figure 5

Number of Companies by County

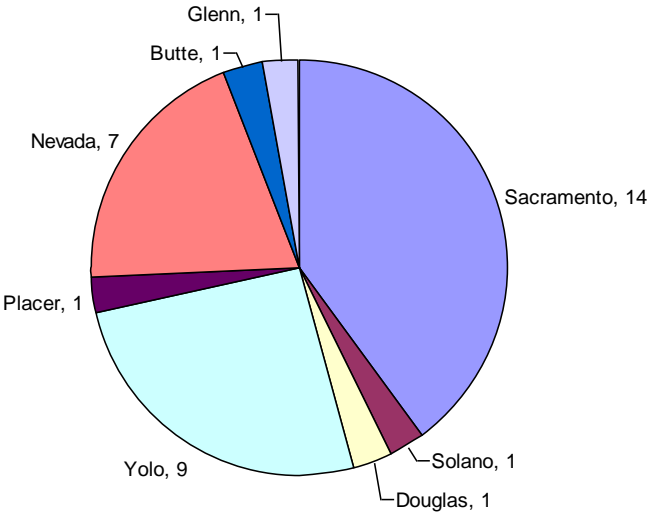


Figure 6
Number of Companies by Industry Segment

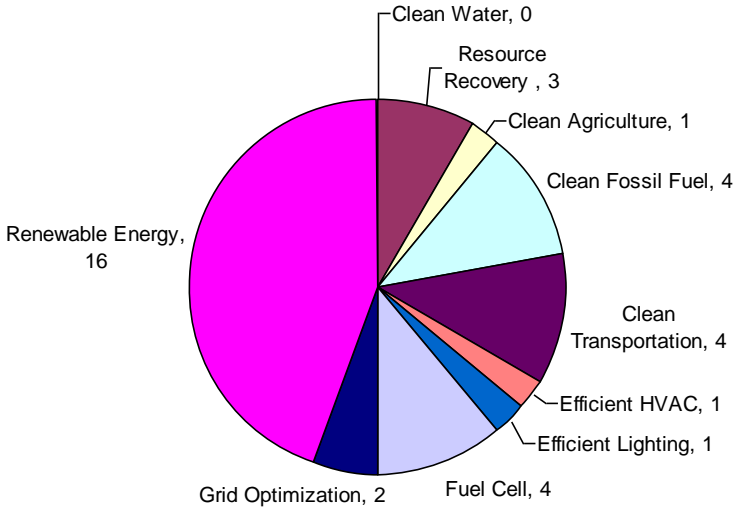


Figure 7
Number of Companies by Business Stage

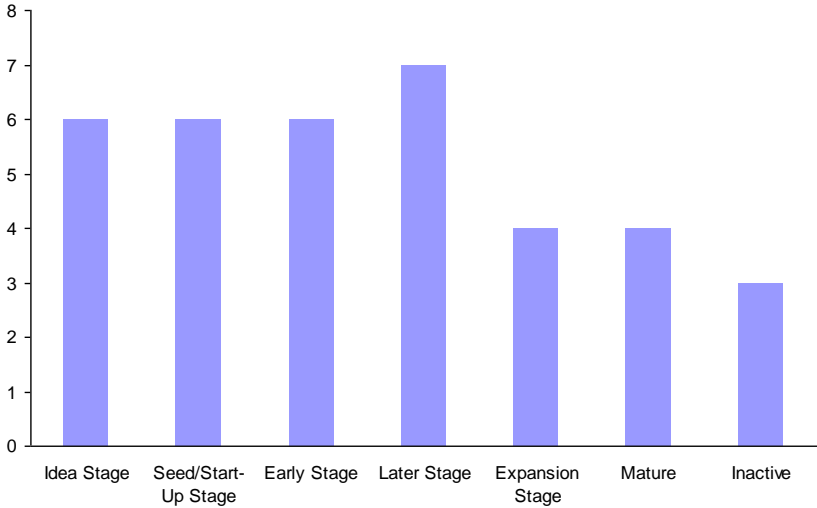
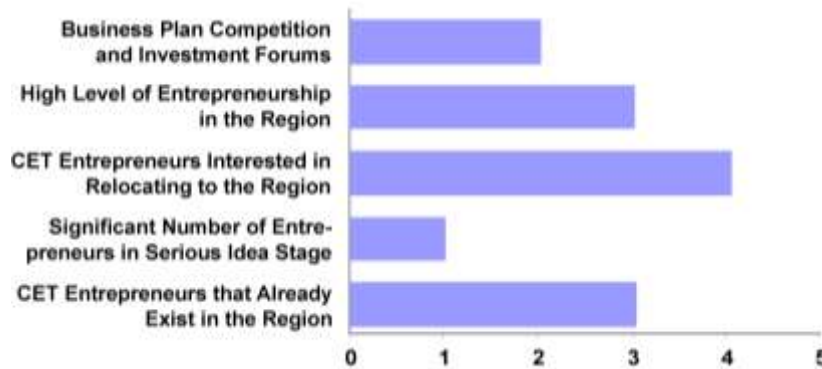


Table 6
Assessment of Entrepreneurial Activity

Resource	Availability in the Region	Implications
CET Entrepreneurs that Already Exist in the Region	<p>Twenty-nine firms at varying stages in the CET sub-sectors of:</p> <ul style="list-style-type: none"> ▪ Renewable energy ▪ Fuel cell applications ▪ Clean fossil fuels conversion ▪ Energy efficiency and optimization 	<p>Current stock of companies is low, even though there are potentially two to three times the amount of companies actually in the region.</p>
Significant Number of Entrepreneurs in the Serious Idea Stage	<p>Only six idea stage companies were identified, three of which are moving toward the early stages of business formation.</p>	<p>This may be the most challenging data to gather because many of the idea stage entrepreneurs that do exist do not necessarily have a market presence yet. Still, it appears that the rate of new ventures is relatively slow, given the already limited stock.</p>
CET Entrepreneurs Interested in Relocating to the Region	<p>Anecdotal evidence of companies interested in relocation. Also, limited examples of companies leaving the region.</p>	<p>Currently unknown whether this resource will have a large impact in the region. Until one or more CET entrepreneurs do locate in the region, this is not a reliable trend.</p>
High Level of Entrepreneurship in the Region	<p>SARTA Regional Tech Index has shown a year over year growth in high tech of 20 to 40 percent.</p>	<p>This broader trend may reflect trends in CET entrepreneurship in the region.</p>
Business Plan Competitions and Investment Forums	<p>UC Davis hosts annual Little Bang poster competitions (one at ITS and one at CIFAR) and the broader Big Bang competition. GCN hosts the local new venture forums. Between these events, there is no activity that is purely focused on CET.</p>	<p>The region has little in the way of activity to promote and expose emerging businesses through venture fairs or business plan competitions. It is clear that in order to generate more business ideas, there will need to be a wider array of events that can stimulate those ideas.</p>

Figure 8

Assessment of Entrepreneurial Activity



Area has:

- Modest existing base of CET entrepreneurs
- Growing familiarity with business plan competitions

Area needs:

- Increased rate of CET new venture creation
- Track record of successfully launching CET firms
- Business plan competitions focused on CET and open to all

Assessment of Business Environment and Infrastructure Resources

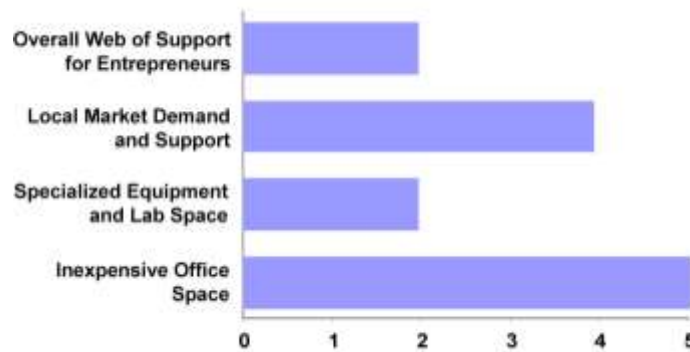
The Business Environment includes resources that characterize the community in which the incubation is performed and that can affect the services provided (see Table 7 and Figure 9). The most important categories of the Business Environment include:

- Availability of inexpensive office space with adequate telecom, IT, and support infrastructure in proximity (very important) to other resources
- Access to unique equipment for prototyping and development
- Local support and local early-adopter demand for the products of emerging companies
- Web of support for emerging companies

Table 7
Assessment of Business Environment and Infrastructure Resources

Resource	Availability in the Region	Implications
Office Space	There is plenty of available, flexible, and inexpensive space in the region.	Access to inexpensive office space provides flexibility for CET start-ups to locate in more convenient and strategic locations.
Specialized Equipment	Specialized equipment and space are available to a limited degree at the local universities, particularly UC Davis. Lab space is currently being built out at the TDC.	Some specialized added equipment and facilities, especially if needed routinely, will likely be needed.
Local Market Demand	SMUD, Yolo county in general, and the California state government are all examples of regional stakeholders that have a strong interest in CET development and commercialization.	Access to customers in this region may be higher than other regions, especially for local start-up firms.
Web of Support	SARTA and GCN together with UCD Connect beginning to pull together some support programs for entrepreneurs. Classes offered via SARTA. But no established get-togethers and coaching provided.	Emerging companies left on their own to a large extent. Does not promote success. Need more interaction and help. Moreover, there is no clear clean energy “anchor activity” as a focal point.

