STRATEGIC FIT FOR NEW BUSINESS INITIATIVES FOR AN ENVIRONMENTAL ENGINEERING FIRM

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ABSTRACT

Engineering consulting firms have a limited set of options to enhance revenues. Engineers sell time and similar services to competitive firms. They are rapid followers not differentiators. To enhance revenues from other sources, an engineering firm has to invest non-billable time in riskier business ventures.

This project explores how a firm could achieve differentiation by examining two new business initiatives that may provide enhanced revenues by entering an emerging industry called CleanTech. This industry is complex and varied; characteristics that may provide market entry opportunities that they can exploit if the firm's partners can manage their propensity for loss aversion.

One option is to provide advisory services to developers and investors in CleanTech. A second option is to assemble technologies and manage consortiums taking solutions to global markets. Managing consortiums may provide a better return on investment. The Advisory service may be too incompatible with the firm's core competency.

EXECUTIVE SUMMARY

NovaTec Consultants has been a traditional environmental engineering consulting firm. In 2004, they decided to take a non-traditional route to find and develop opportunities to do more than just sell hours. A business strategist was hired to develop a separately branded advisory service called Green Due Diligence to facilitate the commercialization of new environmental technologies (CleanTech) and the company started to explore other new potential service areas such as managing consortiums. CleanTech refers to companies developing solutions for alternative energy, pollution prevention and resource efficiency.

The assumption was made that there was a primary and secondary target market for these advisory services. The primary focus was to cater to investors who were contemplating making investments into CleanTech companies. NovaTec would advise them on the efficacy of the technology and/or to develop more appropriate market entry strategies for companies in their investment portfolios. The secondary market was assumed to be CleanTech developers at the commercialization stage who needed market entry strategies and access to financing. As NovaTec explores the potential for these services and performs more market research, it is becoming apparent that there are challenges with realizing value from these target markets and from the Advisory service itself. There may be other functions that would be lucrative such as managing consortiums, or it might be more important to narrow or adjust the focus of Green Due Diligence.

This project document seeks to review these market opportunities, their challenges and to see if there are alternative solutions for developing and growing enhanced revenues so NovaTec can lead itself away from just selling billable hours.

To understand whether these are appropriate businesses and markets for NovaTec to enter, the company needs to understand the peculiar nuances of the CleanTech sector. The CleanTech industry is characterized as early stage with markets at various stages of development around the world. Developers, Buyers and Investors are dispersed geographically and the community is populated with pioneering types on both the investment and developer sides of a transaction.

NovaTec sells engineering and business consulting services. Pioneering companies tend toward self-reliance and independent action. Developing CleanTech companies need to be willing to access and retain consulting support or to join consortiums in order for NovaTec to grow revenues. Yet, many CleanTech inventors who have formed companies tend toward behaviour that does not seek such assistance nor collaboration with peer companies. They are often categorized as "lone rangers" out to prove themselves. Getting assistance runs counter to this motivation.

The CleanTech industry is immensely complicated economically and technically which makes the knowledge of how to commercialize any particular business difficult to package. However, it is also this very characteristic that opens up opportunities to those firms who can aggregate products, knowledge and service into solutions that minimize the transaction costs for producers to make it easier for customers to buy. It is this kind of effort that is required to aid the adoption process of environmental technologies and reduce the pain of switching costs for customers. The question for NovaTec and this thesis is can profits be made in the sector and if so,

which market will bring the best return on investment for their limited resources and loss averse nature.

Regardless of which market is selected, NovaTec will still have to evolve the appropriate services by trial and error to discover which companies will retain NovaTec for certain services and which market segments are not commercially viable. These factors add elements of risk for company growth, use of scarce resources and revenue generation.

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A program like the Executive MBA and a daunting project like this thesis needs inspiration from many sources. For those reading this project I offer a quote from Goethe which I found often delivered a second wind:

> *Until one is committed, there is hesitancy, the chance to draw back, always ineffectiveness. Concerning all acts of initiative and creation, there is one elementary truth, the ignorance of which kills countless ideas and splendid plans: that the moment one definitely commits oneself, then providence moves too. All sorts of things occur to help one that would never otherwise have occurred. A whole stream of events issues from the decision, raising in one's favor all manner of unforeseen incidents and meetings and material assistance, which no man could have dreamed would have come his way. Whatever you do, or dream you can, begin it. Boldness has genius, power and magic in it.*
>
> *Begin it now.*

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1 THE COMPANY

1.1 Introduction

NovaTec Consultants, Inc. is a 20 year old environmental engineering firm that seeks to find more strategic methods of earning revenue. Currently it sells consulting services by the hour to government, industry and commercial companies needing water and wastewater treatment. Growth in revenue only occurs by increasing billable rates. The company could add more consultants but this adds to their fixed costs and puts the company at the mercy of economic swings which could require downsizing. NovaTec is exploring several other options to enhance their revenues. Their efforts to date to grow have had mixed results.

With the emerging interest of solving environmental problems and increasing regulation around the world, NovaTec believes there might be opportunities to capitalize on expanding their services to focus on value-added projects that increase revenue. This emerging industry has been labelled clean technology or CleanTech. Investment in CleanTech has increased substantially in the last four years with 4% of all investments going toward companies with water and wastewater treatment technologies. The term CleanTech covers new technologies in energy, advanced materials, green building, water, wastewater and greenhouse gas reduction that efficiently and economically reduce environmental impacts.

NovaTec has chosen to simultaneously diversify and penetrate markets within their core competency to solve their revenue growth problem. As the demand for CleanTech grows, NovaTec has realized there are few people who understand how to validate these new technologies and commercialize them successfully. Their research brought them to the conclusion

that they may be able to increase revenues by diversifying their offering to include commercialization services to the entire CleanTech sector, not just water and wastewater treatment. They found and hired an experienced senior business consultant to build a branded advisory service that could earn consulting and success fees helping clients in the CleanTech sector commercialize environmental technologies. By retaining this consultant they hope to realize synergies on consulting projects where their technical expertise would also be required by a client needing marketing or growth strategies.

To further penetrate within their own area of core competency, (the water and wastewater industry as a segment of CleanTech), they also recognized the need for developing countries to learn how to reuse water. In another initiative, they helped to form a consortium of companies that collectively can design, build, own and operate water reuse systems for the global market place. This initiative is still in the research phase. The advisory service has been branded Green Due Diligence and was launched earlier this year.

While NovaTec seeks to expand revenue opportunities beyond selling billable hours, elements of their history also hamper this initiative. NovaTec tends to be loss averse at the very moment when risk taking behaviour is required.

This paper explores how these changes in strategic focus toward the CleanTech industry and where market opportunities might exist that suit their core competencies and tolerance for risk. It evaluates the barriers to entry and how NovaTec may or may not be able to earn higher returns by offering new services such as Green Due Diligence or consortium management services.

1.2 An Overview of NovaTec Consultants, Inc.

NovaTec Consultants, an environmental engineering firm has started a new division to separately brand an advisory service to provide technology developers with commercialization services, and investors with technology verification for the CleanTech industry.

The company has retained a senior consultant to build this division and establish the brand. NovaTec typically expects a senior consultant to be responsible for their own business development and build up a client base so that they cover their salary 2.3 times. They are expected to work with minimal resources until the unit can pay for itself.

NovaTec hopes that this advisory service will be able to collect revenues over and above typical hourly project fees. The advisory service should also be able to negotiate success fees for making introductions to financing sources and joint venture partners. These types of activities can typically return a stream of royalties for a year or two which could substantially increase revenues. The time frame for growing a new business unit should typically be at least one year. NovaTec partners are more comfortable with a 6 – 9 month business development period. If the business unit is not producing adequate revenues in this time frame, they have been known to cancel the project and/or let the consultant go.

The CleanTech sector is fairly new and comprises environmental technologies that can replace incumbent solutions more efficiently and/or cheaply while achieving improved performance. As a nascent sector, it is also a high-risk industry with many challenges, complexities and barriers to entry. It is unclear whether a small consulting firm can grow and prosper within this industry and current geographic location. It might be able to augment

revenues in the same way as adding additional consultants now provides. The real question is whether additional revenues will be forthcoming in the time allotted, thereby making the investment in the additional consultant and support staff meet their goals of diversifying their revenue stream.

While the senior leaders and the consultant initially chose the investment industry and small emerging companies as its target market, four months into the business development phase, there is some doubt that these are the most lucrative markets for several reasons. Specifically:

1. Potential clients are widely dispersed across North America which makes finding them and providing relevant service difficult.

2. Small companies at the commercialization stage often don't have the necessary funds to pay for consultants.

3. The investment industry varies greatly in their attitude toward retaining outside experts to advise on technical due diligence.

4. NovaTec has technical expertise in water and wastewater treatment which is only one segment of the CleanTech industry.

While the water and wastewater treatment market was a $203 billion industry in 2002 (Llovera 2005), new companies in this segment received only 4% of all invested funds last year which represents only about seven investments, not a substantial market.

NovaTec may have to reassess their target market and reconsider the strategic fit of incorporating a CleanTech consulting boutique within an environmental engineering consulting firm.

NovaTec has traditionally chosen not to invest in proactive marketing, adding un-billable resources or attempting to grow the company before now. If the market analysis suggests that they need a larger team of people to make the Green Due Diligence service successful, they may not invest further to achieve this without early results. Like many small companies, they have an ad-hoc approach to business development, intolerance of risk and lack supporting resources. This means that leaders in these business units have to bootstrap their early efforts until substantial results are seen. While this approach may prove to be a difficult hurdle for unit leaders to achieve, it also provides a way to validate the opportunity before investing risk capital. This is NovaTec's management style.

1.3 Company Organization

NovaTec Consultants, Inc. has been attempting to become more intentional about changing its strategy in the last three years. They would like to be an innovator and differentiator but are still in the transition phase of this effort.

A consulting firm can grow revenues only if it increases the number of people who can effectively sell billable hours for expertise. This is not a scalable business model and NovaTec attempted this route several years ago and then needed to downsize as the economy sank after 9/11. Growth and revenue generation is limited within a traditional consulting model. In order to break out of this limitation, the company is attempting to leverage its knowledge base by exploring a wider variety of projects that might yield recurring revenue not related to billable hours. This includes looking at commercializing technology they have discovered or helped improve, taking success fees for performance, finding ways to be a trusted advisor on retainer, and organizing and leading consortiums of companies to enter global markets that they could not enter on their own.

NovaTec is known in Canada and the Western United States for water and wastewater treatment process engineering. They are troubleshooting specialists able to advise on technology, the regulatory environment and process design to improve, retrofit or build new systems.

NovaTec has gone through several cycles of growth in the past and has built a solid reputation in North America for their ability to deal with difficult water and wastewater problems. In the process of growing and subsequently downsizing, they've learned that there is an optimum size for a small engineering company if it is only going to rely on billable hours. At fifteen people, the company can get by with low overhead, and the partners are not consumed with management issues. They tend to take on smaller projects and will pursue partners for larger projects to mitigate their risk. Revenue is stable and reliable but is not growing due to this limited approach.

NovaTec's reputation has allowed them to rely on word of mouth to bring business to the door for their traditional business areas. For NovaTec's partners, this strategy has worked until now for two reasons. They have remained small and nimble, retaining high autonomy talent and work in industries with low asymmetric information where people share knowledge with each other. However, as they broaden their product strategy into the CleanTech sector, they may have to change their marketing approach and perhaps their tolerance for risk while investing in more resources for business outreach and market research to increase their network and visibility in order for these new business units to achieve results. These are non-billable activities that increase fixed costs and may not provide a return on investment.

NovaTec likes to hedge its attempts at entering new market areas by relying on new hires to prove themselves first before they invest additional resources. If the effort fails, the

partners re-position or let go of the employee and abandon the initiative. This low risk, under-resourced approach may defeat their attempts at revenue growth.

1.4 Services Offered and Market Niche

NovaTec currently offers three kinds of solutions to four different broad target markets.

Their solution set includes:

1. Technology verification
2. New ways to deal with old problems
3. Regulatory advice

Their target markets include:

1. All levels of government
2. New building or infrastructure
3. Shipping and Forestry Industry
4. Technology developers and investors

1.4.1 Service Offerings: Technology verification

This service has grown from NovaTec's advisory services to governments. They understand the regulatory environments, see many new technologies that governments review and are highly skilled at assessing the efficacy of a field test. A technology developer can claim that an independent expert proved their system can perform at a certain level. However, the testing methodology may allow bias toward a favourable claim. NovaTec is able to review the test results and identify where the testing process may not be representative of the technology's performance. Alternatively, they are also able to determine whether a new technology will actually effectively solve a problem. These services are vital for government as they attempt to upgrade their existing

systems. This due diligence service is also now being recognized as useful by strategic investors and investment banks preparing to take companies public.

1.4.2 Service Offerings: New ways to deal with old problems

As regulations tighten and the public demands improved methods for dealing with environmental problems, new technologies and challenges emerge. The cost of replacing old solutions with a new innovation is substantial. There are economic effects, technical effects and risks. New technology that has not been effectively proven in the field often will never get adopted despite its technical merits. NovaTec is valued for its independent audit and verification ability which government relies on to reduce the risk of making investments in innovation.

The new advisory service will now also be able to augment NovaTec's technology verification by also helping inventors mature their solutions so they are effectively proven and market ready. Some inventors can be brilliant at developing technology and ineffective and incapable of forming an investment-grade business strategy to capitalize on their solution. Buyers purchase solutions, rather than technology. Green Due Diligence adds value to the commercialization process by refining technologies into product solutions that can then be tested in appropriate situations that make sense to buyers. These types of services are sold by the project hour. Additional revenue may be achieved by aiding the innovator to also enter new markets and develop sales and/or by making introductions to funding sources.

