

# Key Success Factors in supporting Clean Tech start-ups: A General Framework and an Italian experience

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## ABSTRACT

University technology transfer is seen as one of the prominent sources of new energy innovation. Due to the global drivers leading to increasing interest, opportunity and necessity of clean technologies, many universities have business incubators which are now looking to enter the clean energy space. It is therefore important for both incubator management and clean technology entrepreneurs to understand the commercialization strategy distinctive to 'cleantech' nascent technologies and start-up companies. The clean technology sector is significantly broad and therefore this research provides a *general framework* (fig. 1) of the key success factors (KSFs) in both the strategy of commercialization of clean technologies and the best practice incubation strategy necessary to foster successful clean technology start-ups.

**Keywords:** high tech start-ups, commercialization strategy, business incubator, key success factors, cleantech.

## METHODOLOGY

A range of sources of information was used in compiling this study including international literature and reports, conferences and interviews. Case studies on successful university research and development (R&D) and incubation in the clean technology sector were also used to consider some best practices in what is still a fast growing and evolving environment.

## 1 COMMERCIALIZATION STRATEGY

### 1.1 Opportunities

Various opportunities are presented in the clean technology sector as the area is broad encompassing a number of different sector verticals across a range of converging technologies. Demand is also wide ranging from end user application to large industrial and utility needs posing opportunities for trillion dollar markets [1].

The social awareness of climate change is at all time high with such support from key change agents such as Al Gore and publications such as the Stern Review, outlining the economic significance of climate change mitigation.

### 1.2 Challenges

Slowing world economy, volatile energy markets, and national security concerns have lead to increased governmental focus on economic prosperity and energy security through clean technology investment [2].

Challenges of nascent cleantech companies include facing a long time to market and large upfront costs which require support from government and industry. Building these small-to-large partnerships maybe difficult given such phenomena as the "innovator's dilemma", global IPR concerns and the controlled network of energy distribution [3].

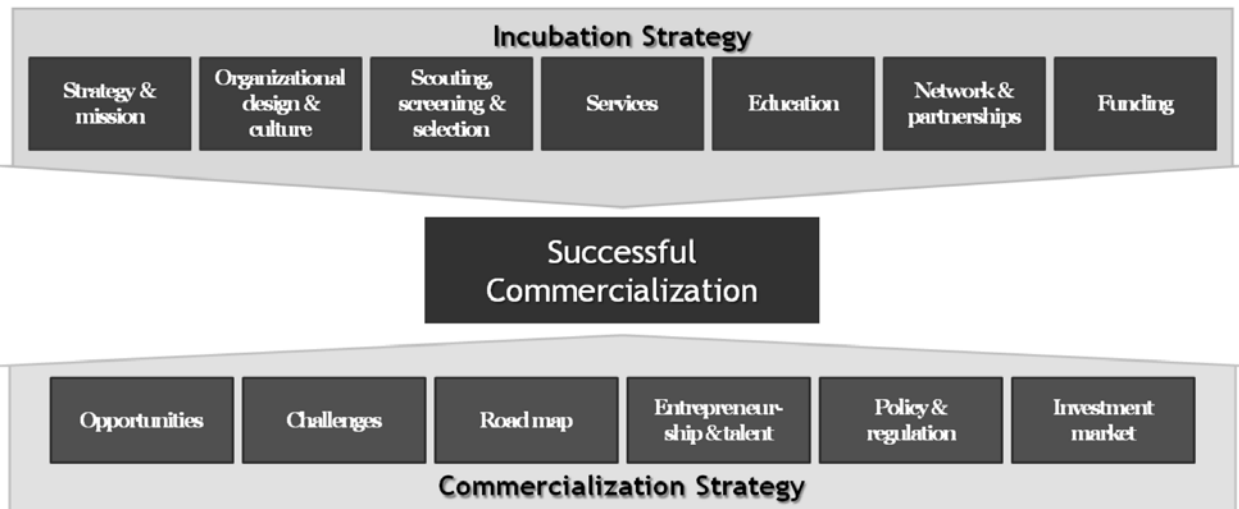


Figure 1. A General Model of Cleantech Commercialization KSFs from Start-Up and Incubator Perspectives

Given the general long time horizon of clean technology commercialization, funding gaps exist between the R&D and scale-up phases as investors wait given the increased uncertainty of their investment and long time to exit.

### 1.3 Roadmap

Although the commercialization roadmap of cleantech is very much dependent on the type of technology, some notable barriers exist such as the gap between public and private funding known as the “Valley of Death”, steep learning curves and entrepreneurs’ lack of business and market driven expertise, cause many technologies to stay trapped in research labs and never reach the point of scaling [3].