Figure 9
Assessment of Business Environment and Infrastructure Resources



Area has:

- Inexpensive office space
- High local support and local market demand

Area needs:

- Stronger web of support for CET start-ups
- “Anchor” institution

Summary of Resources and Needs in the Capitol Corridor

From the analysis, the region has a significant array of resources to accelerate the commercialization of clean energy technologies:

- A growing number of potential CET start-up employees and interns
- CET research and regulatory knowledge that leads the country
- A substantial number of willing legal and financial advisors
- Substantial available government R&D funding
- Modest existing base of CET entrepreneurs
- Growing familiarity with business plan competitions
- Abundant inexpensive office space
- High local support and local market demand

However, the region also has a number of deficiencies that would need to be remedied. It needs:

- An improved culture of industry-university partnerships
- Streamlined access to resources of the holders of Intellectual Capital (both in the private and public sector)
- A deeper bench of mentors and coaches familiar with CET
- A significant pool of talented CET Entrepreneurs
- Support capital for pre-seed and seed stage CET ventures
- Grant-writing assistance
- An increased rate of CET new venture creation
- A track record of successfully launching CET firms
- More CET-focused business plan competitions to stimulate activity
- Stronger web of support for CET start-ups
- An “anchor” institution with which start-ups can be associated

Alternatives for Filling the Unmet Needs

Mechanisms for eliminating the deficiencies identified in this report could include:

- Some form of organized incubation service activity
- Competitions to focus effort on commercialization plans
- Creation of targeted funds to support early-stage companies
- A more tightly-knit network of support with a clear focus

Organized Incubation Service Activity

Various mechanisms exist which could provide a number of the resources indicated above as deficient. Five of those are:

- **A physical business incubator**—An actual location where 12 to 20 start-up businesses are housed, are provided significant support services, and are given firm milestones to meet in order to remain clients
- **A virtual business incubator or a business accelerator**—An organization that may have a headquarters location, does not require tenants to move to a central facility, but rather provides services through frequent visits and a website
- **An “idea factory”**—A team that takes a business idea from an inventor and works it into a viable business, then starts with another one
- **A venture capital firm**—A source of investment for firms meeting its hurdle criteria, and a provider of networks and a talent pool to add to an innovator’s idea
- **A technology business trade association**—A group of new companies, supporters, and government agencies which attempt to promote the formation of new businesses in an area and provide guidance to innovators where to go for help

Table 8 provides an evaluation of the ability and relative merits of each mechanism in meeting the needs of the emerging clean energy business.

Table 8

Comparison of Abilities of Incubation Service Mechanisms to Meet Regional Requirements

Requirement	Physical Incubator	Virtual Accelerator	Idea Factory	Venture Capital Firm	Technology Association
Networks of Contacts	<i>Fair to Excellent</i> Depends on view of mission. If run only as cheap office space, then only fair	<i>Very Good</i> Depends on time spent to develop network	<i>Good</i> By its nature, factory can take on only limited number of prospects and so network is limited	<i>Very Good</i> Depends on size of firm	<i>Good</i> Depends on degree to which time spent to develop network
Improved Connection to Sources of IP	<i>Fair to Very Good</i> Only if effort made to create connections	<i>Fair to Very Good</i> Only if effort made to create connections	<i>Fair</i> Generally IP comes with the idea, but connections could be created	<i>Poor</i> Not generally looking for IP, but already-formed businesses	<i>Poor</i> Not a central mission
Mentors and Coaches	<i>Fair to Excellent</i> Depends on view of mission	<i>Very Good</i> If effort put into developing "bench"	<i>Fair</i> not really a mission to develop large "bench"	<i>Good</i> Not really in mission for firms not ready for funding	<i>Poor</i> Not really a mission to develop a "bench"
Space for Prototype Production	<i>Fair to Excellent</i> If right facilities included	<i>Fair</i> No space available; help in locating space	<i>Poor</i> Not necessarily part of mission	<i>Poor</i> Not at firm; can locate space	<i>Poor</i> Not in mission
Challenger Sessions, Business Plan Contests	<i>Fair to Excellent</i> Depends on view of mission	<i>Excellent</i> One of main missions	<i>Good</i> Limited by team in factory	<i>Good</i> Depends on experience of team at firm, but done only for firms ready for funding	<i>Poor</i> Not in mission
Libraries of Samples of Business Plans and Presentations	<i>Fair to Excellent</i> Depends on view of mission	<i>Excellent</i> Depends on effort devoted	<i>Good</i> Not necessarily extensive	<i>Fair</i> Not usually a part of mission	<i>Fair</i> Not usually in mission
Lists of Appropriate Funding Sources and Introductions	<i>Fair to Excellent</i> Depends on view of mission	<i>Excellent</i> Main part of mission	<i>Very Good</i> May be limited by contacts of team in factory	<i>Very Good</i> Main part of mission	<i>Good</i> Not central to mission, but a likely complement

Table 8 (continued)

Comparison of Abilities of Incubation Service Mechanisms to Meet Regional Requirements

Requirement	Physical Incubator	Virtual Accelerator	Idea Factory	Venture Capital Firm	Technology Association
Locating Good Talent	<i>Fair to Excellent</i> Depends on view of mission	<i>Excellent</i> Main part of mission	<i>Very Good</i> May be limited by contacts of team in factory	<i>Very Good</i> Depends on size and experience of firm, but not for companies not ready for funding	<i>Fair</i> Not central to mission
Encouragement	<i>Good to Excellent</i> Depending on view of mission, but physical co-location helps	<i>Fair to Excellent</i> Depends on network of contacts and mechanisms to assure	<i>Poor</i> Inherently take over from inventor, and then develop in relative isolation	<i>Good</i> Not in mission for clients not ready for funding	<i>Poor</i> Not in mission except indirectly
Exposure to Funding Sources and Acquirers	<i>Fair to Excellent</i> Depends on view of mission	<i>Very Good</i> Depends on network of contacts and mechanisms to assure	<i>Good</i> Develop in relative isolation, exposure comes from network of contacts	<i>Very Good</i> Exposure to other investors, not necessarily to broader audience and not for companies not ready for funding	<i>Fair</i> In mission only to the extent of venture fairs, etc.
Low Funding Risk	<i>Poor</i> Financial requirements substantial in order to do a good job	<i>Very Good</i> Able to offer no more services than are funded	<i>Good</i> Funding to actually develop an in idea into a business a risk	<i>Excellent</i> As long as firm has funds under management	<i>Excellent</i> Small budget required
Ability to Attract Donors and Funding	<i>Poor</i> Large donors needed, but tend to shy away from giving incubators operating funds	<i>Very Good</i> Smaller budget easier to raise, lack of substantial overhead a plus with donors	<i>Good</i> Depends on track record of leaders of factory	<i>Excellent</i> Well-known model, well-established routes to raise funding	<i>Excellent</i> Compatible with multiple small donors

Table 9 summarizes the most important features of this analysis. Overall, moving to some sort of funded incubation service organization does not appear advisable at this time. While the Virtual Accelerator model is likely the best for the region, funding would be difficult to secure unless a pragmatic program can be found that would rally support. That leads to the next option, creating some sort of business plan competition that would serve as the rallying point.

Table 9

**Clean Energy Business Incubator Service Mechanism
Appropriate for Capitol Corridor**

	Critical Needs to be Successful	Ability to Meet Need
Physical Incubator Conclusion: Too high-cost as a way to start	Donors to carry deficits Cheap space Critical mass of companies in incubator to justify assembly of resources Substantial effort to create networks and support services for tenants	Doubtful more than \$200,000 per year could be subsidized Cheap space available in outlying areas Hard to see critical mass of 15 to 20 fee-paying tenants, given low rate of CET business formation
Virtual Accelerator Conclusion: Lower risk, but region not ready yet	Bench of mentors and coaches Access to funding sources	Bench strength weak at this time Funding sources inadequate—need program to spark donations
Idea Factory Conclusion: No teams in place to do this	Talented team that has worked together before to bring ideas to fruition	Unclear if such teams currently exist in area—may grow as an offshoot of other activity
VC Firm Conclusion: Need successful firms first to attract VC attention	Mentors and coaches to work with founders at early stage	Not much evidence of investment in clean energy from local VC sources
Technology Association Conclusion: Region has good associations, but mission to meet only some needs	Ability to make introductions, lots of lists, large bench	Doubtful—current associations good mostly for contacts and networks

Clean Energy-Focused Regional Business Plan Competition

The region is fairly familiar with business plan competitions now through such activities as the Big Bang! and Little Bang! at UCD, and the GCN Early-Stage Venture Forum. These are relatively new phenomena in the area, though. The Bay Area has a far greater number of competitions, social networking, and seminars:

- **Cal Berkeley Business Plan Competition**—MBA student-run annual competition. In 2005 there were 22 semifinalists, four in clean energy, with 21 sponsors (Intel is lead) including American River Ventures. A \$50,000 Grand Prize is offered plus \$20,000 in other prizes.
- **Cal Berkeley-Stanford Innovator’s Challenge (iChallenge)**—A \$30,000 contest for student teams in the engineering schools of either university.