1.4.3 Service Offerings: Regulatory advice

Technology developers often bemoan the fact that existing legislation or government's risk aversion toward innovation forecloses their opportunities to get their technology adopted. Yet it takes years for regulations to change and for conflicting policy impacts to be remedied. The public does not want its money spent on risky innovation, yet many

of today's problems need such solutions. Policy makers often need assistance from industry to know which policies are constricting the flow of innovation and which are opening loop holes for conflicts or risk. NovaTec provides such advisory services for policy makers as well as to technology developers. For developers, knowing how to work around a regulation or apply their technology in new ways that don't encounter regulatory barriers is a much needed service. For instance, water reuse is becoming an important green building technology. Yet in many jurisdictions they have yet to form or refine regulations in a way that developers can easily install water reuse systems. Regulations for water reuse are fragmented across several levels of government (city, county and provincial or state) and functional areas (health, environment, planning, finance, utilities) and often are at odds with each other. NovaTec aids clients by designing a solution that is acceptable to all parties and then is able to exert influence on government representatives to clear up ambiguities between regulatory bodies.

1.4.4 Target Markets: Government

The environmental engineering water and wastewater treatment world is quite small. Municipal engineers talk to each other often which create network effects so that NovaTec is recommended by many branches of government. NovaTec offers engineers problem solving, advisory services to improve their regulatory frameworks and third party verification of new solutions they are considering. For government regulators, they provide some innovations but NovaTec's strategy here is to serve as the reliable trusted advisor to ensure municipal systems keep operating at optimum levels. According to a recent study by Trilogics (Damm, 2004), 60% to 80% of a municipality or city's operating budget in North America is spent on optimizing existing technologies, while only 20% is assigned to introducing innovative technologies. This trend is starting to change due to the increasing failure of aging water and wastewater infrastructure. The Canadian federal government has recognized that municipalities do not have

the resources to re-build and has committed $3 billion in assistance. Learning how to employ innovation at an acceptable level of risk is now high on city managers' agenda. Organizations like the Innovations Group in the US teach city governments how to change, adopt innovation and set up public private partnerships to offset risk and fund improvements. More than 350 cities across North America now belong to the Innovations Group. NovaTec is attempting to position the company to provide services to ameliorate theses growing infrastructure problems by providing advisory services.

The senior partner in NovaTec is active in maintaining relationships with city governments by serving on advisory boards, responding to engineers' questions in discussion threads and attending municipal engineering and standards conferences in both Canada and the US. These activities maintain NovaTec's leadership presence. NovaTec is now being cited by the BC provincial government for leading the effort to form a consortium to provide rural areas and small towns with water management systems so that they can ensure safe drinking water for inhabitants. WaterSmart BC has eight member companies whose services and equipment form the complete water management solution.

1.4.5 Target Markets: New building or infrastructure

For industry, NovaTec provides innovative and differentiated high quality services such as designing new water reuse systems for buildings, re-engineering problem equipment, providing analysis of regulatory frameworks and how to get new innovations to fit the regulations. In this capacity, they are sought out by other multi-disciplinary engineering firms to sub-contract to them to do this work. However, after the contract is complete, NovaTec does little to keep the relationships active or investigate other projects they could do jointly. This keeps much of their water reuse technology and expertise now being asked for by industry, away from

the markets. Early relationship building and positioning would have put NovaTec in the forefront of this emerging need. More attention is now being paid to developing these kinds of networking connections now that NovaTec has been retained to manage a water reuse consortium made up of 20 companies that hope to develop business opportunities in China.

1.4.6 Target Markets: Shipping and Forest Industry

Small consulting firms tend to cater to the industries around them. Within industry, shipping and pulp and paper plants often have the greatest need for troubleshooting their wastewater systems. Wastewater treatment for the shipping industry, like municipal wastewater treatment, is populated by very few experts who are called on to provide service, testing, equipment and oversight. NovaTec brought on a third partner last year to develop this business specifically for the ferries and the cruise lines which must meet new regulations set by the states of Alaska and Florida for wastewater treatment on ships in their waters. This senior partner has spent a lot of time building relationships with the cruise lines. This market is challenging to gain entry into because of long standing relationships with other suppliers. However new regulations demand innovative solutions, therefore NovaTec has a competitive advantage because it understands which new technologies will work effectively with older systems. While the ships ply the waters of the Pacific Northwest, most of the work done on them is in Florida. Once a company like NovaTec has gained entry and proven themselves, they become a trusted resource advising on new technology, planning, design and operation of new wastewater systems that must be retrofitted into very tight spaces on board ships. Trust is built in the interim through NovaTec's testing and monitoring services which keep ships compliant until the retrofits can be scheduled.

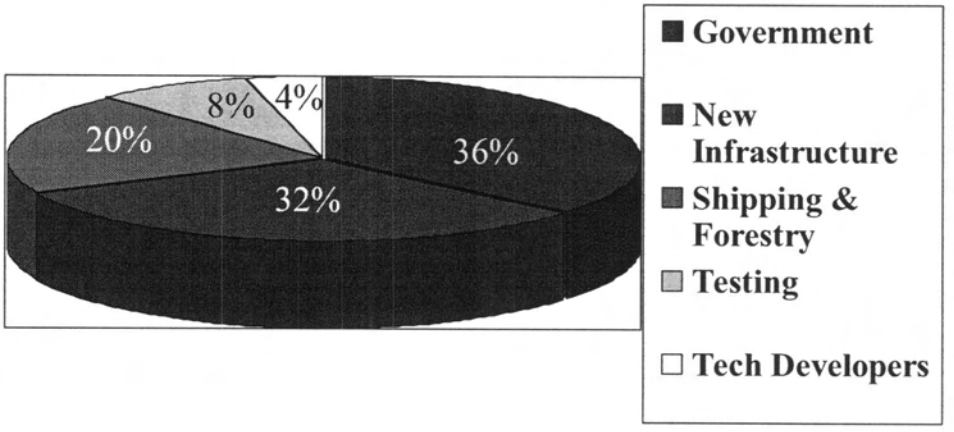
Within the forestry industry, NovaTec has long established relationships with many pulp and paper mills in BC. Troubleshooting and improvement contracts make up a significant portion of NovaTec's revenue to solve problems with treatment lagoons and upgrade aging systems.

1.4.7 Target Markets: Technology developers and investors

Traditionally NovaTec has provided services for strategic investors (corporations acquiring assets) as opposed to venture capital investors or investment banks. They provide verification of other engineering firms' testing protocols and methodology. They examine whether the technology or equipment performs as claimed. This service has the smallest market share because strategic investors do not often share how they acquire their investment decision knowledge with other companies and projects occur irregularly so network effects are hampered.

For technology developers, NovaTec through Green Due Diligence provides commercialization advisory services to help them become market and investor ready. Marketing is required to capture new business because of this lack of affinity between investor groups and the tendency of developers to work in obscurity. Green Due Diligence is their first attempt at branding one of their services to meet this market opportunity.

Figure 1 - Revenue by Target Market for NovaTec Consultants



1.5 Commercialization Services

NovaTec understands the challenges that inventors face attempting to develop a rational business case to commercialize their research and development. While the inventor is skilled at solving technical problems, there are many challenges to transforming these solutions into viable products and businesses that can earn and sustain revenue. Sustainable Development Technologies Canada (SDTC) identifies this problem of moving from research and development to commercialized products as the valley of death. It is used to describe the breakdown that occurs in finding the investment and management talent to enable this successful transformation. This causes a break in the commercialization value chain. NovaTec's technical and business

development core competencies can help some inventors and more mature companies at the pre-commercialization stage build a sturdy bridge across the gap.

The purpose of this paper is to explore:

Whether providing this type of commercialization advisory service is a viable market opportunity and if so,

1. Can it actually aid in the growth of revenue beyond the sale of billable hours for NovaTec? And;
2. Is there a fit between NovaTec's current core competency and extending their offering to provide commercialization services so that there are enough synergies between business units so that they can be complementary?

Currently, NovaTec has positioned the Green Due Diligence brand as a boutique consulting team focused on providing advisory services to investors needing technology validation and to technology developers ready to commercialize their CleanTech developments. This service offers CleanTech companies business plan development, market research, market entry strategies, sales channel expansion and joint venture partnerships. Further, the consultant leading this brand will attempt to build partnerships with the investment community. By bringing them investment-grade companies and working directly with investors' portfolio companies on marketing, technology productization and business development issues, strong reference networks can be established.

Such services are geared for technology developers who are beyond the proof of concept stage. They are ready for commercialization and know that they need assistance with creating a business strategy that will engage the right target market to achieve growth. However, the challenge of this positioning is that technology developers in this market place do not always

have the financial resources to purchase consulting nor the desire or willingness to seek help. In addition, there may only be certain types of investors that seek help outside their current network of specialists to provide technical or market advisory services. Entering the investor network as a trusted advisor will take time and credible evidence that Green Due Diligence adds value. If NovaTec's goal is to break out of the billable hours business model, these target markets have to be evaluated to determine if success fees can be earned. It will take longer than 6-9 months to build this trusted network.

1.5.1 Financial Analysis of Consulting Services

The typical profile of a CleanTech client to date is a company in early stage revenue or about to enter revenue stage. They have raised less than $1 million dollars, have about 2-5 employees and have been working on their technology and their business for more than three years. They have developed a business model, finished demonstrating technology that solves an environmental problem and are eager to enter the market or expand their market potential. They seek help with fine tuning their business model to be ready for more sophisticated investors and/or find a smarter way to enter the market by locating more appropriate target markets. Often, the technology inventor is the president or the chief technology officer. They usually have a CFO but not a vice president of marketing or sales.

The problem these typical companies encounter is that they usually do not have excess funds to retain a consultant and have been trying to do the work themselves in an ad-hoc manner. NovaTec will often refer them to government programs such the National Resources Canada, Industrial Resource Assistance Program (IRAP) who can provide 50% of the funds toward a market assessment up to a maximum of $30,000.

A $30,000 project will cover the costs of market research, building a marketing strategy, coaching the owners in how to implement the recommended plan and possibly identify and secure a strategic joint venture partner or demonstration site that could be a first customer.

There may be add-on projects that NovaTec bills out at an hourly rate of $150 per hour or $1200 per day to help clients with specific needs like preparing to be investor ready, coaching the leadership team, or facilitating problem solving that are beyond the scope of this type of government grant. If the average assignment is $30,000, this takes one consultant about four months to complete and represents about 175 hours.

The average consultant can comfortably be billable for about 100 hours per month. The remainder of the time must be used to continue to market the consultant's services through networking and nurturing referrals so that the business is not subject to the cyclical vagaries typical of small firms: when clients need attention, there is no time for marketing. When the project is finished, there are no prospects in the marketing pipeline ready to engage the consulting firm. It takes another 4-6 months to develop potential prospects into clients. Therefore the consultant suffers through many feast and famine cycles if they are not vigilant about marketing and networking as a regular part of the work week. This is especially true if the consulting firm wants to win higher value work and become trusted advisors relied on by many firms.

NovaTec requires that all consultants be billable to at least 2.3 times their salaries in order to maintain profitability and growth. This means that the consultant must find and sell at least 7 typical projects each year to maximize their time and add to the profitability of the company. Seven projects per year add $26,000 or 14% to the bottom line after covering overhead for that consultant. Should the consultant also be able to secure funding or a joint venture partner

for a client, NovaTec would earn success fees of up to 5% of the amount funded or value of the joint venture. Success fees could add $50,000 to each million dollars of investment that NovaTec helps a client to secure.

The following table highlights the revenue model without success fees.

Table 1 - Revenue Potential for Advisory Services

CleanTech Consulting Boutique Revenue Model		
	Current	
Hourly rate	$	175.00
Monthly hours		100
# of consultants		1
Total monthly Revenue	$	17,500.00
Max Total Annual Revenue	$	210,000.00
Profit Multiplier		2.3
Breakeven point	$	184,000.00
Contribution to Profitability Growth	**$**	**26,000.00**
Contribution % to ROI		**14%**
Average Project	$	30,000.00
Number of projects needed B/E		6.13

Would adding additional consultants increase the company's ability to enhance revenue growth? As seen in the figure below, adding additional consultants does not affect the result unless the fixed costs change. ROI increases to 30%, only if the consultant's salary was reduced or the hourly fees were increased. However the breakeven point is lowered by reducing fixed costs (decreasing salary). Decreasing the salary might not be an attractive option that would allow the recruitment of additional consultants. Increasing the hourly rate may prevent more clients from working with the consultant. This is not a well-populated target market and it is a

small community. If most projects have to be approved by IRAP to be funded, hourly rates will be limited by their guidelines which keep hourly rates below $200.

Table 2 - Revenue Growth by Adding Consultants

CleanTech Consulting Boutique Revenue Model	Current	Inc Fees	Dec Salary
Hurly rate	$ 175.00	$ 200.00	$ 175.00
Monthly hours	100	100	100
# of consultants	1	1	1
Total monthly Revenue	$ 17,500.00	$ 20,000.00	$ 17,500.00
Max Total Annual Revenue	$ 210,000.00	$ 240,000.00	$ 10,000.00
Profit Multiplier	2.3	2.3	2.3
Breakeven point	$ 184,000.00	$ 184,000.00	$ 61,000.00
Contribution to Profitability Growth	**$ 26,000.00**	**$ 56,000.00**	**$ 49,000.00**
Contribution % to ROI	**14%**	**30%**	**30%**
Average Project	$ 30,000.00	$ 30,000.00	$ 30,000.00
Number of projects needed B/E	6.13	6.13	5.37

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NovaTec might be able to reduce fixed costs by decreasing salary and adding a performance component to the compensation plan. However this only works if all employees serving as consultants get similar packages. NovaTec has experimented with commissions and reduced salaries and found the experiment did not breed productivity and team work. Currently, NovaTec only pays a bonus on profits at the end of the year based on merit, if it has been a good year for revenues.