Overcoming such barriers along the commercialization continuum involves strong government support, funding bridges such as grants and seed funds and strong collaborative efforts with industry and the business community for symbiotic and mutually beneficial relationships [4].

### 1.4 Entrepreneurship & Talent

A strong management team for cleantech start-ups is seen as one of the most important factors to successful commercialization. Moreover, maintaining entrepreneurial spirit within management is crucial to creating real value in clean technology companies [5]. Entrepreneurship specifically in the energy sector has certain barriers when compared to the available talent pool of information technology (IT) and software developer entrepreneurs. Such barriers include the need for multidisciplinary competences spanning the converging topics surrounding cleantech (e.g. anywhere from electronic engineering to life sciences) [6]. An energy entrepreneur should also be particularly savvy in environmental policy while also successful at managing the required network, industry and government dynamics [6].

This will require entrepreneurs in other fields to be re-trained in the cleantech space in order to ensure the adequate management acumen available to grow nascent clean energy companies.

Talent scarcity is also a general issue across the green collar job market with many CEOs finding it difficult to fill the talent gap in this field [7].

### 1.5 Policy and regulation

Policy plays an extremely important role in the development of new clean technologies given the capital intensity and commodity nature of energy. Such policy interventions include traditional regulation, carbon pricing and innovation policy all supporting both the supply and demand side of new energy research, development and deployment [2].

Furthermore understanding and capitalizing on price support systems is an integral factor of clean energy diffusion and is suggested to be the most popular policy mechanism to support new energy technologies in the future [2].

### 1.6 Investment market

Projected growth in the clean energy is robust with USD450 billion projected worldwide capital investments in 2012, USD600 billion in 2020 and reaching a potential cumulative USD45 trillion invested in renewable energy technologies by 2050 [8]. Investment in clean energy in 2008 fared well given current conditions rising to USD155 billion world-wide in comparison to USD148 billion in 2007.

Falling commodity prices, pressure on the housing and construction industries, and regulatory uncertainty contributed to sell-off [2]. Early stage financing remains uncertain as many venture capitalists opt for later stage rounds. This poses a problem to early stage technologies by augmenting the funding gap. Some Venture Capital (VC) firms have criticized this reluctance in early stage investment stating that it will only hinder the development and dispersion of breakthrough technologies in the sector [9].

However the industry still has very strong growth prospects and current market conditions have corrected stretched valuations seen in some sectors including solar and wind in 2006 and 2007 [2]. The downturn has also pushed out the non-serious players in cleantech investing leading to a longer-term and more sustainable focus to investing in the sector [10].

## 2 INCUBATION STRATEGY

### 2.1 Strategy and Mission

There is a broad range of factors affecting the strategy of new energy (fig. 2). The evolution and trends of European incubators is to move to a profitable incubation model. With this in mind incubators should direct their strategies and missions to complement clean technology bottom line themes of “People, Planet, Profit” with a specific interest in social developments such as green collar job creation and carbon emission reduction. Appropriate social, financial and environmental KPIs should be used for the measurement of cleantech activities and alignment to both social development goals and incubator mission.

Management of university incubators currently focused on other sectors looking to enter the clean technology space, should align strategies to those conducive to successful clean technology commercialization. Such strategic decisions include return and revenue sources, technology source, technology type, level of engagement and phase of intervention [11].

### 2.2 Organizational design and culture

Given that a strong network is a KSF of cleantech commercialization, organizational design should focus on the successful management of network links [13]. Strong management and support systems will also be needed in managing virtual incubation [14] as many clean technology startups will require facilities beyond the capabilities and

capacity of traditional incubator office space (such as those needed for IT start-ups) leading to increased decentralization of portfolio companies.

The creation and development of an innovative culture in the surrounding university and community will be critical in enhancing the scouting activities and attracting new ideas to the incubator. Four main criteria of culture favorable to innovation and entrepreneurship in cleantech include [15]:

1. A local investor community
2. Entrepreneurs that have an innovative product and want to get rich
3. Government support systems
4. Educational environment: the source of entrepreneurs and employees to push technology forward

### 2.3 Scouting, screening, and selection

As energy entrepreneurship encounters various barriers and talent scarcity, novel and wider reaching scouting methods will be needed to find new and promising technologies for incubation. Important ways of achieving this is through scouting international opportunities, especially in emerging markets and also having strong incentive schemes such as grants and seed funds to encourage and attract high quality researchers and entrepreneurs.

Opportunities for cross fertilization of incubated companies exist in specialization or clustering of common technology typologies within the cleantech space to benefit from knowledge transfer between start-ups and benchmarking [16].