- **Stanford Entrepreneur's Challenge (eChallenge)**—A \$50,000 contest for teams affiliated with Stanford.
- **Haas School of Business Leading Edge Technology Conference and Expo**—A 2-day gathering of leading technologists and technology companies.
- **Haas Venture Capital Investment Competition (VCIC)**—A contest where teams play role of VCs in reviewing business plans. The winning team goes to a national competition.
- **Haas Entrepreneurs Association**—A group that organizes and presents programs for MBA students and other members of entrepreneur community.
- **Berkeley Solutions Group**—An MBA student-run program providing consultants to new enterprises and small businesses.

As an example elsewhere, MIT has an even broader program through:

- **MIT \$50,000 Entrepreneurship Competition**—Involves five schools (Engineering, Sloan Management, Science, Humanities, Architecture). Claims to have facilitated the birth of over 60 companies now with aggregate market value over \$10 billion. These companies have generated 1,800 jobs and received \$175 million in VC funding.
- **MIT Enterprise Forum**—Monthly presentations of case studies and speeches by noted technologists. Sixty-six sponsors.
- **Ignite Clean Energy Business Plan Contest**—Thirty-six clean-energy focused contestants, \$30,000 Grand Prize. Contestants need not be associated with a university.

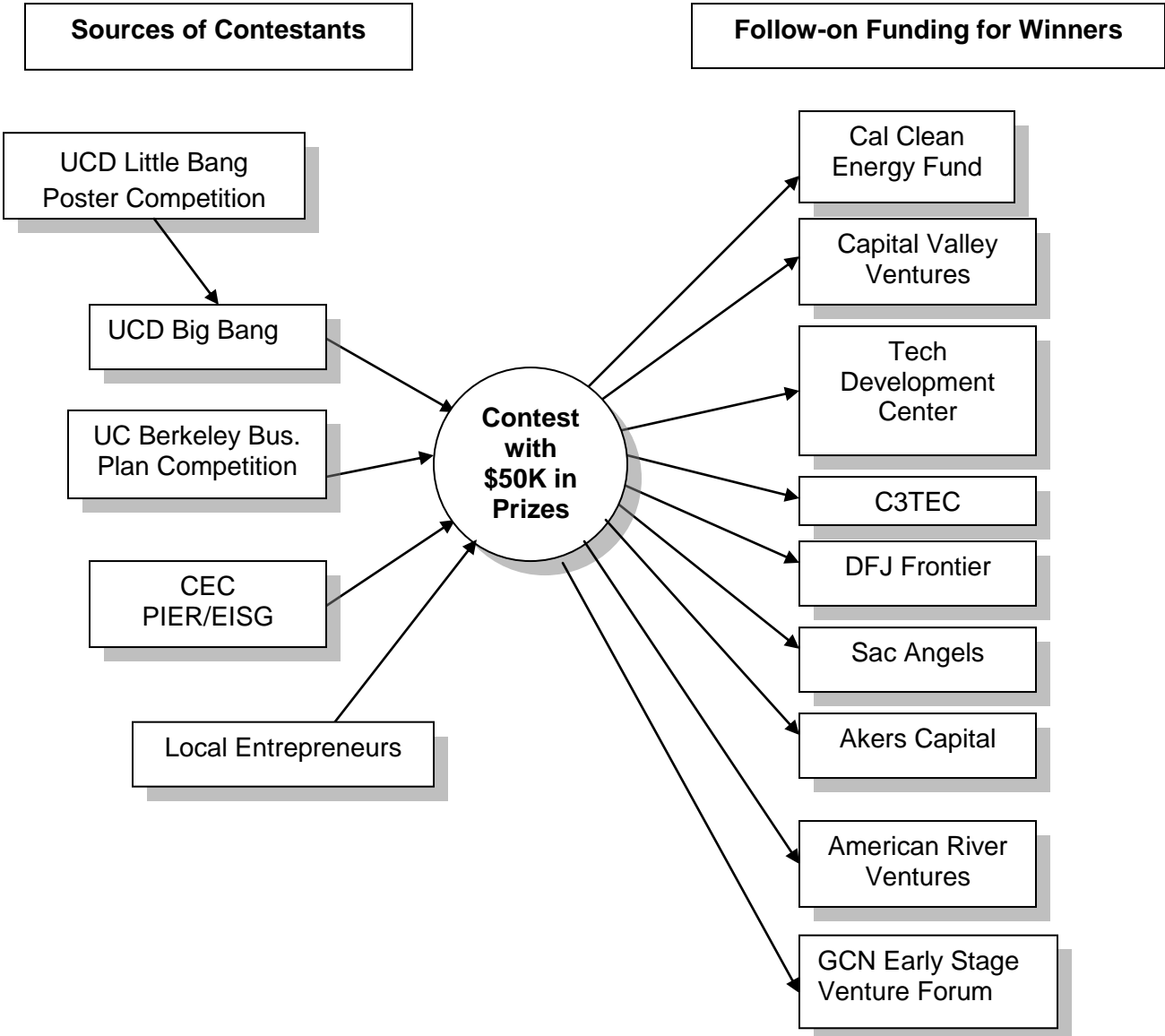
If the regional activity were expanded to include some of the kinds of competition and support activities present in the Bay Area, a number of the missing ingredients for clean energy technology commercialization could be supplied:

- Attracting a group of advisors, mentors, and coaches as a part of creating and judging the business plans
- Providing a motivating network of support for those with good ideas for commercial applications of clean energy inventions
- Creating a focal point to attract the interest of donors and supporters to provide funding
- Establishing a beachhead on which other incubation activities can build, including providing to the winners a small amount of money for actual prototype development

Accordingly, a CET-focused business plan competition appears like an excellent start for the region as a rallying point, especially if a significant amount of prize money can be offered. The Big Bang! top prize is only \$10,000. A prize of \$25,000 is likely to attract substantial interest. The Big Bang! is limited to teams with some connection to UCD. There would be no need for such a limitation on the regional CET contest. In addition, a business plan competition would connect entrepreneurs to sources of follow-on funding (see Figure 10).

Figure 10

Regional Business Plan Competition Focusing and Stimulating Deal Flow



Creation of Targeted Funds to Support Early-Stage Companies

Always the most serious challenge is in accessing funds for companies at their earliest stages. But the problem is more than money itself can solve. Therefore, any effort at providing more financial support must be tied to other actions to improve the chances of success in commercialization.

Second, early support funding is likely to come in a variety of stages. Some sources are more appropriate at the very first. Other sources after certain gates have been traversed.

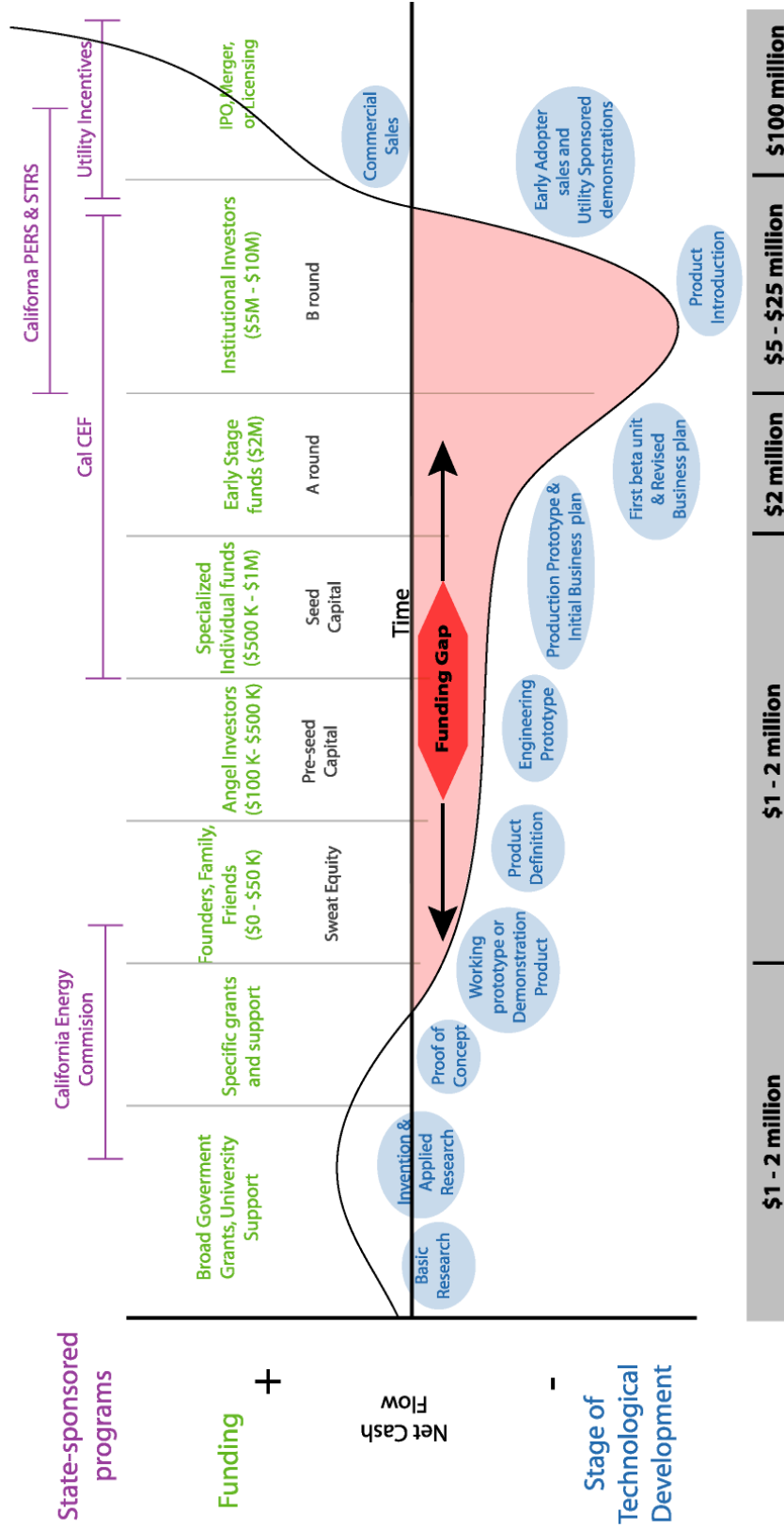
As a precondition to any outside funding, an innovator must be willing to commit substantial personal resources to advancing an idea. If this condition were not met, then there would be no assurance the innovator is serious. If this condition is met, then there will be a point where clearly it is not practical for the innovator to proceed solely on personal resources.