1.6 Potential Revenue Enhancement Opportunities

Is there another option for the company that could return a higher ROI on their invested capital?

There are other potential markets for consulting services that might provide more lucrative projects in size and hourly rate. For instance some Fortune 1000 organizations are now seeking support in how to lessen their environmental impacts and increase sustainability efforts. Other organizations such as GE, Siemens and IBM are making investments in CleanTech companies, products or services. However, NovaTec might not have the experience or core competencies needed to work with this sector. Business development cycles (the time period from introduction to being retained for a project engagement) are often two or three times as long as winning business from a small firm.

Since selling more services based on billable hours does not enhance revenue growth, NovaTec is attempting to broaden their perspective beyond the Fortune 1000 market and look at other potential target markets. Research is currently be conducted and funded by the Federal government through NovaTec to determine if developing consortiums[1] would be a successful business model for small Canadian firms. NovaTec would not only be part of the consortium providing process engineering, they would also manage the consortium which could provide management fees, and sales commissions. However, selling the consortium product in overseas markets also has a long business development cycle.

[1] A consortium is a group of small companies that each make a component or provide a service. Collectively they provide a total solution that solves a bigger problem. The typical consortium has its own governance model, branded product, business development team and management system. Each company retains autonomy and has the right to bid on projects that the business development team brings in. Not all companies will win work from each project. The client only deals with a single point of contact. It is a method for small companies to enter global markets that they would not have access to on their own.

The challenge for NovaTec will be to have a group of synergistic and complementary services that can generate enhanced revenue with both shorter and longer sales cycles. At this stage in their research of consortiums, it is difficult to predict if the effort will result in project contracts. It is becoming clearer that the Green Due Diligence service will have some early revenues and therefore appears to have a shorter business development cycle. The service will slowly attract more business but may not generate more than a few $30,000 projects per year without additional investment in marketing, networking and success-based contracts which all involve taking additional risks.

The natural evolution from managing consortiums is to be the middleman that integrates technologies from suppliers and sells the aggregated solution to its own clients. Within the CleanTech sector, there are some companies start to pursue the selling of solutions by becoming systems integrators. A systems integrator sells solutions to problems using best of breed technologies that have been assembled and combined. They earn enhanced revenue from the sale of their solutions and the consulting needed to evaluate the client's problem and assemble the solution. This kind of business may be beyond NovaTec's core competency.

There are pros and cons with each of these target markets and whether they are actually a strategic fit for NovaTec that will be explored in subsequent chapters once the CleanTech sector is more fully understood.

2 ANALYSIS OF THE CLEANTECH MARKET

2.1 Introduction to the CleanTech Sector

In order to understand where NovaTec should place its strategic focus, it is necessary to explore the CleanTech sector. NovaTec's history is in providing environmental engineering services related to water and wastewater to government and industrial organizations. With the growing awareness and action in climate change, the environmental industry has now expanded to include a growing sector called clean technology or CleanTech. Prior to 2000, environmental technology was thought of as "end-of-pipe" solutions. CleanTech is now anything that helps ameliorate the impact on the environment and covers a much wider range of technologies and services. This chapter hopes to answer the following question. If NovaTec hopes to enhance their revenue by pursuing an advisory and consulting business and organize and manage consortiums, which market within CleanTech might provide the best fit with their current core competence and the needs of the selected segment?

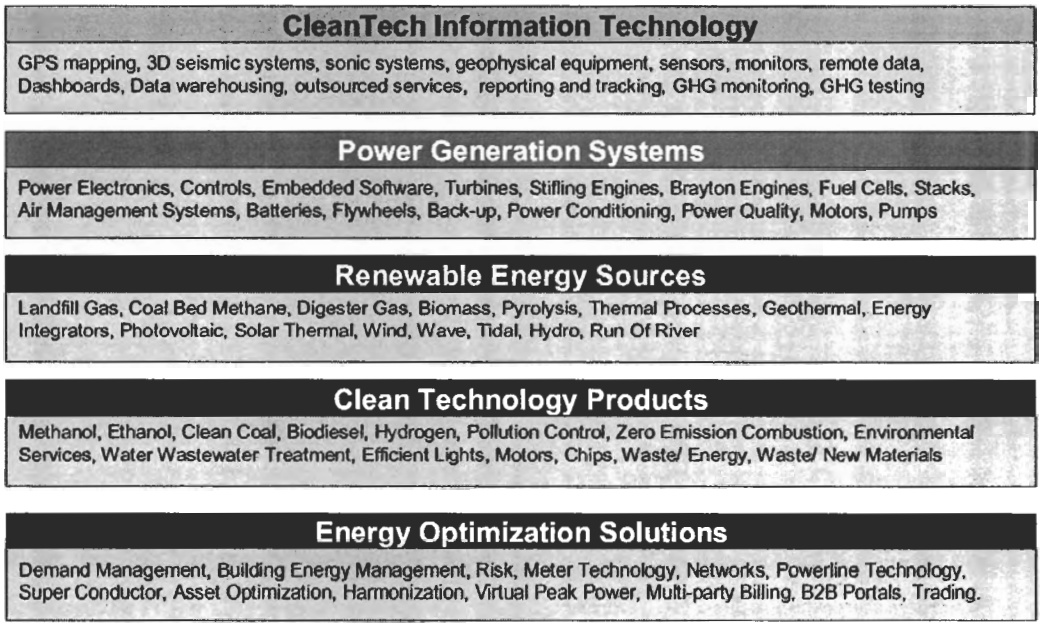
While it would seem logical that a complex and wide-ranging new industry would need consultants to advise companies on growth and other functional issues, the fact that the CleanTech sector is young, immature and diverse actually may work against the ability of a consulting firm to establish a valued service and grow. The industry is populated by many small companies not ready for the market and has only grown 67 public companies as of the first quarter of 2005 (McKenna 2005). It is uncertain as to whether there is enough growth yet to support more than a few small consulting firms. The concept of organizing consortiums is not new, but within this sector it is not a known market entry solution.

2.2 The CleanTech Industry

Standard classification systems as yet do not include the CleanTech Industry. It is a new term coined by the venture capital industry to describe a broad range of innovations that improve operational performance, productivity or efficiency while also reducing costs, inputs, energy consumption, waste or pollution. All of these characteristics benefit both business and the environment. The old term used to be environmental technology which was associated with "end of pipe" solutions purchased by managers of health and safety.

The Cleantech Venture Network uses the following industry segments in its definition of CleanTech: Energy Generation; Energy Storage; Energy Infrastructure; Energy Efficiency; Transportation & Logistics; Water Purification & Management; Air Quality; Materials & Nanotechnology; Manufacturing/Industrial; Agriculture & Nutrition; Materials Recovery and Recycling; Environmental IT and Enabling Technologies. The figure on the next page also delineates finer distinctions of the types of technologies viewed as CleanTech.

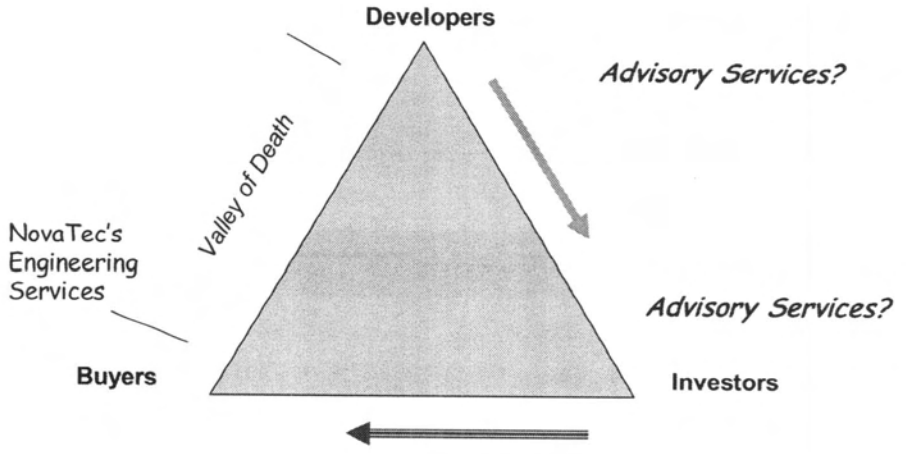
Figure 2 - CleanTech Classification System and Product Definitions



The common characteristic between all of these sub-classifications is the idea that the product or service is disruptive to current applications of the installed infrastructure. This means that in order to dislodge an incumbent technology the disruptive solution must perform in a way that reduces the environmental impact at a cost that is similar or less than the current method. To be successful it also means that the hassle of replacing the existing solution be minimized and the resulting new effect should be of such substantial improvement that the transaction and switching costs are clearly offset.

Governments and commercial buyers also need to purchase CleanTech solutions when regulatory changes mean that the old technology is no longer acceptable, or when existing systems are reaching their limit and the old technology requires unacceptable capital costs for expansion such as is now occurring with many cities wrestling with waste issues. NovaTec has traditionally provided services to evaluate new innovations on behalf of these buyers.

Figure 3 - Ecology of CleanTech Business System



Looking at the above figure, it must be understood that the developer can't usually access buyers without getting funding support. With funding support they have the resources to work through the lengthy buying process. Getting innovation adopted within government and industry has many challenges. NovaTec has acted as the gatekeeper for these

technologies in water and wastewater treatment. Without their approval, technology is not adopted.

It is important to understand the buying behaviour of CleanTech customers in order to gain perspective about the barriers to entry faced by technology developers and NovaTec attempting to expand its service to developers and investors. Buyers are loss averse. The developers are risk seekers attempting to extract rents from their inventions. They need investors to provide capital for their companies to be able to deliver these solutions to the market. Investors are risk averse in their approach to extract returns from their investments within a certain time frame. Within this ecological system, NovaTec hopes to be able to add value and be seen as a trusted advisor to buyers of their services. NovaTec tends toward loss averse behaviour and to date has been well-matched with the buyers of such technology. NovaTec reviews these innovations and provides the security review that buyers need to make decisions to invest in innovation. NovaTec may need to change their risk profile in order to more fully realize opportunities to work with the other two market areas.

2.3 CleanTech Adoption Process

To further understand how this ecological system works an example is useful. Wastewater treatment plants and landfills used to be located on the edge of towns. Now cities have grown up around them and there is no room to expand existing facilities to handle the increased waste. Innovative solutions are needed in communities around the world for reducing the impacts of landfills and sludge, one of the by products of wastewater treatment. For instance, to reduce sludge which currently is either trucked to a landfill or applied to agricultural or pastureland as a soil amendment, cities may instead choose to invest in a new technology that reduces the amount of sludge produced. As cities keep expanding, they either need to add new

equipment to handle greater wastewater flows or reduce sludge. Land use application is becoming increasingly difficult politically for some cities to get access to. The alternative is to buy new digesters and treatment equipment to minimize the sludge. A new digester costs $15 million and takes up an entire city block. If a plant can't expand, it has to find new methods to reduce the increasing amount of sludge.

A sludge reducing system currently being tested in Los Angeles would cost 10% of the cost of a new digester and reduce sludge by 60% so that a new digester would not be needed. But before the city will buy, it has to be sure the equipment is effective and not disruptive to current systems. In order to be assured of minimal risks to systems, the city may choose to test the equipment for six months to a year through many kinds of weather conditions.

During that testing phase, the young CleanTech company supplying the equipment must provide the solution and the maintenance services free of charge. There is often no guarantee that a purchase contract will result from the test. Many city governments test new technology but never have the resources or political will to purchase it. Investors must be willing to support the young company until these tests are complete to reduce risk to the point that a city like Los Angeles would spend $20 million to purchase enough systems to manage their growing sludge problem properly. This process will not end with one demonstration in the city of Los Angeles. Each city will also want to undertake similar testing as they have different systems in place and different wastewater patterns and problems. This will result in a continuously slow sales cycle that will not be alleviated by reference customers for several years to come.

To complete this example, NovaTec would have traditionally provided services to the city of Los Angeles to evaluate this sludge reduction system. Now, through Green Due Diligence, NovaTec would want to advise the developer of the system on their marketing strategy

to gain access to more demonstration sites and make introductions to more financing sources. Or NovaTec would also be able to advise the investor about the efficacy of the technology. NovaTec may also be able to assemble a group of technologies to help the city of Los Angeles deal with their waste problems in a more comprehensive manner. The sludge reduction system would be one company within this solution based consortium. With any of these other services, NovaTec's role and relationship to the city is dramatically different. Can the company successfully make this segue to service a different client without disrupting their trusted advisor relationship with the city? Would developers and investors trust that NovaTec had the skill sets necessary to advise them effectively? On the surface, the company's inside knowledge of how a city buys new equipment would be very useful to their new clients. However, analyzing the industry and the market further is necessary to fully realize the complications at each point of the ecological system.

From the investor's perspective, the need is obvious, but the lengthy buying cycle of the average government adds to their risk. Investing in CleanTech is not the same as investing in a software company. The return on investment might eventually be higher but the time frame to earn that return is substantially longer and riskier due to the high costs of providing research and development dollars, obtaining proof of concept and finding demonstration and field tests to gain potential customers. Investors new to the CleanTech space often balk at this type of investment.