Another consideration in selection for the portfolio mix is the timeline of various technologies and stage of development. For example some efficiency technologies may prove more viable in the short term as compared with other radical energy solutions which have a longer term focus and thus portfolio mix selection should take into consideration such factors.

### 2.4 Services

Ownership of complementary assets helps in establishing who wins and loses from innovation with imitators often outperforming innovators if better positioned with respect to complementary assets [17]. Therefore an incubator's service offer can be assumed to be of vital importance to tenant companies. Clean technology start-ups require a mix of services which may differ in importance than other industries. Such services include specialized facilities and equipment leasing programs, a strong network leading to partnership opportunities, increased funding and financial advice and multidisciplinary technical support. Also a strong support on marketing, sales and business development activities should be offered as these areas often lead to underinvestment in cleantech start-ups compared to other industries [18].

### 2.5 Education

In order to assist cleantech start-ups in initiatives ranging from industry outreach, networking events, scouting, business coaching to technical support and advice, it is advantageous to have cooperation and support from all relevant departments within the university. Such departments as business schools, scientific and technical based departments, professors and other interested parties can be linked to help incubated start-ups through initiatives created through a formal energy initiative. Such initiatives have proven successful in prominent clean technology R&D focused universities in the United States and have lead to less fragmentation of contemporaneous departmental energy activities.

### 2.6 Network and Partnerships

As a key success factor of the commercialization process of nascent cleantech companies, a strong multidisciplinary network is needed with very early participation in order to reduce uncertainty and increase flexibility along the roadmap.

The network should be a key source of human, intellectual, physical, social and financial capital [19] to nurture startups into speedy and successful commercially viable ventures. The network can be a source of more formal arrangements, partnerships or governing boards which can prove mutually beneficial for both parties if the partnership process is aptly managed.

The critical factors involved in the best practices of managing such partnerships include; fulfillment of the technical and business missions, managing social capital and assigning the right collaboration agent who handles the stages

Factors	Extremes	
Technology status	<i>Mature</i>	<i>Embryonic</i>
Technology know-how	<i>Low</i>	<i>High</i>
Industrial basis	<i>Weak</i>	<i>Strong</i>
Raw materials	<i>Scarce</i>	<i>Abundant</i>
Production location	<i>Foreign</i>	<i>Domestic</i>
Manufacturing units	<i>Small</i>	<i>Large</i>
Business consolidation	<i>Horizontal</i>	<i>Vertical</i>
Industry structure	<i>SME</i>	<i>Centralized</i>
Innovation system	<i>Fragmented</i>	<i>Networked</i>
Innovation type	<i>Incremental</i>	<i>Radical</i>
Market		
– <b>Geography</b>	<i>Domestic</i>	<i>Global</i>
– <b>Size</b>	<i>Small</i>	<i>Large</i>
– <b>Status</b>	<i>Mature</i>	<i>Embryonic</i>
Timing	<i>Late</i>	<i>Early</i>
Policy measures	<i>R&amp;TD</i>	<i>Market deployment</i>
Public funding	<i>Small</i>	<i>Large</i>
Value positioning	<i>Component</i>	<i>System</i>

Figure 2. Factors affecting new energy strategy [12]

Selection and screening should also be more rigorously approached compared to ICT as the needs of nascent cleantech companies including services and support and thus cost, will be higher than the more autonomously run internet start-ups.

involved in the process [20]. Support systems using information technology can be used to assist the management of the partnership process including connecting collaborators [20].

## 2.7 Funding

While venture capitalists are excellent at identifying nascent innovation cycles they have been somewhat criticized for their herd-like mentality in cleantech investing by going into sectors where money is already flowing [9]. Furthermore the venture capital investment timeline is also relatively short compared to the investment horizon required for energy ventures and combined with the current economic uncertainty, has meant a majority of firms are unwilling to take technology risks at early stages.

Therefore in order to successfully bridge the gaps in the commercialization roadmap, and spur much needed early stage radical energy innovations, governments, utilities, industry, universities and even venture capitalist will need to provide more early stage financing to cleantech start-ups including small seed funds, grants, venture leasing, and loan programs. This will require an evolution in the mix of financing options traditionally available to start-ups. The challenge for incubators operating in the clean technology sector is to provide access to a range of such financing options to incubated companies to accelerate clean technology commercialization while also allowing for financial sustainability of the incubator and financial partners.

## FURTHER RESEARCH

This study is limited in its depth as it considers the cleantech sector as a whole and therefore provides only a general framework to the important aspects of commercialization. Further and more specific research needs to be conducted within each industry of clean technology including primary quantitative and qualitative research to understand how different technology typologies differ in appropriate commercialization strategy.

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