That point is often near the time when the concept must be proven as practical and a working prototype developed (see Figure 11). For this development, grants are likely to be the best source of funding. But even this funding cannot be given in a vacuum. There needs to be a linkage to some serious commercialization plan to carry the technology forward. Showing that linkage or plan should be the second major condition of funding. Part of that linkage should be to require parallel effort on development of a business plan or commercialization plan, with adequate attention to identifying actual practical products and customers.

Obtaining grant funding will require assistance both in preparing applications to various funding sources as well as in establishing programs at those funding sources that are keyed to the kinds of applications that would come forward from this targeted early-stage commercialization activity.

The largest source of funding for this kind of CET commercialization grant is likely to be the California Energy Commission. The CEC has multiple sources from which to fund efforts to advance new energy efficiency, renewable energy, and power generation technologies totaling well over \$100 million per year. Even a small allocation of those funds to CET early-stage commercialization would be of tremendous benefit. The CEC already funds activities that are similar to what is needed through the Public Interest Energy Research (PIER) program and the Energy Innovations Small Grants (EISG) within that program. If given a clear mission to expend these funds to support the commercialization activities described here, these existing programs could enhance the benefits the public receives from their expenditure.

Figure 11
Significant Gaps Exist in Funding Process Locally



In addition, the CEC has discretion over funds for gas R&D that could be adapted and the mission of the CEC PIER program could be expanded to include transportation technologies.

The California Air Resources Board, the California Integrated Waste Management Board, and the California Department of Agriculture all to a somewhat lesser degree than the CEC have R&D funds available. Clarifying the mission of these agencies to support CET commercialization would open useful new sources of support funding as well.

Finally, federal sources likely are available as well through the Departments of Energy and Agriculture, and the Environmental Protection Agency. Grant-writing assistance may be the most effective in accessing those funds.

Beyond the proof of concept and prototype development stage, early stage funding becomes a real problem. Venture capital generally will not be willing to invest at this stage. To bridge the gap that exists here may require invention of new mechanisms such as:

- Explicit incubation service contracts from agencies such as the CEC, building on the existing program funded by the CEC at the Environmental Business Cluster in San Jose.
- Creation of a “bench” of angel and early-stage investors that are willing to invest if a company has received adequate coaching and vetting. The bench could include existing VCs and the California Clean Energy Fund, willing to commit small amounts of funding each, but aggregating to the level of \$500K to \$1 million.
- Creation of an explicit early stage fund for companies in the region, following models such as that in Illinois.

Creation of a Tightly-Knit Network of Support with a Clear Focus

Providing support to emerging CET companies is not likely to be a viable stand-alone activity. Some sort of constant “buzz” will be needed to bring out the best in all the participants. The region has a number of important institutions that provide in one way or another support to emerging companies—SARTA, Golden Capital Network, McClellan Technology Incubator, Sacramento Entrepreneurship Academy, UCD CONNECT. However, these efforts are not necessarily coordinated nor focused on clean energy technology companies. Two things appear to be needed:

- **Focused leadership** to ensure all available resources are being used well in support of emerging clean energy commercialization
- **A regional “theme” that will attract support**—The best such theme that has emerged from this study would be to focus activity on a particular kind of clean energy—not exclusively—but as a primary objective: clean energy from biomass and agriculture. This theme would tie into the region’s deep roots as an agricultural and food processing center, as well as the excellent research resources in the area.

This focal point would, we believe, be a very exciting one for many of the interests in the region and would be likely to ease the process of securing funding.

Illinois Technology Enterprise Center and Illinois Ventures: A Model for California?

Illinois Ventures created by University of Illinois Board of Trustees in 2002

“We work with inventors & entrepreneurs to mold concepts, vision, intellectual property, sweat and passion into breakthrough, high-growth technology companies. Our hands-on coaching approach, access to a network of resources, and early stage capital gives our start-ups a jump-start.”

Associated with three other institutions:

- **Illinois Technology Enterprise Center (operated by Illinois Ventures)**—ITEC provides one-on-one start-up services to entrepreneurs, pre-seed and seed stage companies with proprietary technology. ITEC provides the following services to its clients:
 - Development of business start-up and commercialization strategies
 - Review and refinement of sales and marketing strategies
 - Basic market research and networking
 - Assessment of company funding strategies
 - Assistance with federal funding programs including SBIR and STTR
 - Location of strategic partners and service providers
 - Management assistance and coaching including human resource management, accounting and financial management, legal structure and identification of specialized service providers.
- **EnterPrise Works**—The campus Research Park incubator which provides low cost access to facilities. Active on three campuses.
- **Illinois Emerging Technology Fund**—entirely private fund for seed and venture financing. Total of \$20 million (how many and what companies funded?)

Illinois Ventures FY '04 funding consists of \$700,000 from U of I, including President's Office and \$1 million in additional state funding. ITEC also receives \$300,000 grant from Illinois Department of Commerce and Economic Opportunity.

FY '05 funding was \$4.1 million.

As of end of 2004, Illinois Ventures had reviewed 200 proposal and companies, provided consulting to 70 and invested in 25. Focus is on life sciences, computer sciences and engineering.

Six companies have been launched successfully, two in fuel cells.

Operating budget on the order of \$500,000 per year. Over \$1.5 million used to date to jump-start companies, either through seed investment or grants.

Recommendations

1. **Put someone in charge**—Stimulating the emergence of more clean energy businesses in the region requires a clear mandate to someone to execute. The region has numerous relevant resources, but no one is in charge of focusing those resources on a specific mission of ensuring more clean energy enterprises emerge here. This activity should not compete with but be complementary to ongoing related activity in the region. A primary focus of that activity is the Sacramento Area Regional Technology Alliance or SARTA. Rather than burden someone with all the administrative duties of a stand-alone organization, it would be better to put the person in charge and let them focus on building the portfolio of clean energy companies in the region. To that end it would be advantageous to house the effort within SARTA, where MTI is organizationally housed now. The clean energy activity would be well-served by its own Board of Advisors, but as a part of SARTA would have the SARTA Board as its overall governing board. Such a structure would ensure the clean energy activities are complementary to the ongoing technology development activities in the area.
2. **Establish clear goals**—The person in charge needs to have specific objectives that define “success”. The suggested goals are to add 100 net new jobs in clean energy enterprises in the region by the end of 2008 along with the establishment of ten new, viable clean energy businesses. By 2010, the goal should be to add 1,000 net new jobs along with the establishment and survival of 25 new clean energy businesses.
3. **Set aside the question of physical space for emerging companies for the time being**—Too often initiatives to promote business development in a region get sidetracked by a focus on creating and then maintaining a physical facility. The primary focus needs to be on helping entrepreneurs create new clean energy enterprises, not on renting real estate.

The region is blessed with abundant and inexpensive office space and manufacturing space. Modest meeting space and office space for the staff executing this plan will of course be necessary. But the need for dedicated space for companies being coached will become apparent when there is a need to reap the benefits of synergy and mutual encouragement that only physical proximity can provide. That need may not occur for several years.

In the meantime, the facilities of MTI as well as the Technology Development Center in West Sacramento and other in the region provide adequate opportunities to provide what is needed in physical space initially.

4. **Establish a rallying point that can attract attention, enthusiasm, and support**—The effort needs a starting point that is tangible and popular. Little support will come to a concept that is vague. The starting point most likely to succeed appears to be the creation of a substantial and focused regional clean energy business plan competition.

Such a competition can serve a number of functions. It can be way to raise money to support the staff needed. It can stimulate a number of new clean energy businesses to come forward. It can through prize money provide the winners with start-up funds. It can identify candidate companies to which incubation services can be offered. It can expose worthy companies to other funding sources. It can form the base to which more and more incubation services can be added. It can be an easy way to explain to potential supporters and the public the activity to add more clean energy businesses locally. It can be a way to publicize the broader activity.