From the developers' perspective, they hope to be able to ride out the long sales cycles to achieve the expected revenue growth which could be substantial as the average city the size of Vancouver would need 8-10 units and a city of the size of Los Angeles would need 15-20 units. However, they need investors who are willing to risk their investment for a longer period of time and who are willing to bet that this sludge reduction system will be the chosen solution.

Finally, the management team of this developer must be of such a high calibre of experience that they can steer the company on this narrow focus for the duration of the long journey. It would appear fairly compelling that this company will need technical and business consultants to help them stay the course and that investors would want technical advice on whether this technology was able to do the promised job.

This example only highlights some of the challenges within one sector of CleanTech that is the most complementary to NovaTec's core competencies. CleanTech companies and markets vary profoundly from technology to industry.

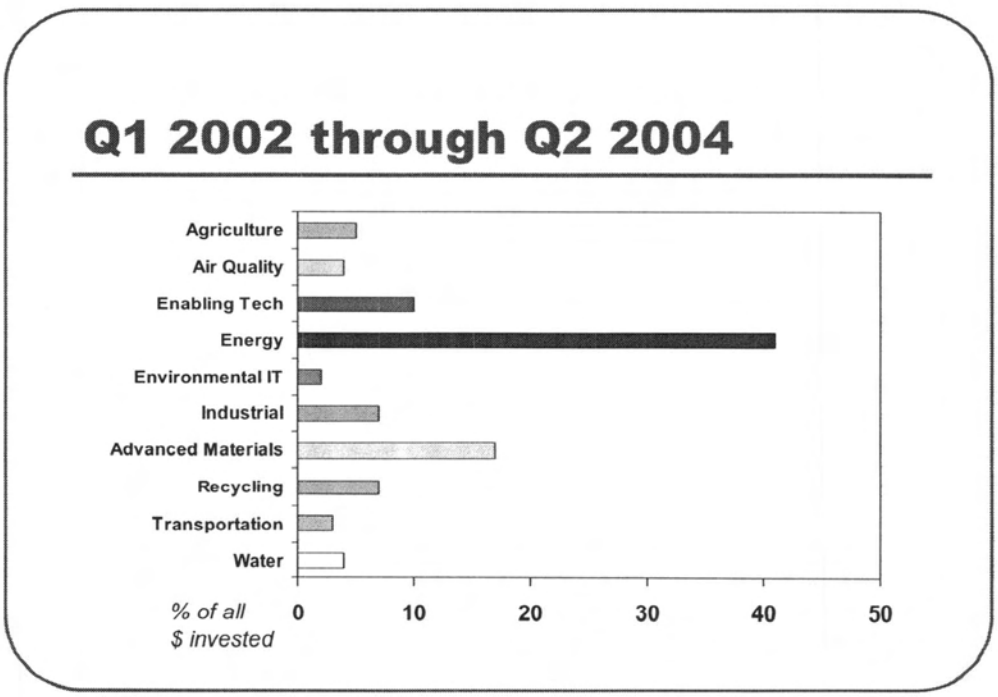
2.4 Industry Characteristics

The CleanTech industry may be growing because of the price of oil and the ratification of Kyoto. But it would not be growing as rapidly if there were not investors involved in funding technology developers and revenue generating companies. CleanTech products will provide the solutions that may help solve some of the planet's environmental problems. However, the growth of the industry and therefore the adoption rate of these solutions are highly dependent on the willingness of the financial markets to participate. When evaluating the opportunity of this industry to provide increasing returns for NovaTec it is important to understand how the industry operates and where NovaTec's services might best fit with industry characteristics.

This industry is only now maturing because CleanTech companies are starting to earn substantial returns in this climate of rising oil prices, climate change, increasing regulations and global markets battling environmental problems. In marketing terms, this industry can be characterized as pioneering, emerging and therefore high risk. High risk sectors can attract venture capital and angel investment in the early stages and more conservative investors as they mature and return profits. CleanTech companies have earned annual global revenues of greater

than US$150 billion to date (Parker, LoGerfo, Propper de Callejon 2005). The renewable energy segment has the fastest growth and the greatest returns to date for investors with wind and solar power companies achieving 5-10 year compound annual revenue growth rates as high as 35% (Parker, LoGerfo, Propper de Callejon).

Figure 4 - Investment by Industry Segment



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Investment in CleanTech companies has been increasing. From 1994 through 2003 an estimated $8 billion of venture capital was invested in this industry in North America,

[2] Source: Graphic developed by author after data published by the Cleantech Venture Network (Parker, LoGerfo, Propper de Callejon) and presented by Nicholas Parker to the University of Toronto's school of business.

including Canada. However in the last five years, average annual investment grew from $350 million to over $1 billion with more than half of the $8 billion invested in the last three years.

It is very clear that the reason CleanTech companies are attracting this kind of investment is primarily not derived from investors' interest in the environment. Interest in the environment is a secondary factor and has different motivations than the sustainability or triple-bottom-line movement. The primary driver for investors in this sector is profits first. There are now companies that are attracting significant investor interest because of their ability to produce profits. For Fortune 1000 organizations, their primary motivator in purchasing CleanTech solutions is to deal with the fact that insurers and pension funds (their investors) are now demanding they pay attention to how climate change will affect the growth of their business. Some Fortune 1000 companies are actively pursuing sustainability strategies and investing in CleanTech for their own use or as strategic investors.

To prove that investments in CleanTech mean healthy profits, Hamilton Clark, an energy-focused investment banking group studies the market each quarter and reports that the renewable energy sector returned 28.9% to shareholders while clean technology companies provided 19.2% return in 2004 (Dhungel, 2005). Bernard Llovera of Expansion Capital Partners, a venture capital firm focused on investing in the CleanTech water/wastewater sector noted at the recent CleanTech Venture Network Summit that water-related stocks have outperformed the S&P index in the last five years. Water stocks returned 15.5% to the S&P's -2.3%. In the last ten years, water stocks returned 17.8% and the S&P returned 12.1% to investors. (Llovera 2005). Now that the financial industry is researching returns in the CleanTech sector, more venture capital will be available for future developers.

2.5 Financing the CleanTech Industry

2.5.1 Venture Capital

The CleanTech sector has matured: entrepreneurs have finally found markets for their wares and management teams that know how to execute to achieve substantial growth according to Nicholas Parker, CEO of the Cleantech Venture Network, an organization that tracks CleanTech deal flow to prove that investments in the sector can provide substantial returns. To place this in context, it should be noted that in order to attract venture capital investment, an early stage company should be able to demonstrate an ability to achieve compound year over year growth so that within a five year time horizon, they have achieved at least US$50 million in sales.

This is a steep growth curve. Where the typical software company can develop a product in a year or less with a laptop and an office, a CleanTech company can take five to ten years to solve some of the more complicated environmental problems before they are able to commercialize their inventions. Venture capital investors do not typically invest in companies until the technology has at least been demonstrated in the field. This time lag between proof of concept and successful field tests creates a substantial funding gap problem. There is a lack of seed capital available. It is also at this stage that an emerging company logically needs the most external help from consultants who can determine the business value of their research and development effort, find them strategic joint venture partners and facilitate their market and investor-readiness.

Since returns have been slow to be reported in CleanTech (the CleanTech Venture Network only began tracking and publishing their research two years ago), companies in this sector are not awarded the large sums attracted by biotech and life sciences companies where development takes as long or longer. This is partly due to the fact that there are no big acquirers

for CleanTech companies yet as there are in biotech (Pharmaceutical giants). GE has been one of the few companies that have acquired CleanTech companies (Ionics and Osmonics, both earning more than $50 million in revenues at the time of their acquisitions by GE) and therefore provided venture capital groups exit strategies to earn their return. Secondly, the development cycle for CleanTech systems is varied, not well understood and inconsistent across the wide variety of industry sectors involved in CleanTech.

A traditional venture capital fund has a three to five year time horizon. For CleanTech deals, the venture capital community is learning they need to extend their participation to between five and eight years to realize gains. At the fifth year, the CleanTech company ideally should be preparing for an initial public offering (IPO) or to be acquired (according to the venture capitalist's risk averse strategy). The next acquirers in this economic development food chain are the private equity groups, investment bankers who facilitate the IPO or strategic investors like GE ready to acquire companies that have reached the $50+million stage. Venture capital fund managers will engage in discussions with any of these groups to liberate the profits from their early stage funds to provide a return for their own investors.

While there is $60 billion in venture capital waiting in the wings (Ehrenpreis 2005) for new venture capital investments for all industries, only $1.209 billion went to CleanTech companies last year (Parker). This represents the total CleanTech investments of about 20 venture capital companies. GE has said they will invest $1.5 billion in research and development each year to become the leader in CleanTech solutions. According to CleanEdge, CleanTech will not remain long as an underinvested space, especially since the CleanTech Venture Network began to track investments and return on investment in the sector each quarter. They have proven that CleanTech investments can beat traditional technology. In fact in 2004 the 11 CleanTech companies now public returned 19.2% to shareholders and represented a market

cap of $3.5 billion (McKenna 2005). In contrast, the S&P500 returned 0.7%. The Russell Index representing small cap companies which is a closer comparable index to the companies in the CleanTech index returned 18.3%. These returns are bringing more investors into the space at both the venture capital and private equity level. This should provide more capital. However, there is still a scarcity of early stage and patient capital willing to wait longer than a five year time horizon to liquidate their positions. This fact limits growth and opportunities for valid technologies. In Figure 6, it becomes clearer when a CleanTech developer could best benefit from advisory services. However, due to the funding gap, there are limited funds available at the earlier stages of commercialization when the most help might be needed.

Figure 5 - Funding Gap in CleanTech Commercialization

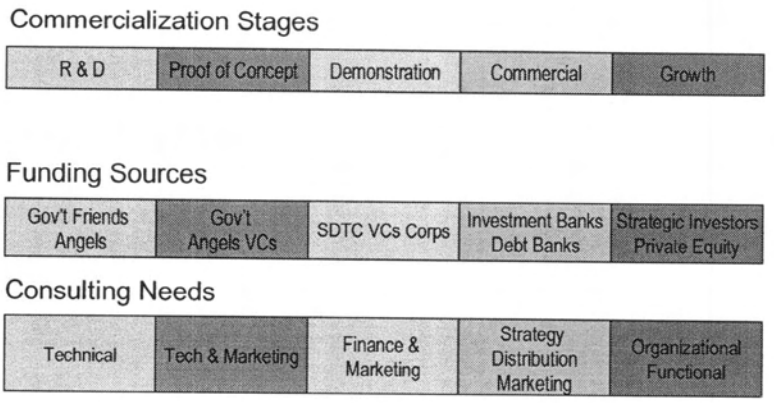
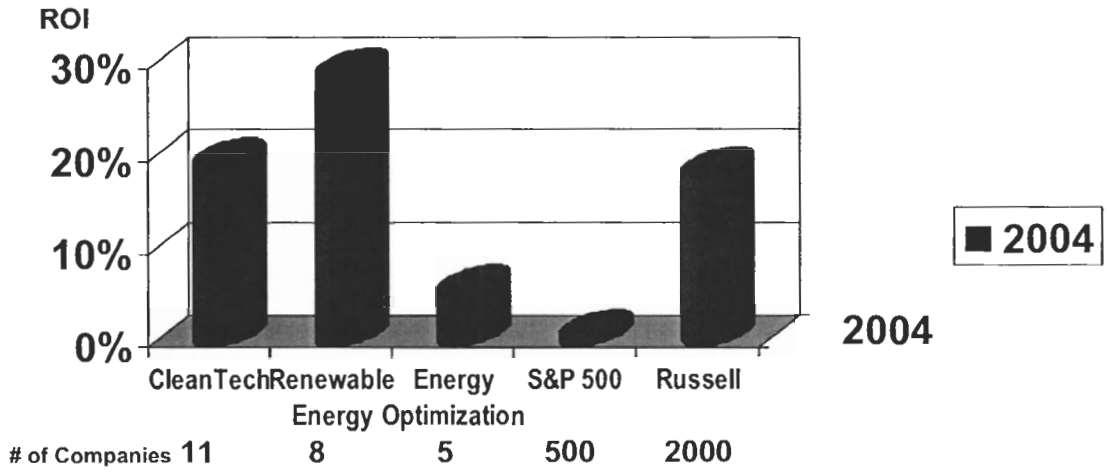


Figure 6 - Return on Investment in CleanTech Companies



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While it is true that venture capital companies want to see more deals, they also have many of their own methods for tracking good investments in the CleanTech space. HamiltonClark, an investment banking firm claims they are tracking 900+ companies earning revenue in the CleanTech space in their proprietary database (McKenna) and (Makower 2005b). Venture Capital groups traditionally do not pay to see deals, nor do they hire consultants to review deals for them (Parker, Makower, Ehrenpreis). Occasionally they might use a firm with

[3] Sources: Graphic developed by Author. After data published by HamiltonClark (McKenna), CleanEdge Report (Makower) on CleanTech Investing and from data reported in Yahoo Finance.

technology expertise to vet a product. However, they would prefer to tap into well known names within their community such as the PhDs at GE (Ehrenpreis). This new insight does not bode well for NovaTec's plans to provide technology verification or due diligence to the venture capital community.