An initial plan for the first such competition is included as an appendix to this report. The idea is to raise \$200,000 in deductible contributions to create the contest and fund its administration, and to give away \$50,000 in prize money. The intent would be to continue this competition as an annual event, and continuing focal point for all clean energy activities in the region.

In the longer run, the regional competition could be expanded to include similar contests in other regions, culminating in a “State Championship” contest (for all regional winners and runners-up, for example) also held in Sacramento.

5. **Create a “beehive of activity” and an extensive network**—Making emerging clean energy companies successful requires that those companies be given constant stimulation. It should be the job of the staff to ensure that these companies are bombarded with opportunity and continually challenged. Among the items on the list should be:
 - Assembling an audience of interested coaches, investors, and technologists
 - Monthly meetings where client companies can pitch their ideas and get feedback
 - A network of potential corporate acquirers and licensers of technology
 - A database of potential customers (state agencies, local utilities, local governments) wanting to try early prototypes (nothing helps get funding more than having customers at the ready)
 - Presentations from successful clean energy companies on lessons learned
 - Sessions in grant-writing targeted at energy R&D agencies
 - A calendar of every event, class, and seminar offered for emerging technologies in the region in which the clean energy companies could participate

6. **Add funding for incubator services for promising technologies developed from government R&D contracts**—The California Energy Commission, the Air Resources Board, the Department of Technology, Trade & Commerce, the Integrated Solid Waste Management Board, the California Department of Agriculture, and probably many other state agencies every year award millions in contracts aimed at creating new clean energy

and environmental technologies. The intent of such programs is clearly to benefit the public from these innovations. However, virtually every such program struggles to get these inventions into the market and very few have ever established significant market penetration.

These public benefits from these programs would be significantly enhanced if market penetration were enhanced. Most of these contracts require some form of commercialization plan as a part of the award, including the requirement of a commercial partner as a part of the project being funded. The PIER Program at the CEC included an excellent tool to diagnose where a technology was on the path to deployment (Table 10). The CEC has taken an initial step in providing funding (to the Environmental Business Cluster in San Jose) for incubator services for about a dozen of its most promising contract awardees. Of those, more than half have now gotten funding and are moving toward significant commercialization. Using the existing diagnostic tool and providing funding to the most promising commercialization candidates both more widely at the CEC and at other clean energy technology-funding agencies would be important in actually boosting the chances for market penetration.

7. **Help create a critical mass of clean energy activities in the region**—The clean energy incubation mission is best done in the context of a larger activity regionally to emphasize clean energy development. The activities of a related group to bring government-funded test labs and prototype testing facilities to the area focused on biofuels and bioproducts could be crucial. The incubation effort ideally would augment that larger effort. Similarly, the incubation activity may improve the chances of success of the larger effort. The resources of the region should come to the aid of this larger effort.

8. **Establish an “Investment Club” of those likely to fund early stage clean energy enterprises in the region**—While early-stage funding is one of the most serious gaps in the process of launching a new clean energy company, creating a new fund to support these companies locally is both time-consuming and not likely to succeed in the absence of a proven track-record. There are adequate investment funds and angel investment groups already in the region. There is no need to duplicate what already exists. However, they are not currently focused on clean energy as an investment area. That focus is emerging and can be amplified through involving these investors more closely in the clean energy incubation effort.

Moreover, the chances of an emerging clean energy enterprise eventually receiving private investment are improved if those private investors are closely involved in coaching and supporting those companies early on. The clean energy effort should then create a specific “club” of those potential investors to which client companies can “pitch” their plans. After some experience has been gained, it may become apparent that a special fund focused on the region and on clean energy may be worthwhile. Starting with the “Investment Club” approach does not preclude that evolution, and in fact will contribute to it.

Table 10

CEC PIER Innovation Stage Diagnostic Matrix

ACTIVITY	STAGE						
	Idea Generation	Technical and Market Analysis	Research	Technology Development	Demonstration	Market Transformation	Commercialization
Marketing							
Engineering/ Technical							
Legal & Contractual							
Risk Assessment							
Quality of Plans							
Strategic							
Production Readiness							
Public Benefit/Cost							

9. **Establish other prizes and recognition awards for clean energy innovators in the area**—Not all inventors will be motivated to create an enterprise to exploit their ideas, yet it is important those ideas get visibility. Adding folders to a drawer of patents in a technology transfer office is not a very effective way to publicize worthy inventions. A spotlight needs to be shone on them. Recognizing a “Clean Energy Innovator of the Year” is one way to provide that spotlight.

Another is to offer substantial prizes for specific energy innovations—such as a 15 percent efficient solar array that costs less than \$1 per watt, or a 60% efficient fuel cell operating on natural gas, or a prototype of a car that can carry four passengers and get 100 miles per gallon. The Orteig Prize won by Lindbergh opened the way to commercial air traffic. The Ansari X-Prize won by Burt Rutan is leading the way to the commercial use of space. These “Golden Carrot” prizes work wonders in focusing teams on specific areas for innovation—if the prize is large enough. DOE offered such a prize for a refrigerator that

was 30 percent more efficient than the conventional models, and Whirlpool Corporation won—and put the unit into commercial production.

The local area may not be able to sponsor big prizes itself, but it could certainly encourage the largest employer in the region—the State of California—to do so, and bring more attention to the region as a center of clean energy innovation.

APPENDIX A
SUMMARIES OF INCUBATION RESOURCES

APPENDIX B

ORIGINAL CONCEPT PAPER

CAPITOL CORRIDOR CLEAN ENERGY BUSINESS INCUBATOR

JUNE 2004

Objectives

- Provide resources to accelerate the emergence of viable clean energy commercial enterprises in the Davis/Sacramento/Vacaville area
- Provide opportunities to extend UCD faculty research and CEC/ARB-sponsored research into the development of new commercial products
- Provide practical training opportunities for UCD, CSUS and other students
- Create a portfolio of successful new companies that will continue to grow and create a local “cluster” of activity

Rationale

Great enterprises are born of the kind of great research talent that a university and commercial R&D firm has. However it is a tough process to go from idea to enterprise.

“Research is the mother of industry, and thus a necessity for any thriving country. Technology, for the most part, does not occur by accident... It is created by brilliance, fed by visionaries, and only succeeds when nothing is left to blind faith. So many brilliant ideas have died in the garage because technologists didn’t have the know-how to find resources to assure their survival in a competitive landscape.” (Sally Richards, Inside Business Incubators & Corporate Ventures, 2002)

The means to find the resources to hatch a good idea into a business are not hard to describe. It is generally recognized they are:

- A product with a lot of market potential
- A good management team
- Early-stage capital
- Appropriate infrastructure (offices, lab space, communications, legal support, accounting services, PR help)

However, one does not simply go to the Yellow Pages (or now the Internet) to find these resources. It is usually a grueling journey with many false starts. Unfortunately it often relies on the ability of a visionary inventor to ferret out the needed resources, an ability which inventors rarely possess.

A “business incubator” is an organization whose mission it is to provide business resources and professional services to a select number of high-potential infant businesses in order to bring them to a stage where they can stand on their own and be successful enterprises. The incubator is paid for these services partially in fees and partially in shares of the companies they nurture. There are now over 800 such organizations in the US, with every variation of services on offer, technology focus, and geographic reach that one can imagine.

Growing a business is a complex process and not everyone is going to be successful in growing their own business. In fact, most brand-new companies fail. An incubator exponentially increases the odds of success of those companies it helps, by providing the nurturing and the “fertilizer” to grow a good idea into a great product and a viable company. A recent study concluded that 87% of incubator graduates stay in business, and that incubator businesses grow up to 22 times faster than businesses that have not gone through an incubator (*Impact of Incubator Investment*, 1997)

An incubator can provide:

- **Access to resources just-in-time**—Rather than each entrepreneur spending time trying to locate people or firms or outsource services, the incubator can provide “pre-packaged” arrangements that each entrepreneur can customize. These resources may include office space, Internet access, e-commerce support, office equipment, legal and accounting services, management and staff recruiting, pilot manufacturing, lab space, packaging design, alliance development, and marketing help. Providing such resources allows the entrepreneur to focus attention on core activities for growing the company, reducing the burden of having to find all the non-core support activities.
- **Qualified mentoring, coaching and training**—Entrepreneurs in incubators are offered the value of wisdom and experience, either by individual mentors, advisory groups, training programs, board creation, or direct part-time staffing by experts in various business functions. Some incubators even have “alumni” programs to bring successful “graduate” companies back to share experiences and lessons with the current clients.
- **Consulting on market and product development**—Often an entrepreneur has not spent a great deal of time in making a product manufacturable or in defining and testing the specific offerings to the market. An incubator can provide access to technical experts that give the company a good “scrub-down” in these areas, improving the offering.
- **Synergy and support for the entrepreneur**—Members of incubators benefit by peer-level relationships, mutual support, and a chance to keep aware of developments in related areas. Many incubators have regular seminar-style internal presentations from their companies. Creating a growing a business can be a lonely effort. Incubators combat that isolation and despair. An incubator can provide opportunities for synergies with other incubator clients, will champion its clients, and will support and encourage the successful execution of each company’s business plan.

- **Industry knowledge**—Since there are few truly unique ideas, the staff of the incubator often can provide a useful perspective to a new entrepreneur that can help avoid common pitfalls and can provide critical information so hard to find any other way.
- **Business and management skills**—Most entrepreneurs need training in basic business management. Good incubators have a process to hold their companies accountable to a predefined series of financial and product milestones, and provide access to experts to fill gaps in company teams. That process is a kinder-and-gentler version of what the company will face after it graduates from the incubator and must face the market head-on.
- **Previous success record**—Good incubators will accept only companies that have a good chance of success. In order to do so, incubators need a good “admissions” process to screen applicants. On the other side, when a company “graduates” from the incubator and is seeking outside funding, a good recommendation from the incubator that the company is “ready for prime time” is invaluable in gaining outside investor confidence. That “seal of approval” grows in value as more and more “graduates” become successful.
- **Access to capital**—Whether by providing direct investment and access to growth capital or by establishing sound channels for financing, incubators provide a critical component for enterprise growth. It is the rare incubator that can provide direct access to capital. More commonly, the incubator trains the growing enterprise in sharpening its business plan and helps the enterprise gain access to investors highly likely to be interested in what the enterprise has to offer. For the earliest stage companies, the incubator can help secure research and development funding from government agencies, providing proposal writing help and developing a relationship with major funding sources that improves the chances of an award.

Description of a Capitol Corridor Incubator

There is no one right way to set up an incubator. After reviewing studies of many of the existing ones, it is also clear that no two are alike. The design of the incubator is therefore dependent on the specific resources available in a location and the desires of the founders. The one key to creating an incubator is finding a consistent source of funding that can cover the cost of assembling the physical facility and an initial staff. For an incubator in this area, that sponsor is most likely to be a charitable donor or foundation. The chances of success of securing donations will be increased if some association with UCD can be shown. Accordingly, the incubator will need to be designed to be compatible with and benefit UCD.

A preliminary incubator design as a place to begin the discussion includes these features:

- **Nonprofit status**—Some incubators have succeeded as for-profit enterprises, but that appears to be the toughest route. In particular, for-profit status precludes one from seeking tax-deductible donations as a source of funds to cover operating expenses. Moreover, for-profit status triggers a need to comply with a long list of SEC regulations that are complex and restrictive. Accordingly, incorporation as a non-profit entity is likely the best route.
- **Physical facility**—Some incubators are “virtual”, providing management and technical expertise as needed, but little in the way of physical infrastructure. The more successful incubators seem to derive a great deal of benefit out of the physical proximity of the client companies, both in terms of keeping a watchful eye and of creating the interplay between the resident companies. A physical facility would make it easier to create some of the connections to students and faculty, as described later.
- **Clean energy/clean technology focus**—To create the synergy benefits of an incubator and to provide some kind of focus of venture development resources, it is good to define a narrow scope for the incubator. Clean energy is one natural focus, with the activities of the Institute of Transportation Studies and the range of research on campus in energy efficiency, biomass, and environmental technology. Other natural focal points would be biomedical technology, agricultural technology and non-energy related environmental technology. There is nothing to prevent parallel or serial development of incubators in these areas, building on a core of expertise in venture development and IP commercialization initiated with the clean energy incubator. However, as will be described, there are some ready sources of funding for a clean energy-focused incubator that may make it the logical starting point.

There are already nine other business incubators with a clean energy focus inside a broader mission in the US, five of which are directly associated with universities. Those nine have through NREL organized into “The National Alliance of Clean Energy Business Incubators” (www.nrel.gov/technologytransfer/entrepreneurs/inc.html). The nine are:

- Advanced Technology Development Center (Georgia Tech)
- Austin Technology Incubator, Clean Energy Incubator (UT Austin)
- BizTech
- Boston Technology Venture Center
- Mobile Business Innovation Center
- Environmental Business Cluster (CSU San Jose)
- Florida/NASA Business Incubation Center

- Technology Ventures Corporation (Lockheed Martin foundation seeking to commercialize technology from NREL, DOE, and universities in CA, NM, and NV)
- Albany NanoTech (SUNY Albany)
- Rensselaer Polytechnic Institute Incubator (RPI, Troy, NY)

A Davis area clean energy business incubator associated with UCD would therefore be in a relatively exclusive club, and would have the very relevant experience of these others on which to rely in its creation.

- **Relatively broad scope of services**—The Capitol Corridor area is not yet a hotbed of start-up ventures, certainly not the way Silicon Valley is and was. Accordingly, one of the higher value offerings of an incubator here would be the aggregation in one location of a fairly broad range of venture development services. These services would otherwise be fairly difficult for companies in the area to locate. The ultimate portfolio of services should be targeted to include:

- Legal services
- HR support (recruitment, payroll, benefits)
- Business planning services
- Market assessment and product targeting
- Financial management
- Business skills training
- Small scale manufacturing
- Product development
- Prototyping
- Technical review
- Telecommunications support
- Conference room space
- Office and cubicle space
- Proposal writing and grant application support

These services can be provided at a physical space or in “virtual space”. Some are already provided locally, but they are not all linked together in a coherent and broad offering.

- **Talented staff and advisors**—Clearly an incubator is all about people. Some who are successful in business cannot coach. Some have excellent people skills, but no

experience in business. Assembling a powerhouse stable of advisors and staff is going to take a while.

- **Explicit ground rules**—The incubator must be highly selective. It can only accept as clients those companies which have a reasonable prospect of being commercially viable. It will then need clear and explicit policies and processes for “admissions”, “graduation”, and “flunking-out”. The importance of this last should not be overlooked. One of the most destructive forces in an incubator is the presence of the “walking dead”. Companies failing to make the grade can destroy the morale of those still on the quest and can absorb an inordinate amount of staff time in dealing with their compounding problems. Clear guidelines for “eviction” will be vital.

On the other end of the process, criteria for admission must be equally tough-minded. The incubator will be measured, particularly in its first years, on its success rate. It cannot afford to go many years without a successful “graduation.” It needs to have in its entry class some quick winners, and thereafter has to develop a nose for picking the applicants with the best chances to succeed out of the pile.

”Graduation” requirements are also essential. Some incubators make it a rule not to retain a client beyond two years and reject any applicants that look like they would overstay that welcome. That may be too tough as a rigid rule, but the idea is to move companies out in about a year.

In any case, substantial effort will need to be devoted to crafting these rules, guidelines and procedures.

- **Limited number of sponsors**—Some incubators have attempted to maintain funding through recruitment of 50-100 supporting sponsors. However, the experience of these incubators appears to be that they were consumed in continuous fundraising activity—either reporting back and justifying to existing sponsors, trying to renew sponsors, or recruiting new sponsors to replace those dropping out. It would be superior to focus underwriting efforts on obtaining a limited number of (less than 10) committed sponsors that would make a multi-year pledge to the incubator and serve on a Board of manageable size. The most likely such sponsors would be the vehicle manufacturers and large energy equipment vendors. The inducement for these sponsors would be the chance to see interesting technology at an early stage and possibly the chance for them to spin out some of their own IP into a standalone start-up that would have a better chance of commercializing it. This can be a very compelling offer to these companies.
- **Venture funding**—To really be attractive, and helpful, the incubator will need its own associated venture fund. This fund would need to be allocated to various purposes:
 - Pre-seed, pre-business plan support—for a company that has a lot of promise but is at a very early stage, provide \$50-100,000 to get them started and formulate a business plan

- Seed money—up to \$500,000 to support product prototype development for a company with a compelling business plan and to prepare for Round A fund raising
- Round A venture capital—up to \$3 million for companies to get beta units in the field and only for companies that have secured outside investment as well.

That is probably as far as the incubator should go. Even in these rounds, the incubator fund should be made available only if there is a matching contribution from another source.

Beyond these needs, the companies should be looking primarily to outside investors. The next funding rounds would likely be:

- Round B and C venture capital placements—raising up to \$25 million each to fund initial commercial production and sales
- Initial Public Offering (IPO)—raising \$100-300 million for substantial production and to reach positive cash flow from current sales.

Alternatively, the companies may find routes to commercial success through selling licensing rights or being acquired.

If the incubator is only offering a place to hang out, it will be far less successful than it could be. Accumulating the initial seed/early-stage venture fund will take a great deal of effort.

Critical to the ability to gather this seed funding is building relationships with angel investors in the area as well as established venture capital firms and local companies. The Davis/Sacramento/Vacaville area is beginning to have enough of this activity to make this kind of fundraising possible.

- **Reasonable compensation**—The incubator should be compensated by a combination of fees and equity shares in the client companies. The equity share should be 2-5% of the equity in the company, as close to the founder’s price or the last external financing price as possible (a valuation basis for the company needs to be clear or the 2-5% share could be miniscule portion of the company’s actual worth). This is relatively common practice among the incubators, especially the nonprofits. Clearly if just a few of the companies do very well, it’s a home run for the incubator. As a nonprofit those gains can only go to support the incubator—not a bad thing. The suggested equity stake is modest and should be so to avoid burdening future fundraising by having such a large share of the company essentially unavailable to investors.

Companies also need to pay a monthly fee for using the incubator. There should be no confusion that the companies need to start learning financial discipline from day one. Rent and services will undoubtedly be below market for the client companies, but providing services for free invites abuse. Typical fees would be on the order of \$500-1000 per person per month. More refined fee schedules can be developed later.