2.5.2 Investment Banks

The Investment Banker is usually next in line to facilitate an exit for the venture capital group and the original investors (angel investors, friends, family and founders). The Investment banker will typically advise on valuation of the company and on the best options for proceeding with this exit. They can search for an acquirer or prepare to go public. Investment bankers will provide strategic advice and restructuring to help the company get organized for either option and then do the work to either conduct the acquisition or raise the capital to do an IPO and go public. Investment bankers can appear to be a substitute threat for CleanTech consultants as they perform advisory work for free in the hopes they will earn substantial fees after raising the capital. However, their advisory services are focused on ensuring that the company is positioned to be most attractive to investors. They may not provide other forms of consulting support that NovaTec would be able to provide. As a result there may be an opportunity to form alliances with investment banks to increase NovaTec's network and access to companies that need assistance.

2.5.3 Strategic Investors

The strategic investor, or Fortune 1000 company is perhaps somewhat unique to the CleanTech industry. Currently there are few distribution channels for CleanTech products except in green building materials. Developers must sell their wares directly. The average CleanTech developer must learn how to partner with the Fortune 1000, government and utilities

to sell their wares. They are selling solutions to environmental problems or providing the larger organization a competitive edge opportunity.

Several companies needing such solutions have become strategic partners and investors in CleanTech companies, most notably, GE, Corning, Johnson & Johnson and Dannaher. In the last three years, the strategic investor has started to fill a missing part of the supply chain in the complex commercialization road map for CleanTech products. Several Fortune 1000 organizations and utilities now have technology scouts on the payroll searching for companies to acquire, invest in or partner with. This is a global phenomenon with giant trading houses or "Sogo-Shosha" like Marubeni, a Korean firm, appearing at CleanTech events to find opportunities to invest in start up companies that they can incubate. The strategic investor is perhaps the most vital investor in the CleanTech sector. For a developer they can serve as a channel to the market, offer horizontal expansion, provide marketing and sales insight as to how Fortune 1000 companies operate, inject funding for further research and development and supply project financing which is often critical on some infrastructure projects. However, they are not potential buyers of advisory services. They would have their own in-house technical experts.

2.6 Industry and Business Drivers

The CleanTech industry faces many challenges as it attempts to grow and find a foothold in the North American economy. Industries within each segment of CleanTech are at different stages of development and therefore have different requirements that affect whether developers in those industries need advisory services.

Alternative energy, for instance, has many substitutes which complicate the buying process. However the technologies themselves (wind, solar, geothermal) are fairly mature

so developers tend to be more sophisticated. They can attract management from the utility sector and so often may not need business consulting support.

Water and wastewater technology needs are starting to increase as governments are releasing funds to deal with rejuvenating aging infrastructure. As the buying cycles of government are long and complicated, it would make sense that a consulting group that has inside information on how government does buy may have greater credibility and therefore attract more developers in this segment as clients for advisory services. Given NovaTec's core competency, this is a market area worth paying attention to.

Greenhouse emission reduction technologies cover a wide variety of industries and are quite difficult to get tested in the field as they often must dislodge incumbent and entrenched technologies. Consultants might be quite beneficial in aiding this process.

The green building material industry is benefiting from the real estate boom as buyers prefer environmentally-sensitive developments. In some cases, consultants might be able to help the manufacturers and providers of green building materials.

In order to evaluate which markets might prove beneficial for NovaTec, it is important o understand the industry drivers. Focus is important in selecting the right target market. While NovaTec has technical core competency and reputational capital in water and wastewater, the business consultant they have retained has a broader base of experience. Strategists would argue that more reference customers and therefore growth would emerge by positioning the Green Due Diligence service to one sector. However the challenge to this approach is that CleanTech businesses are dispersed geographically rather than clustered which makes developing networks difficult.

The drivers for CleanTech solutions are more complex and contradictory in nature than the concept of increasing productivity or achieving more in less time which typical products claim. Each industrial set of products has its own set of buyer and supplier dynamics, threats of entry, able substitutes and competitive challenges. Here is a brief look at some of the drivers and challenges:

2.6.1 Renewable Energy Drivers

Within the renewable energy sector, demand is being driven by:

1. The price of oil;
2. The need to reduce greenhouse gas emissions (GHG);
3. The need for new sources of electricity to increase reliability and reduce costs of building new generation and transmission (demand management);.
4. The availability of resources to produce energy.;
5. Differences in the costs to generate electricity regionally
6. Increasing costs in the spot market for energy trading. When consumption increases suddenly, certain regions pay a premium.

Changes in the energy infrastructure won't happen over night. It took 100 years to build the energy grid we rely on today. It is a capital intensive business limited by the fact that electricity can't be stored for sale at a later date. Reducing reliance on off-shore oil or the GHG emissions from coal-fired plants may be driving the push to add renewable energy. But the economics of the energy market will limit the ability of renewable energies to penetrate the market deeply enough to have an effect. The transition will happen gradually and in steps. Natural gas and hydro (though both have other types of environmental impacts) is seen as cleaner than other forms of electricity (coal and oil) so capital expenditure will move to cleaner forms of energy first.

There is even a renewed interest in Nuclear energy. If there is a way to economically separate and sequester the GHG emissions from coal-fired stacks, coal will become

a clean source of electricity. These evolutionary steps rather than revolutionary change where the grid is dominated by renewables are the likely trajectory over the next 25 to 50 years (Moore, Wustenhagen 2004). Developers need to remember that innovation adoption occurs is small steps, rather than big leaps. Some investors are highly attuned to look for incremental technologies. Developers are often more attuned to building revolutionary solutions. Consortiums can sometimes help bridge these gaps by selecting a range of technologies that can offer small and larger incremental innovations.

Some of the other factors affecting the growth of demand which will affect a CleanTech developer's ability to enter the market for renewable energy include:

1. Regionalization: What works technically and economically in some areas does not work in others.
2. Economics: The cost of competing sources of energy is often less than the renewable source of energy. They will not attempt to sell into those markets. Many technology developers try and sell into their local market ignoring the poor economics because they don't know how to develop networks further a field.
3. Policy: A government may or may not have the political will to redistribute tax dollars to create incentives for renewables or direct policy toward establishing minimum levels of renewables in the energy stream mix. Markets with renewable incentives tend to create demand for new technologies. Developers should be working in those markets despite the fact that competition is much more intense. Competition and capital markets hone a management team and push best of breed systems and companies into the forefront which sets the stage for the beginning of a maturing market. A maturing market expands the pie for most entrants.
4. Investment: Technologies that could provide energy in a better way do not get to market because the originators are not able to develop an investment-grade business case to build a company around.
5. Technology: Often, it takes years of use and continued improvement to be able to build the technology at a cost and with the economies of scale that make it

competitively attractive. Yet without the years of investment to do this, all new innovations will be deemed uncompetitive. Therefore an entity like government must make the investment in improving technological advancements to sustain the cost of these improvements if society is ever to adopt the new method of producing energy.

6. Social: While society may express a desire or interest in having renewable energy sources, they may be unwilling to make the trade-offs in cost, reliability, security and quality to achieve a sustainable renewable energy infrastructure.
7. Incumbents: The energy market is characterized by regulated and unregulated companies. There are currently few incentives, unless they are mandated by government, for regulated energy generators to add or switch to renewables in Canada. Adding renewable energy to transmission lines offers a host of problems associated with free-rider status such as who fixes the problems at the interface point where the renewable enters the grid? Who subsidizes the cost of a transmission line only operating at 30% capacity due to the renewable energy source's fluctuating power generation as occurs with wind power?
8. Energy Trading: The market for energy fluctuates with usage demand and therefore price changes constantly and is being hedged by various players in the market. Generators (such as wind developers) need access to this market and to be able to sell their product at times when they can get higher prices when the demand is highest. But if the wind isn't blowing at the same time, a wind generator cannot control their pricing and therefore can't capitalize on market timing. This situation is compounded by the fact that renewable energy generators must then have substantial investment capital to ride out the fluctuations this will bring to revenue streams. Renewable Energy credits are one policy and market mechanism that is starting to mitigate this problem in various jurisdictions within North America. However is subsidized energy economically supportable over the long term?

Consultants must understand the complexities of all of these issues for each type of renewable energy if they want to be of service in this market. NovaTec has some business development experience in renewable power but might not have the right mix of expertise to provide the level of sophistication new energy companies need. This requires a unique skill set

not easily found. For example, there are emerging groups of power arbitragers who capitalize on power demand fluctuations that create price differentials and resell the power for profit. This is called virtual peak pricing. Such companies assemble a set of technologies and serve as systems integrators selling a combination of consulting, integrated technology and power. They install devices into industrial, commercial and residential sites and turn down their power and resell it back to the grid during peak usage periods for a profit. In effect, they are also serving as a consortium management team: each building they install devices into becomes an electrical generation partner. The company then sells their "wares" on their behalf. They are therefore enhancing their revenues at every step of the value chain as NovaTec would like to.

When looking at the market opportunities to provide advisory services to the CleanTech energy sector, there are many intricacies that if well understood, could provide significant competitive advantages for NovaTec and its clients. Clients need more than just consulting services, they need to form joint ventures with other manufacturers and utility partners to realize their commercialization goals as the company in the above example does.

The energy component is more mature than other industries within CleanTech. Wind energy equipment is now a mature industry and does not need commercialization support. Wind projects are slated for many markets and are now backed by many types of investment groups. No new technology is needed for this sector to mature. Solar energy is also well-advanced and finding traction when combined with other technologies within the green building market. There are many experts in alternative energy which creates increased competition for pure strategy consultants.

For instance, there is an emerging set of consulting firms that act similarly to system integrators in the information technology environment. They develop energy solutions

using a variety of best in breed technologies and couple them with education, assessments, installation and monitoring to create energy efficient solutions. A company that wants an energy efficient building can now go to a one-stop shop and buy an integrated solution rather than try and figure out how to evaluate what kind of energy efficiency system would work and locate all the needed equipment.

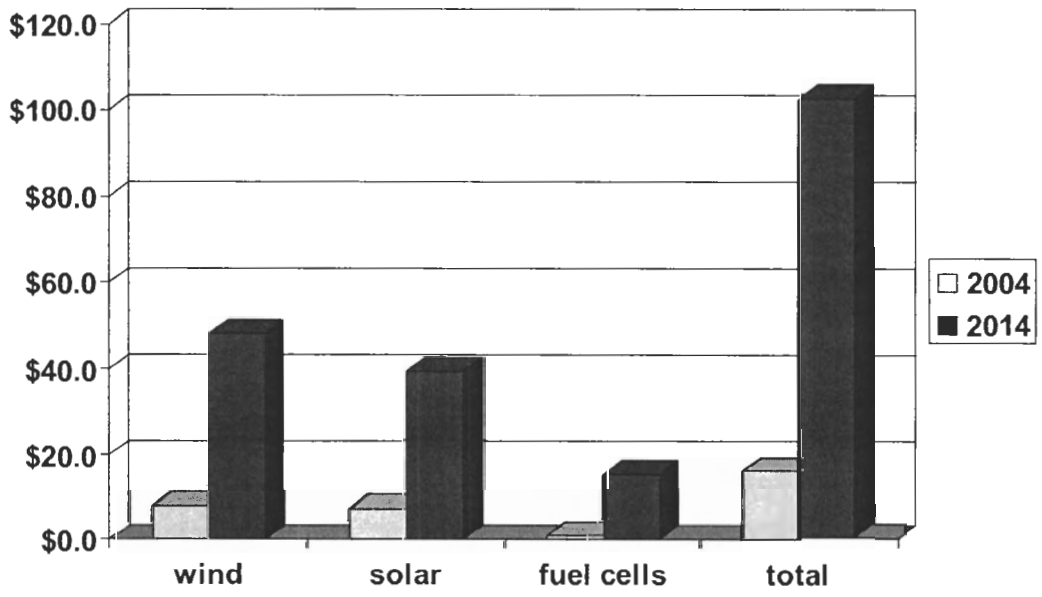
This new type of systems integrator now becomes the missing link in the supply chain: they are the new distribution channel for the renewable energy CleanTech developer. The developers' products are now becoming part of a suite of other products, much like the consortium concept NovaTec is attempting with water technologies. The systems integrator acts as a consultant to help the buyer to acquire a "green energy" solution that provides the right kind of energy efficiency. They might select a combination of renewable energy generators like solar panels, lighting systems, demand management modifiers and enabling software to track consumption and use patterns. The buyer in this instance might be one or many resource utilities (water, energy, gas) and/or building owners.

For the CleanTech developer who was trying to sell their individual component to an end user who would not necessarily be able to put the component to work effectively, the systems integrator is a vital part of their future. The systems integrator in energy will be successful where the individual component developer will not because the integrator understands that buyers need full complete and seamless solutions for energy efficiency. They do not buy wind turbines or electrical harmonizers or technical dashboards to advise them on their power consumption.

Of all the CleanTech sectors, the alternative energy market is predicted to continue to grow the fastest and the furthest, barring unforeseen circumstances (like coal

becoming a preferred "clean" alternative). While fuel cells will probably continue to lag in the transportation sector, other forms of alternative energy not associated with the grid (solar, geothermal, waste to energy systems) will probably have the greatest success.

Figure 7 - Clean Energy Projected Growth 2004-2014 (US$ Billions)



2.6.2 Water and Wastewater Drivers

Since 1920, the world's water systems have been increasingly exposed to the effects of human interaction. Water tables come into contact with sludge from poor wastewater

[4] Source: Graphic developed by author. After research published by CleanEdge (Makower), San Francisco, CA 2005

treatment systems. Agricultural chemicals such as nitrogen and phosphates leech into water ways and change local ecosystems. Shifting weather patterns and population increases are creating water shortages in many parts of the world. These dynamics not only threaten the amount of water available for human and agricultural use, they also threaten the safety of drinking water. Demand for high-quality water is increasing in industry and for irrigation of food crops.