Prerequisites

Studies of incubators indicate the importance of connections and deal flow. There is some question whether the Davis/Sacramento/Vacaville area has enough of both to support an incubator focused on clean energy. There are only a handful of general-purpose business incubators in the area to begin with. Taking an optimistic view, those incubators didn’t exist a decade ago, so there are signs conditions are improving.

There is a small group of angel investors active in Sacramento. These are very important in creating funding for very early-stage companies. It is not clear how big an appetite these investors have for clean energy companies. To some extent, an incubator under the wing of UCD can “pull” interested investors from across the country. There are well over 100 venture investment firms that have indicated an interest in clean energy nationwide (see NREL “Clean Energy Investors Directory”). Many of these are in California. Thus the relative scarcity in the Davis/Sacramento/Vacaville area is not necessarily fatal.

Adequacy of deal flow is another matter. The kind of physical incubator that would work well presupposes there will be enough companies to fill it, and not just work at a distance. A reasonable size for an incubator is 10-20 companies. To get and keep this many companies in the facility, and to maintain the discipline of some pretty tight “admissions” criteria, one should expect to have to review 75 companies a year. There is considerable doubt that there is the kind of entrepreneurial activity in this area that would generate 75 clean energy company prospects a year. Perhaps the number of companies in the incubator could be smaller, but there is a portfolio advantage with having more than 10. The chances of having at least one of those be successful increases with the total number of resident companies.

This relatively thin deal flow could argue for being less restrictive on the focus of the candidate companies. An expansion to include environmental companies would be logical. An expansion to include any kind of technology company is more difficult because, that step will require finding additional qualified subject matter experts as advisors and staff. It is another delicate balance. The size of the anticipated deal flow may be the key uncertainty to resolve and deal with in the next phase of this effort.

APPENDIX C

CONCLUSIONS FROM A REPORT TO THE CONNECTICUT TECHNOLOGY TRANSFER AND COMMERCIALIZATION ADVISORY BOARD BY INNOVATION ASSOCIATES

1. Based on a detailed review of the best examples, active programs to commercialize new technology in a region can have excellent payoffs.

Georgia Tech's Advanced Technology Development Center has created over 100 firms since 1980 and in 2004 these firms generated more than \$1.75 billion in revenue and 4900 jobs.

At MIT, probably the most successful in commercializing technology, 150 firms are founded per year, an average of 22 are funded, and a total of 5000 have been launched. These provide 1.1 million jobs and revenues of \$230 billion per year.

"Those firms that don't receive support in the early stages face a long hard road. Those firms that do receive management, resource, and technical support have about a 9% chance of surviving five years." Director of Purdue Gateways Program.

In ten years, UCSD CONNECT assisted 203 companies in starting and funding their businesses, of which the survivors raised \$550 million in capital and 120 are still doing business in the San Diego region.

In three years, Pennsylvania Early Stage invested \$70 million in 41 companies, leveraging an additional \$350 million. Seven companies were sold for \$1.4 billion and now employ 1500 people.

Implications: Even a less well-regarded program can have a good chance in making a difference.

2. Regions successful in technology commercialization put in place multiple components that address business needs at different stages and facilitate deal flow from one stage to the next.

Important components include:

- A business plan competition with significant participation
- An entrepreneurship training program
- A program of dinners or lunches that provide opportunities for innovators, researchers, and investors to mix and mingle

- A seed capital fund that can provide support until a technology is licensed or moves to A round equity funding
- Assistance in applying for funding from DOD, DARPA, DOE, USDA, NIST, and SBA
- A group of venture capitalists eager to fund viable new ideas
- An annual venture forum that presents new companies to the VC community
- Incubator services to coach and train innovators in business skills
- A group of mentors and advisors willing to work intensively
- A set of established businesses in related areas
- Some sort of physical facility that can be a focus for meetings, staff, and mentors

Implications: Providing stand-alone incubator services is not sufficient. Those services need to be part of a web of support. We have the beginnings of most of the components of the web but may need to augment them.

3. Networking and active engagement from venture capitalists, serial entrepreneurs, service providers, mentors, and technology leaders are critical to a region's ability to create and retain start-up enterprises.

A continuing mix of events, challenges, meetings, and informal gatherings are needed to assure active engagement, not just passive lists of supporters. These supporters are busy people and need an excuse to get together and help.

Implications: Need to have more active means to focus the networking on clean tech—special events, dinners, etc—and these will require a measure of staffing and funding.

4. Most new technology enterprises do not come from universities, but rather from employees and former employees of companies.

The data show about one-third or less of the new enterprises come from universities. However, universities are crucial to vetting new ideas and providing lab and prototyping support.

Implications: We have not identified that many companies or serial entrepreneurs in the area that are generators of clean tech ideas.

5. Commercialization programs take time. At least 20 years will be needed to assess the true success of a program.

A typical progression would have the first five firms graduating in three years, attracting about \$10 million in venture funding.

Implications: Not sure the sponsors of a program in this area are aware how much patience is required. Conversely, will need to condition expectations well and provide interim milestones that keep support alive while waiting for the payoff from the growth of successful firms.

6. The most common gap is the absence of seed capital. In most cases, success was paced by the ability of both governments and the private sector to create seed capital funds.

Instead of one-shot of seed capital, the best results seem to be from staging injections of seed money based on achievement of milestones: \$50,000 to develop a promising idea (“proof of concept”), \$100,000 to create a working prototype, \$250,000 to create a viable business model and plan with an expectation of a company start or a license in 18 months, for example.

Further, this money needs to leverage angel investment. Typically a target of 3:1 leverage is set, and is often exceeded. A tight connection with sources of angel funding is important.

Other successful commercialization efforts have managed to get half of the needed “pre-seed” money from foundations, usually regionally-connected foundations. The other half is a mix of government and private money. The private money typically was from wealthy individuals.

The return on the government investment in these seed funds has been evaluated as about 7:1 (direct and indirect).

Implications: This is likely the weakest resource in our area, and the one needing the most work to remedy.

7. Successful commercialization efforts require a champion.

Implications: There are a hundred obstacles to enhancing commercialization activity. It takes a visionary to overcome them.

8. Successful involvement of universities requires a culture of rewards and incentives to faculty for assisting the commercialization of technologies.

Successful commercialization efforts often have close linkages to R&D universities and departments. If faculty are not rewarded for assisting in commercialization, they won’t participate. Rewards can come in a variety of forms—tenure credit, recognition, time off.

9. A second connection through the university is to the alumni who are likely to be candidates as mentors and donors.

Implications: To promote more involvement of faculty, UCD should consider an “Innovator of the Year” award or other forms of recognition.

APPENDIX D

NOTES

Lewis, David A. *Does Technology Incubation Work?* Athens, OH: NBIA Publications, 2002.

1987: 170 established incubators

2002: 875 established incubators

Checked track record overall

Key challenges entrepreneurs face: lack of capital, poor management skills, and insufficient understanding of the marketplace

Public-sector direct cost per job created by investments in incubators is about \$3,000 to \$12,000 with a survival rate of 90% of incubated firms. 84%⁶ of incubated firms tend to locate locally after graduation.

Average number of clients: 12.0 for all incubators, 13.9 for Tech Incubators

Average annual operating cost of target incubator: \$448,629

Goals of an incubator:

- Produce successful firms that will exit the program financially viable and free-standing→ create jobs, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies.

Tech incubators provide:

- Below market rent for physical space with basic equipment⁷
- Access to sophisticated equipment at no or reduced cost
- Free or subsidized business services, saving the start-up firm operating capital
- Improved access to capital markets

Best Practices

Successful incubators offer a physical location where multitenant occupants co-exist. This provides day-to-day interaction with peers which is a key ingredient to success. It creates an informal network that can prove the difference in making one region more successful than another (i.e. Silicon Valley)

⁶ 82.2% for general incubators, 86.0% for targeted incubators

⁷ Rising rent rate schedule encourages timely graduation

Local embeddedness and credible relationship with tech generators (universities) and capital (investors) is extremely valuable.

Three parts ***Besides Feasibility Study:***

Facility, Type and Quality of Services, Operation and Management

Facility

Flexible space to allow for expansion

Space to accommodate new firms

High speed broadband

Specialized lab space and access to university research facilities

Complimentary Services:

Business plan development

IP Protection assistance

Legal services

Administrative assistance

Accounting and bookkeeping services

Presentation training

Grant writing assistance

Organizational Attributes

Advisory Board

Well-developed mission and goals

Carefully selected manager

Entrance and exit criteria which encourage self-sufficient enterprises

Ongoing evaluation of incubator performance

Typology

- 25% technology focused going on 40%
- 84% of incubators non-profit
- 44% draw from urban, 16% suburban, 31% rural
- Sponsoring entity 20% university, 16% government, 15% econ development

Funding

Reliable funding is important to success. Revenue varies across sponsoring entity and over time. Revenue from rent and services increases as a percent of total revenue over time →

eventually becoming the largest. Grants vary over time based geography and economy. Fluctuation results in shifting focus of the manager onto fund-raising and also may result criteria to be sacrificed for rent revenue.⁸

Growing trend... 24% of incubators take an equity stake in their clients. Royalty agreements also becoming popular. One study showed that universities that take an equity stake in spin-off companies realized a greater return in the long run relative to average revenues generated from licensing deals.