As the population increases, demand for products that must depend on water for processing outpace the amount of water needed for drinking. In Europe and the US, the automotive industry will need to use 56,000 litres per square meter of land used per car just on metal production (Tillman 2005). Referring to the table on the next page, the average person in the western world uses about 100 gallons per day for drinking, toilet flushing and household needs. The average residential building needs about 2700 litres per square meter of building occupied per year. (Foran 2002) As the population of the planet moves toward 10 billion people in 2050, countries will have to find sustainable solutions to increase capacity by 1000 km^3 (square kilolitres) per year. (Tillman 2005). Industry development will demand more water but also produce new contaminants.

Table 3 - Water Needs by Industry Type

Process Needing Water	Water required	Comment or Caveat
Residential	4,700 litres per sq m per year	Ranges between 3,000 – 10,000
Commercial	2,700 litres per sq m per year	Ranges between 1,600 – 4,700
Manufacturing	19,600 litres per ton produced	average
Manufacturing cars & metal goods	47,600 litres per ton produced	average
Manufacturing paper	23,400 litres per ton produced	Water recycling reduces this #
Manufacturing textiles	13,100 litres per ton produced	Water recycling reduces this #
Dairy Cows	1 Megalitre per cow	Irrigation requirement of pasture
Fruit and vegetables	3-6 Megalitres per hectare	Varies per crop and region

Technology solutions are needed to deal with the contaminants and to provide the level of purity needed. More efficient agriculture and irrigation practices must be found as the growing population leans on the shrinking agricultural land base for food. Regulators are seeking more stringent standards for drinking water and water reuse. Increased regulation will spur demand for cities, industries, buildings and homes to install water reuse systems in existing infrastructure and knowledgeable people to operate these complex systems.

[5] Source – Graphic developed by author. After research data from the Commonwealth Scientific and Industrial Research Organization Future Water Needs (Foran)

For instance, in 2004 China declared that all new buildings greater than 30,000 m^3 must have water reuse systems to treat grey water and black water for flushing toilets, landscaping and other non-drinking uses. After making this policy, regulators discovered that current Chinese technology and expertise in water reuse is substandard and actually causing new health problems (Featherstonhaugh 2005). In attempting to understand the source of the problem, regulators discovered that importing technology and equipment is not adequate to address the problem. They need expertise and education in how to design, install, operate and maintain water reuse systems.

In short, the Chinese need an organization that can supply a complete solution made up of the right equipment for the particular project and a lot of education, service and consulting support.

The government is now anxious to import such complete solutions and has signed a memorandum of agreement with NovaTec through Nankai University (the primary designing centre for water technologies in China). To place this water reuse problem in China in perspective, 6.09 billion sq m of new buildings were constructed between 1999 and 2002 alone, nearly doubling the country's total built floor space. In the next 25 years, 345 million people are going to move from the rural areas into the city areas, which is the biggest mass migration of people ever, anywhere according to Guy Hollis, of international real estate agents Jones Lang LaSalle. Urbanization is driving the Chinese real estate boom which is creating demand for shopping centres and office buildings.

Water reuse is but one technology that could help China and many other countries deal with its water and wastewater problems.

In North America, consumers are now demanding more reporting and more controls over their drinking water. Today governments are also now concerned with security (more than just perimeter fencing) and safety which require solutions yet to be developed.

Within the entire water and wastewater infrastructure there is a demand for a whole host of products that work independently and are also part of a larger total solution. However, to be successful, manufacturers need to collaborate with each other and form joint venture partnerships or consortiums with organizations that already have relationships with governments and industries that buy water and wastewater equipment. Or, there could be a market opportunity for a systems integration company that combines such technologies and offers government and industry comprehensive and integrated solutions with installation.

Despite the need for such technologies, the municipal and industrial sectors are hard markets to break into. Their buying cycles are slow and decision-makers seek to mitigate the risk of innovation, rather than adopt innovation. Regardless of the product offering, entering the water and wastewater treatment market needs a skilled and experienced guide with well developed networks to provide facilitation and assistance to the technology entrepreneur.

Table 4 - Water Technology Uses and Requirements

	Drinking Water	Waste Water	Sludge	Pipes
Remove solids	*Filtration*	*Sedimentation Flotation*	*Thickening*	
Remove Organic Matter	*Membranes*	*Flocculation*	*Aerobic & anaerobic*	*De-sintegration*
Remove Nutrients	*Ion exchange*	*Activated Carbon*	*Aerobic & anaerobic*	
Remove Ions	*Ion exchange*	*Electrodialysis*	*Chemical precipitation*	
Adjust Oxygen	*Gas exchange*	*Ozone*	*Air Stripping*	
Remove Toxics	*H2O2*	*Ozone*	*Air Stripping*	*Chemical oxidation*
Remove bacteria	*H2O2*	*Ozone*	*Thermal Disinfection*	*Thermal reduction*
Remove viruses	*Chlorine*	*Ozone*	*Thermal Disinfection*	*Thermal reduction*
Process Management	*Sensors*	*Sensors*	*Cleaning*	*Sensor*
Inhibit recontamination	*Chlorine*	*Cleaning*	*Thermal Disinfection*	*In-lining*

© Lorraine Rieger 2005 [6]

The main buyers of many water and wastewater solutions are municipal and regional governments. The funding for these kinds of retrofit and aging infrastructure projects are state, provincial and increasingly federal governments. There are many influencers in the buying decision and many variations of the solution are needed to fit all the different environments. Currently, there is no mechanism available to government decision makers to remove their personal liability of a decision made on implementing an innovative technology that has the risk it might not perform as promised. This risk can often be mitigated through lengthy pilot projects observed by independent third parties. Primary research done by Trilogics (Damm 2004) found

[6] Source: Graphic developed by author. After research data from Sustainable Asset Management, (Tillman) Zurich, Switzerland and interviews with NovaTec Consultants, Ltd.

that municipal governments are seeking solutions to buy innovation and pass the risk on to third parties through public/private (P3) partnerships.

In the meantime, a CleanTech developer will have to support the pilot project without any revenue for that entire sales cycle. Many companies do not make it. To complicate the transfer of new innovations to city infrastructure, the venture capital community has been loathe to invest in companies where government is the primary buyer or the market is buffeted by fickle government policy regulation. However, some venture capital companies that understand the complexities of the CleanTech sector now say that a pro-environmental public policy stance can be a driver in bringing new business and investment to a region and that increased regulation is an important factor in their investment decisions. (Burtis, 2004). Infrastructure rejuvenation will not be possible without capital from the investment community for the inventors and from government so that cities and towns can buy the solutions.

These regulatory fluctuations send mixed signals to the marketplace and it results in a lack of funding for companies developing the technology. This is a complicating factor that federal, provincial and state governments must address with policy remedies. Consultants may or may not be able to aid in the remedy.

2.6.3 Greenhouse Gas Reduction Technologies Drivers

Technologies that reduce greenhouse gases (GHG) also have many complicating factors that affect demand. With the arrival of the Kyoto Accord, many new inventors are

claiming their technologies reduce emissions (GHG[7]) and therefore must qualify for credits. The truth is, very few companies will be able to qualify for credits unless their technologies:

- Meet existing protocols and standards for GHG emissions.
- Are validated as to how much of any GHG is removed and how it's processed for reuse or sequestered.
- Can sink, sequester or re-deploy substantial amounts of one or more GHG.
- Can be aggregated with companies to amass enough volume to qualify to sell a credit.
- Can afford the legal and audit process requirements to register for credits as defined by the European Union's Emissions Trading Scheme (EU-ETS). The value of a credit is determined on the open market and increases in value depending on the global warming potential (GWP) rating of the gas as defined in footnote 9 on page 66.

[7] GHG Greenhouse Gas Emissions include six gases as described in the Kyoto Accord UNFCC (1991)
1. Carbon dioxide global warming potential GWP rating of 1, Burning fossil fuels releases carbon that has been stored underground for millions of years into the atmosphere. The carbon in these fossil fuels is transformed into carbon dioxide, the predominant gas contributing to the greenhouse effect, during the combustion process. While carbon dioxide is absorbed and released at nearly equal rates by natural processes on the earth, this equilibrium is disrupted when large amounts of carbon dioxide are released to the atmosphere by human activities, such as the burning of fossil fuels.
2. Methane GWP of 21 Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and oil, coal production , and incomplete fossil fuel combustion;,
3. Nitrous oxide A powerful greenhouse gas with a global warming potential of 320. Major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning;,
4. HFCs, Compounds containing only hydrogen, fluorine, and carbon atoms. They were introduced as alternatives to ozone depleting substances in serving many industrial, commercial, and personal needs. HFCs are emitted as by-products of industrial processes and are also used in manufacturing. They do not significantly deplete the stratospheric ozone layer, but they are powerful greenhouse gases with GWP ranging from 140 (HFC-152a) to 11,700 (HFC-23);
5. PFCs A class of chemicals with a global warming potential GWP rating of 6,500 – 9,200) composed of one or two carbon atoms and four to six fluorine atoms. PFCs have no commercial uses and are emitted as a by product of aluminium smelting and uranium enrichment and;
6. Sulphur Hexafluoride a colourless gas that is soluble in alcohol and ether; a powerful greenhouse gas widely used in the electrical utility industry.

In the US, credits are available only for reducing Sulphur Dioxide (SOX) and Nitrous Oxide (NOX), not for carbon or other GHGs. In Canada, there is no market developed for credits within the country[8], however carbon sequestration projects will receive incentives and credits can be traded with other Kyoto signatory countries (Vickers, 2005). In Europe ETS can add an additional return on investment for investors in projects that meet Kyoto protocol GHG standards which can be an attractive inducement. However, technologies, companies or projects that can sequester carbon dioxide as opposed to using it as a feedstock for another process, do not qualify for credits. Carbon recaptured and used for beverage production would qualify. A credit is worth roughly one ton of recaptured carbon. Polluters who need to buy credits are looking to "offset" many tons of carbon created by their industrial processes. A credit may be worth any where from €5 to €12 per ton (Edwards 2005).

While it is true that the planet needs GHG reduction technology, it is unclear what kinds of companies will determine they need to purchase such technology without regulations demanding it or corporate values that would motivate their interests. Companies such as Alcan have set a corporate commitment to social responsibility and reducing their environmental impacts. However it takes years of integrated planning to begin to understand how to become "sustainable" and then introduce measures into corporate processes that employees will implement. Changing attitudes and behaviour is the first step.

GHG reduction technologies also need other performance characteristics in addition to emission reductions. Buyers want performance improvement, cost reductions from incumbent technologies or other economic efficiency. For instance, conventional thinking believes energy derived from coal is a dirty form of power that will have to be slowly phased out

[8] The Canadian Federal government is proposing to introduce a trading scheme similar to the European Union's Emissions Trading Scheme (EU-ETS) by 2008.

in favour of clean renewable energy sources. Yet it is the most prevalent source of power in the world with over 8000 billion tonnes of coal still in the ground compared to oil with only 200 billion tonnes available (Leggatt 1999). If the GHG emissions (carbon, nitrous oxide, sulphur dioxide as well as mercury and chlorine) can be significantly reduced or captured for reuse, some argue the coal industry would enjoy resurgence. Ironically, carbon (representing 12% of emissions) is one of the gases that can be separated from coal-fired plant exhausts. Carbon is what is needed to release oil from the heavy tar sands in the Western part of North America. Sequestering carbon underground is one of the ways that many tons can be taken out of the atmosphere. Separating and sequestering carbon would make coal cleaner but also result in adding fossil fuel capacity into the market. Some would argue that this is not a net gain in reduction of GHG emissions. Selling these technologies requires an understanding of these fine distinctions and a large network of connections to the oil industry, utilities, government and environmental groups all forming coalitions to create demonstration projects to advance these technologies.

In Canada, there are at least three companies developing GHG separation technologies for use on industrial stacks including coal fired plants. While it appears that it would be an easy purchase for coal plants, in reality, developers need to spend years demonstrating these solutions in unison with joint venture partners in order for buyers to be satisfied that they are effective. Retrofitting a coal plant with this technology will cost owners millions of dollars. Finding uses for the captured gases is another business in and of it self. Confusion abounds about which organization would receive the right to sell the emissions reduction credits. Consultants and consortiums of solution providers are needed to realize revenues in this sector of CleanTech business.

2.7 CleanTech Industry Growth Factors

The CleanTech industry was first described in 2001. It does not yet have many anchor companies as success stories or that could be the lynchpin to support clusters. There are few that have grown into multi million dollar companies yet. So far, only 67 have provided exits for early investors to initial public offerings (IPOs) after 15 years (as of 2004) and 730 have gone through merger and acquisition transactions in North America. (Parker, LoGerfo, Propper de Callejon).

Historically, the clean energy and environmental technology industry has been fostered underground since the 1970s when the price of oil first spiked. When the price dropped backed down, interest in alternative energies waned and was left to the do-it-yourselfer and activist groups looking to solve poverty problems in developing countries. At the turn of the 21st century, the sector has "suddenly" emerged from the underbrush and found its way onto the world's radar screen. While this growth is certainly coming due to the high cost of oil, natural gas and other energy-related commodities it has been compounded this time by the extended turmoil in the Middle East and the financial opportunities spawned by the Kyoto protocol and new regulations in the EU.

Some of this growth is also due to technology breakthroughs such as MBA Polymer's (Biddle, 2005) ability to mechanically sort through shredded waste appliances (anything with an electric cord attached) and miraculously extract 32 different materials which are then each transformed into virgin resins. Solving this problem took eight years and $28 million dollars.