Lessons from Successful Incubators

- Level of financial stability is critical component
- Shared facilities, flexible space, credibility in the community
- Network effect of working side-by-side with peers.
- Good Manager is critical facilitating appropriate interactions
- University sponsored incubator may be slightly more successful
 - value comes from the university image, access to labs and equipment and the bench of students
 - provide opportunities for students and faculty and potential revenue stream
 - no statistical difference between private and public universities

Success = Job Creation at Lowest Cost to Public?

Total jobs created, Cost per job created

Should also include: indirect jobs created, total amount of additional income in region, increases in taxes collected

But would these companies exist if it weren't for the incubators?

For profits may be replacing non-profits. They provide more space on average. Little comparative studies have been done.

Clients' reasons for location at incubator

- Reduced Rents (46%)

⁸ NBIA emphasizes the need for predictable, reliable, long-term sources of funding.

- Nurturing environment (20%)
- Space meeting needs (16%)

Regional Considerations

Regional characteristics that increase the likelihood of successful incubation:

- Presence of one or more technology generators (university, national lab or private R&D lab)
- Sufficiently skilled labor force
- Technology culture
- Sufficient investment capital activity in the region

Client firms grow faster when there are large corporations nearby or government agencies who will buy products. Also client firms tend to have more successes in the presence of a university.

Reasons for failure (anecdotal)

- Inflated expectations
- Selection of wrong manager
- Overestimation of incubator's role in an econ development plan
- Overspending
- Failure to leverage resources

Good incubator managers

- Have diverse skill set
- Good problem solvers and prioritizers (get stuff done)
- Passion for detail coupled with ability to multi-task
- Team player and knowledgeable of community
- Motivated by challenge

Questions to answer:

- Do incubated tech firms outperform similar nonincubated firms in economic terms
- Are there locational characteristics that enhance or dampen the performance of tech incubators?
- Do interinstitutional linkages, cultural milieu, and public policy play significant roles in the trajectory of an incubator?
- Are there complimentary policies at the state, regional, or local levels that improve the returns on public investments?
- Is there a need for public investment in incubation?

APPENDIX E

NOTES FROM MEETING WITH PACIFIC INCUBATION NETWORK HOSTED BY JIM ROBBINS, JUNE 28, 2004

Robbins—Only three realistic ways to fund an incubator

- Get a free building
- Get a consistent committed group of sponsors
- Create a series of special programs that can attract funding for a few years (then create the next one)

Sector focus increases the willingness of donors and supporters to contribute. In fact try to create some sort of standard term sheet that explains what a donor will get for a contribution at various levels—Board seat, invitation to quarterly meeting, invitation to annual pitch day, name on brochures and documents, etc.

Business plan essential for an incubator. Otherwise it is just drifting.

EBC is creating a clean transportation project with a lot of local support, and this project could become its own incubator. Nearly identical to ITS interest in Davis incubator. Could be competitive with it.

Incubators should be flexible and adapt to changing conditions—essential to keep sponsors interested

Incubators are moving to higher degrees of specialization as a means to attract more interest

Essential to have success metrics and report back to sponsors on what they are receiving for their “investment”—jobs created, sales tax revenue generated, interesting leads to companies, etc.

Distinction between sponsors (contributor that receives benefit and exposure) and partners (organizations that add value to the incubator and to which the incubator adds value)

Citigroup gives grants to local incubators that are focused on creating economic activity, esp. among minority populations and in economically depressed areas.

What makes an incubator attractive for foundation funding? A special program that aligns with foundation objectives. Acquisition of something tangible, like a building. In general, foundations are a tough sell. One of the best ways to overcome resistance is to have the incubator strongly associated with a university. Foundations reluctant to donate without imprimatur of a university. Otherwise they put up a lot of hurdles such as number of years in existence, experience of

management, etc. All that tends to melt away if one can say the incubator is associated with a university.

How do you fill an incubator? Great PR. Every time a client joins, get an article. Each media article generates phone calls. Phone calls generate leads. Leads turn up qualified clients.

In a feasibility study, establish who your most likely contributors would be:

- For funding go to your most prominent local employers (for Davis, that would be UCD).
- For non financial support, find your local resources—business groups, economic development entities

“Clean energy” may be too narrow a focus; “environmental” may be a better and more support-attracting label.

EBC is funded one third from long-term grants, one third from continuing annual sponsorships, and one third from special programs (and the CEC funding counts as a special program in Jim’s mind).

APPENDIX F

EXAMPLE OF SUCCESSFUL INCUBATOR LAUNCH

Renewable Energy Incubator Launches in Rochester

Tuesday July 6, 2004 3:36 pm ET

'RENEW NY' Supports Clean-Energy Start-Ups, Jobs in Western New York

ROCHESTER, N.Y., July 6 /PRNewswire/—Leaders of the New York State Energy Research and Development Authority (NYSERDA), High Tech Rochester, Greater Rochester Enterprise (GRE), and Rochester Institute of Technology, announced the formation today of the Renewable Energy Network of Entrepreneurs in Western New York (RENEW NY).

RENEW NY is a collaborative effort focused on identifying, incubating and creating renewable energy companies in Western New York. Renewable energy sources include wind, hydro, solar, biomass and geothermal power.

NYSERDA President Peter R. Smith, said: "The establishment of RENEW NY is another step forward in carrying out Governor Pataki's vision to promote energy efficiency, diversity and security, while protecting our environment, and improving our economy. This Network will bring a unified approach to our mutual efforts in Western New York, and produce benefits for the entire State."

The incubator's goal is to create a cluster of renewable energy companies in Western New York, defined as the geographic region west of Interstate 81, including the areas of Syracuse, Binghamton, Ithaca, Corning, Rochester and Buffalo. One of its primary goals is to market these firms to other companies throughout New York State, both for potential partnership opportunities and for business transactions. It will also assist firms in reaching out to a broader audience out of state.

"RENEW NY demonstrates that Western New York can work together as a large region to compete more effectively in a large, rapidly growing industry sector," said Paul Wetenhall, Executive Director of High Tech Rochester (HTR) and Project Director for RENEW NY. "Our renewable energy entrepreneurs will need world-class capabilities to compete successfully and this program will help them leverage the considerable resources of this region."

The incubator will create a catalogue of renewable energy companies and resources in the region and establish an inventory of all the clean-energy intellectual property available in the area. It will also match entrepreneurs with seed capital; assist with grants; provide coaching, mentoring, education and training; offer networking opportunities; and raise overall awareness of renewable energy companies in Western New York.

"GRE and our economic development partners are thrilled to announce RENEW NY," said Michael Finney, President and CEO of Greater Rochester Enterprise. "High-technology

incubators are supporting businesses and creating jobs all across the country, but an incubator specifically designed to nurture clean- energy companies is a new concept. With RENEW NY, Rochester is now home to one of the few clean-energy incubators in the country, reflecting once again that our region is on the cutting edge and reinforcing our position as a leading hub in the alternative energy and fuel cell industries."

Rochester is not the only region focused on clean energy in New York State—Albany is home to renewable energy companies as well. Smith noted that NYSERDA established the Saratoga Technology + Energy Park, (STEP, near Albany) last year to host clean-energy business and industry. The Park's current structures are now full and new buildings are being developed.

Funding for RENEW NY is provided by NYSERDA, which is contributing \$150,000 toward the effort. Additional contributions come from HTR, GRE, RIT, and the Ennovation Group, a Rochester-based consulting firm that will provide incubation and other services to RENEW NY client companies.

NYSERDA awarded the contract to HTR, with GRE, RIT and the Ennovation Group as participating organizations. Ennovation Group partner Larry Simpson serves as RENEW NY's Incubation Director. RENEW NY has an office at the RIT High Technology Incubator, 125 Tech Park Drive, in Henrietta, but will operate primarily as a virtual incubator.

About NYSERDA:

The New York State Energy Research and Development Authority is a public benefit corporation created in 1975 by the New York State Legislature. NYSERDA has successfully developed and brought into use more than 140 innovative, energy-efficient, and environmentally beneficial products, processes and services. NYSERDA also administers the New York Energy \$mart(SM) program, which assists the State's businesses and consumers in implementing energy- efficiency measures.

About HTR:

High Tech Rochester is a nonprofit organization focused on regional economic development in the technology and high-growth business sector. HTR assists the development of new and emerging businesses through its business incubator, the Lennox Tech Enterprise Center. The incubator provides accelerated growth and success opportunities to entrepreneurs and start-ups. Through its Manufacturing Extension Partnership, the organization improves the competitive position of small manufacturing firms. HTR collaborates with academic and research institutions, businesses and professionals to support innovation and technology commercialization.

About RIT:

Internationally recognized as a leader in computing, imaging, technology, fine and applied arts, and education of the deaf, Rochester Institute of Technology enrolls 15,000 full- and part-time

students in more than 300 career-oriented and professional programs. U.S. News and World Report has consistently ranked RIT as one of the nation's leading comprehensive universities.

About GRE:

Greater Rochester Enterprise (GRE) is a public-private partnership established to professionally market the Rochester metropolitan region as a competitive, high-profile place for business location and growth. GRE will collaborate with business, academia, not-for-profit organizations and government to ensure a unified approach to regional economic development efforts.



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