These kinds of breakthroughs are continuing exponentially through investment in research and development at universities around the world. It might be fair to say that this growth

in funding academic research investment was born from Michael Porter's observations of existing clusters (1998) and how they form. He observed that where there are academic institutions with high levels of research and development, clusters of supporting organizations tend to spring up. This appears to be true in the US for some types of industries like software (Silicon Valley and biotech (Boston). However when considering the potential of a CleanTech cluster to flourish in any region of Canada, new research suggests that in some cases cluster growth may occur only where companies are within a five mile radius of a university (Globerman and Shapiro 2005). In fact, this research also suggests that the Canadian economy may be too small to support many diversified clusters.

In BC there has been a concerted effort to develop an environmental cluster. However, despite the fact there are close to 400 companies developing solutions or providing services in this sector in BC, they are not clustered around a university, they are dispersed across the province. Complicating this dispersion is the fact that while they all work on different environmental problems, BC's technology developers and service providers belong to more than ten different industry groups that have yet to find common connections.

To offset the lack of organic clustering, a new group is attempting to spawn network effects by building an investment community focused on CleanTech. CleanTech companies around the world are slowly banding together as a community through the efforts of the CleanTech Venture Network. As a community, people from many geographic areas come together twice a year to build relationships which can provide some cluster-like synergies if nurtured over time. It should be noted that CleanTech events attract investors, technology providers, advisors and intermediaries (lawyers and accountants) but it is not a forum for activism, corporate social responsibility or sustainability leaders.

One of the leading groups within the CleanTech movement is investors. The venture capital community ties themselves very closely to academia in order to discover the latest technology breakthroughs. The Venture Capital industry is already clustered in California where 29% of all CleanTech investment occurred in 2003 (Burtis). In 2004, 12% of all venture investments were made in Canada which is proportional to the population and economy ratio between the US and Canada (Parker, LoGerfo, Propper de Callejon). This is an important determinant in evaluating the opportunity for NovaTec's Green Due Diligence advisory service to be successful. Consultants get most of their clients from referrals. Given this geographic dispersion, NovaTec may have to invest consistently in building its reputation within the CleanTech community by attending conferences that hopefully lead to connections and referrals for Green Due Diligence's services. The company may not be able to rely on marketing solely to the local marketplace.

In the CleanTech industry there are a few significant universities at the forefront of various cluster formations. For example, in Canada for water and wastewater they are the University of Waterloo and the University of British Columbia. For GHG reduction it is the University of Regina. For advanced materials such as nanotechnology the University of British Columbia is one of the acknowledged leaders in North America (amongst many other American universities). Across other countries, for renewable energy in ocean and tidal energy it is the University of Oregon in the US and the University of Edinburgh in the UK that are leading the way. It is interesting to note that some CleanTech American venture capital groups are very aware of the technologies coming from Canadian universities and track their progress. This factor may prove to help NovaTec become a valuable contributor of deal flow to investors if the company carefully nurtures relationships with the universities, technology developers and the CleanTech investment community.

The most compelling driver causing such swift changes in adoption of clean technology is political. The need to solve our energy and environmental problems is now apparent across most ideologies. For example the UK set policies to generate 20% of their energy sources from renewable energy by 2020 (Edwards). China has committed to meet 12% of their power generation capacity from new renewables by 2020 (ENS Newswire 2004). In Germany the government set up feed-in tariffs that made solar photovoltaic products so popular it led to solar module shortages around the world. (Makower 2005). Germany, Finland and the UK's renewable energy and green policies have created the need for many consultants, incubators and government programs that fuel commercialization of CleanTech products. Strikingly, despite the fact that the US did not sign the Kyoto Protocol, they have more regulations and policy governing energy and the environment than Canada has.

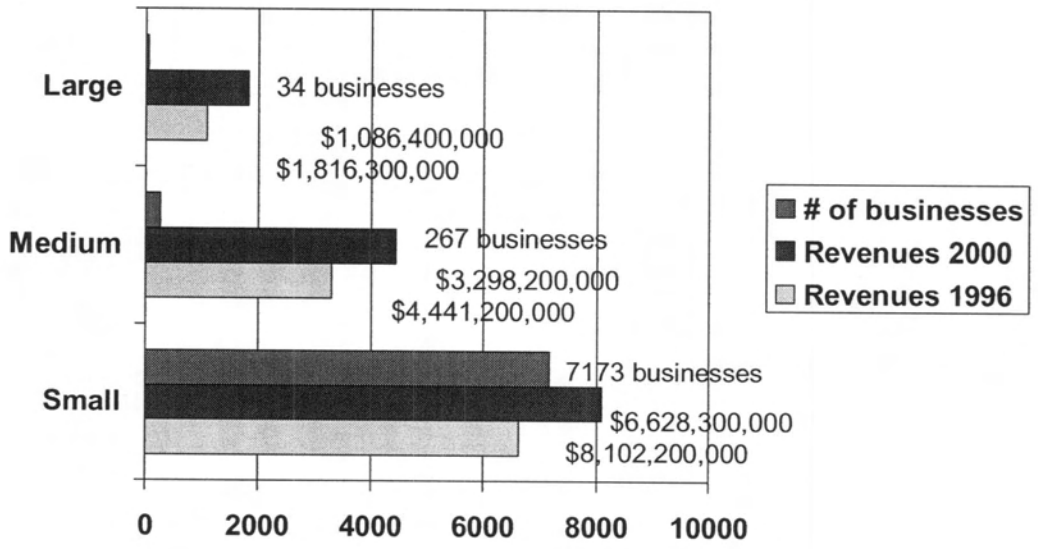
In the US, individual states are signing on to Renewable Portfolio Standards (RPS) to allow renewable energies and trading credits to flourish. In some states, like Connecticut, Massachusetts, Texas and California, solving the energy problem is on top of political agendas (Williamson 2005). Even at the municipal level, Seattle mayor, Greg Nickels has convinced 300 of his colleagues across the country to adopt sustainability initiatives and invest in innovation to improve infrastructure. (Grissom Little 2005).

These types of initiatives are spurring demand for a wide range of energy and environmentally-sound alternatives and hence consultants who can help developers package and sell these technologies as complete solutions rather than components. It is important to note that Canada does not have a national energy policy and therefore new industry regulations that could drive innovation or investment do not exist. Regional political and economic differences tend to defeat efforts at national policies that might appear to restrict commerce. This is also a factor that

must be evaluated in determining the potential of a CleanTech consulting service, especially one based in Canada versus more environmentally responsive jurisdictions such as Europe or the US.

One way to measure the success of an industry is to look at how many jobs are supported. The US tracks job growth data in this sector. Canada has completed one report on environmentally-driven economics in 2002 (Orok 2002) which identified revenue growth and the number of businesses in environmental industries from 1998 through 2000. The next report will not be complete until 2006 so there is no baseline comparison data to track growth as of 2005. Statistics Canada defines the environmental industry as any company providing services or equipment that deals with an environmental problem. This definition represents a somewhat different set of companies than is defined by the concept of CleanTech which does not include environmental engineering services but does include information technology and enabling technology. The study does not track employment. Therefore it makes a comparison between the US and Canada difficult. It is rewarding to note that there has been growth in the sector and that small business leads the way as the figure on the following page notes.

Figure 8 - Total Canadian Environmental Revenues by Business Size 1996-2000



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The US calculates that the renewable energy industry employs 115,000 people while the entire coal industry by comparison only supports 83,000. (Kammen, Kapadia, Fripp 2004). The re-manufacturing industry (the practice of recovering, disassembling and reusing or recycling a product's parts) employs 480,000 people in the US and generates $53 billion in annual revenue. The US Water and Wastewater industry employed 99,000 people in 2002. In total environmentally-related industries support 850,000 jobs in the US. To put these numbers in perspective the entire mining and electricity generation industries in the US support 1.4 million jobs. This is an industry in its genesis period. (Bertis)

[9] Source: Graphic developed by author. After data published by Statistics Canada (Orok)

Finland discovered that by changing its Environmental Protection Act in March of 2000 when they adopted an integrated approach to preventing environmental damage, they could fuel the growth of their CleanTech industry and solve environmental problems. Prior to this change in legislation, this sector was valued at about $2.5 billion. By 2003 Finnish companies were expected to have environmental technology products worth $4.6 billion each year. (Vihersaari 2002)

However, for all the strength in these growth numbers and policy changes, companies in the CleanTech sector already in cash flow are plagued by delayed product releases, lack of experienced management and limited earnings. With these same issues facing emerging companies yet to move into commercialization, some investors are turning instead to larger players such as GE, Sharp and Toyota to place bets on more guaranteed results. (Makower) This is to be expected given the risk averse nature of the average venture capitalist. This tendency to seeking investments with lower risks removes capital from where it is desperately needed. Investors believe that governments and developers should shoulder the risk at the early stage. A lack of early stage capital diminishes the market for advisory services: developers cannot afford to retain consultants unless the government pays for their services.

Another way to measure whether investments in the early stage sector are increasing is to track venture capital investments. In 2004 investors made 69 deals which is a 14% drop from 2003 where 80 deals were completed (Makower). However, the size of each of the deals increased demonstrating a greater commitment to those companies they did invest in.

2.8 Conclusion – Industry Analysis

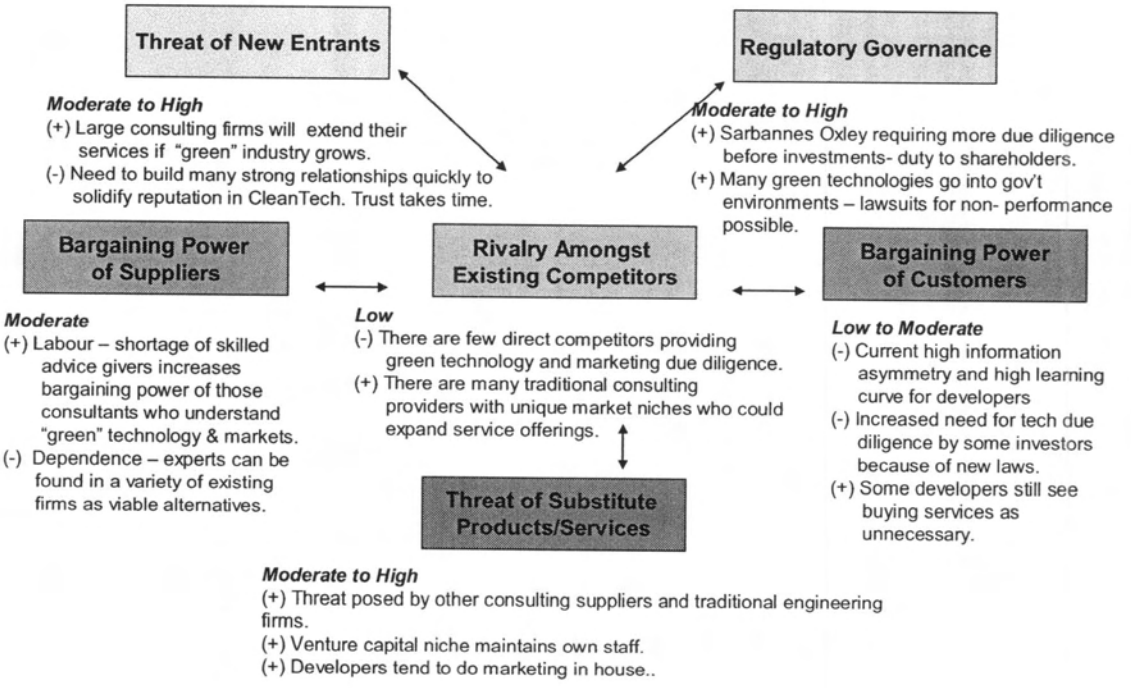
The CleanTech sector is driven by government regulation, political influence, cluster affects and the pace and size of investments in innovation. Looking at Porter's five forces

(Bukszar 2005) to conclude the industry analysis for advisory services for CleanTech, the threat of new entrants is high. This is especially true if the sector can continuously deliver returns on investment higher than 19% year over year. The consulting industry typically has low barriers to entry as it is easy to set up a consulting firm. What is more difficult is building the relationships necessary to break into the industry and prove that the firm adds value. The CleanTech community is still relatively small and there are many established relationships. Consulting firms that can separate themselves from the competition by retaining CleanTech knowledge experts in specific sectors such as water and wastewater may be able to grow their market niche. Correspondingly, local experts will find it easier to be of service to local companies.

The larger threat is from substitutes. There are many types of consulting firms that already have established relationships with universities and governments where they provide technical and marketing assistance. Further diminishing the landscape of potential buyers of services, developers who attract investors often gain a new set of advisors: the venture capital community tend to be very hands-on in their investments. Many developers in the commercialization phase prefer doing much of their business development in house which makes sense as they have to develop their own abilities. If an advisory services supplier such as NovaTec has hard to find expertise and core competencies the developer needs, then the bargaining power of customers is lower. However if customers are not demanding services, then their bargaining power is increased.

The following figure on the next page illustrates the level of attractiveness for a company to enter into the CleanTech Advisory Services Industry. In the figure, a plus (+) sign indicates that the factor increases the rivalry that may occur between competitors or the bargaining power of suppliers, for instance. The negative sign (-) indicates the factor decreases the threat of new entrants or the power of substitutes to dislodge a company from the marketplace.

Figure 9 - Industry Analysis of CleanTech Advisory Services



© Lorraine Rieger 2005 [10]

It is also vital to evaluate the cluster forces at work in various regions and the experiences of other companies or competitors within the region and the sector. Vancouver, BC does benefit from being known as a centre for sustainability. It is always difficult to track the number of start up companies at any given time. (Kennedy, 2005). The Centre for Sustainable Communities performed a cluster study in 2003 (CSCC 2003) and found about 300 companies in BC focused on developing products and services for the CleanTech sector. Sustainable Development Technologies Canada has screened 700 CleanTech business plans in the last four years (Kennedy). HamiltonClark, a CleanTech investment banking firm claims to track 900

[10] Figure developed by author after Buksar 2005 EMBA Strategy Seminar

companies around the world who are developing products for environmental improvement. In 2004 venture capital groups noted they were tracking 600+ CleanTech companies at the commercialization or revenue stage in North America. This number does not reflect the numerous companies in pre-revenue stages of the commercialization process.

While there may be 84 renewable energy companies in Western Canada , (CSCC 2003 and 2004) most have only 1-5 employees and perhaps less than 10% are earning revenues. The largest wind power project development company with the largest investment pool has yet to build any wind farms and therefore has no revenue. The largest CleanTech companies in BC are in the solar or power management energy business (Xantrex, 700 employees), (Carmanah Technologies 500 employees).

In contrast, California's CleanTech companies support 180,000 jobs (Burtis). California received 29% of all venture capital funding in 2004 representing $360 million of the total of $1.209 billion invested in CleanTech (Parker) while all of Canada received 12% ($144 million) of all venture funds. Looking at these kinds of statistics, it is important that NovaTec, headquartered in such a small market be able to tap into the CleanTech community network to promote its services and find a successful method to work with CleanTech developers and the investment community all over North America. It might be more important to understand how to overcome these challenges and then determine more appropriate business solutions that transform them into opportunities.

3 MARKET ANALYSIS

3.1 Potential Target Markets and Market Niche

The next question is how does the an advisory service or consortium management group fit in with these emerging trends and the rate of investment in the CleanTech sector? If there is a need for a consulting group is there a need to segment by sector or by the problem or solution set offered? Can a small consulting group afford to scatter their focus or should it be targeted at the Fortune 1000 pursuing sustainability or only toward the commercialization companies? Is there a sizable market to provide advisory services to the investment community as well or exclusively? Is there a need or a willingness amongst developers to join consortiums? Can NovaTec continue to do business exclusively in Canada or must it attempt to work throughout the CleanTech community in North America or even in other regions? Are there other opportunities to sell more than billable hours that fit NovaTec's core competency and would deliver solutions to the industry, which are complementary to consulting?

Business wisdom would say a good strategy has a narrow focus. A small company like NovaTec which is already seen as a specialist within water and wastewater treatment should probably not stray too far from their core competency. When reviewing the trends in the CleanTech sector it would appear that the market segment that is growing the fastest in terms of investment dollars is alternative energy. HamiltonClark reports that the 900 + energy related technology companies around the world that it tracks collectively are seeking $3.4 billion in venture capital. This is the segment of the CleanTech industry attracting the most entrants and

the greatest investment, but NovaTec does not have core competency or a reputation in alternative energy or enabling technologies such as power management or testing.

To NovaTec's possible advantage, the greatest need that has yet to emerge as substantial portion of investors portfolios is water and wastewater treatment. Expansion Capital estimates the market for water technology and services was $203 billion worldwide in 2002. (Llovera 2005). Of that $203 billion, 75% will be spent on services of which 50% will be invested in waste treatment and the remainder on safe and reliable drinking water. North America companies will see 30% of this $203 billion invested in infrastructure.

GHG emissions reduction technologies are attractive to many investors due to additional returns offered by trading credits in the EU-ETS. This market is in its infancy and industry values are uncertain at this date. Again, NovaTec does not have core competencies in this area.

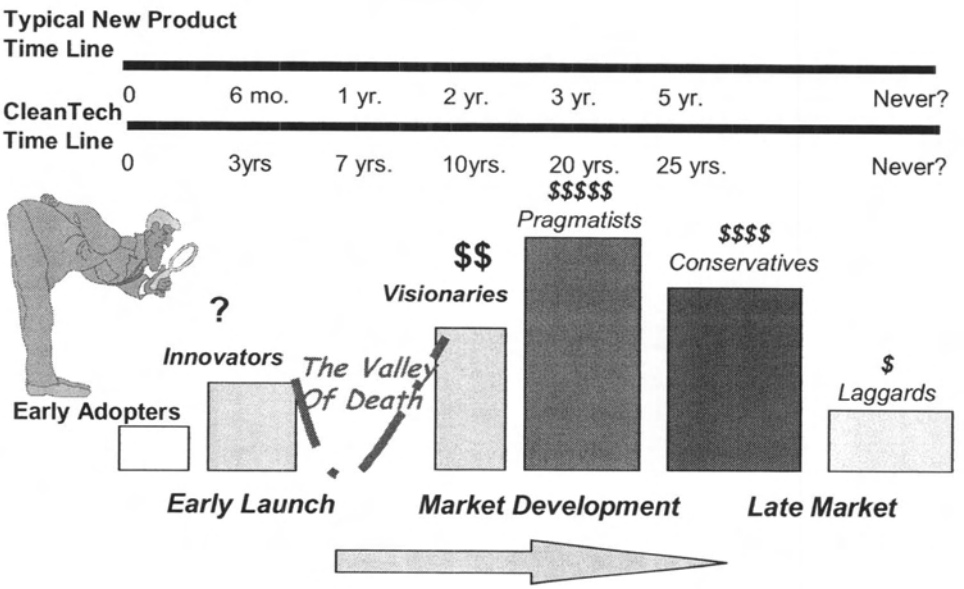
This analysis must be combined with attempting to identify which segment will be populated with potential clients who have the ability and willingness to pay for services that are in alignment with the firm's core competencies. Then it is vital to understand if the selected segment can be penetrated effectively given NovaTec's marketing resources and geographic location. It would also be relevant to evaluate whether this market segment would also yield reference customers.

Geoffrey Moore in his seminal book "Crossing the Chasm" noted that to be successful in growing a technology company, the leadership team must focus on a market that has built in reference relationships across companies (Moore 1991). If the first buyer of a new technology then also recommends it to colleagues in the same industry, the leadership team now has the beginnings of traction in the market and can continue to capitalize on their clients' next

referrals. Without referrals, a new company often falls into the chasm known as the valley of death, working hard for every sale without the momentum gained from referrals. This phenomenon is observed across most industries and is particularly prevalent for pioneering technologies that must disrupt incumbent systems. The majority of buyers will not risk being the first purchaser. Finding the few buyers will to take the risk to invest in innovation is a key offering of a good advisory service. In order to be able to offer entry to a first buyer, the advisory service also has to have a track record of having made such introductions for other companies that resulted in successful sales. NovaTec must have a solid and growing relationship with a network of potential buyers.

The figure on the following page contrasts the length of time for product adoption of typical pioneering new products such as software or telecommunications and CleanTech products.

Figure 10 - Commercialization Journey Comparison



© Lorraine Rieger 2005 [11]

Within the CleanTech community the most important referral for a consultant comes not from the CleanTech developer but from investors. CleanTech developers do not talk to each other and as mentioned are not clustered so there are few network effects. But if the Green Due Diligence team worked on a project that yielded results and where prominent leaders in the CleanTech community were investors, referrals would be forthcoming. NovaTec would benefit more from ensuring the Green Due Diligence team continued to develop its CleanTech investor networks by bringing good companies that they have worked with (deal flow) to the right investors. To complement this effort even further, the Green Due Diligence team should focus on

[11] Sources: Graphic developed by author. After concepts developed from research in the high tech sector by Geoffrey Moore and experience of CleanTech entrepreneurs as observed by the author (1990 – 2005)

those investors who claim an emphasis on the water and wastewater sector to be able to offer NovaTec's technical verification services at the same time.

4 STRATEGIC FIT

4.1 Introduction

This chapter seeks to identify the best fit for NovaTec within the CleanTech sector. An analysis of the emerging trends in this sector compared to NovaTec's core competencies and resource capacity may point to service areas, market needs and market segments that will enhance their revenues.

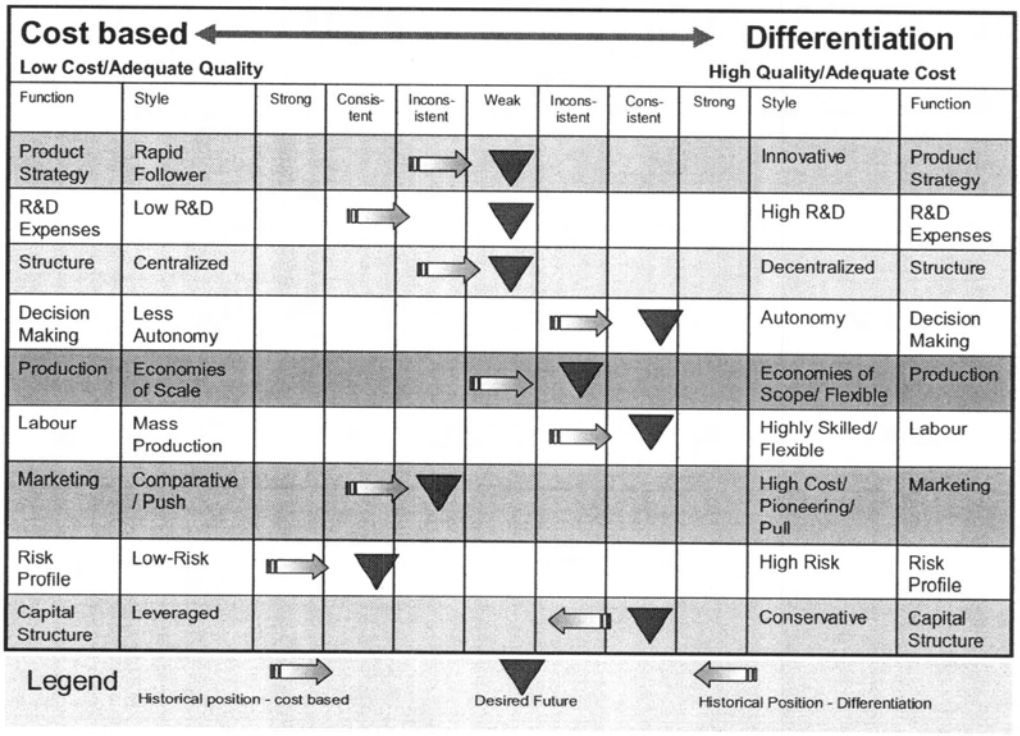
When a firm wants to change the fundamental way they earn profits, they are in essence taking on a new set of risks that could jeopardize their cash flow, reputational capital and stability. Changing the nature of the business by adding other services or expanding into new areas may cause disruptions in the areas that are stable. Employees used to established routines and ways of working may find the changes too difficult and leave or become inefficient in their work. (Bridges 2003)

In a firm the size of NovaTec, all resources need to be employed at ensuring that profitable work continues. There are not enough resources to devote to projects that don't provide an immediate return on investment.

Currently, the company is relying on the work of six people to support the new business initiatives being developed by eight people. These imbalances will likely cause rifts in the cash flow, profitability, capacity or stability of the firm. Therefore it is important to know that such new initiatives are relatively complementary to existing activities and that there is a synergistic reason to pursue other forms of business. To evaluate the efficacy of enhancing

revenues with the Green Due Diligence Advisory Services and the managing of consortiums, this chapter explore and compares NovaTec's strategic fit with these new initiatives.

Figure 11 - Strategic Fit of NovaTec's Business Model



4.2 Strategic Fit

NovaTec began as a partnership between two PhD civil engineers 20 years ago. Their strength at the beginning was the polarization in styles between the partners. One is fiscally conservative, detail oriented and systematic. He keeps the company on track financially. The

[12] Source: Graphic developed by author. After and adapted from Ed Bukszar EMBA Strategy Seminar

other is entrepreneurial, big-picture focused and socially gregarious. He is ready to take chances by backing new ideas and initiatives. This polarity has created a constant tension that appears to have allowed them to build a profitable business with a conservative capital structure (100% equity, no debt). However today, it has also resulted in a muddled strategy that is reflected in how they attempt to enter new markets and extend their expertise into related services. New initiatives started by the entrepreneurial partner are given 6-9 months to flourish or they are closed out by the conservative partner. Therefore, many new projects get invested in and few result in enhanced revenues. They aspire to be differentiators but still operate many activities as if they were rapid followers.

They have built their business reputation on being water and wastewater problem solvers, rather than on bidding on environmental engineering contracts. In comparison to other environmental engineering firms that traditionally bid for work and win contracts based on the price of their service offerings, NovaTec has been successful at differentiating themselves in one market niche: as solution providers needed when crises management or innovation is required. Price then becomes a secondary issue. This allows them to charge rates that other engineering firms cannot get and to bundle solutions at premium hourly and daily rates in comparison to traditional firms. However, the size of these projects tends to be under $50,000. On larger projects, NovaTec prefers to partner with larger firms to reduce their risk, thereby also reducing their revenues.

4.2.1 Research & Development Expenses

NovaTec has a policy for research and development. Unless the company can get a government grant such as a National Research Council Industrial Research Assistance Program (IRAP) or funding from the client or joint venture partner, it does not invest in research and

development internally. For instance, to fund the development of the consortiums, they raised grant money to develop a water reuse solution for a market the granting agency was interested in aiding (China), rather than selecting the right target market for the solution and the company's ability to service that market. NovaTec is very proactive in acquiring grants to do research for internal projects that it hopes could result in future business opportunities. However, because these projects often must be moulded to fit grant requirements rather than business development needs, the subsequent work needed to be done to develop projects into viable businesses gets overlooked or never completed. Many potential business development projects sit on the shelf.

NovaTec's partners are very inconsistent in how they turn basic research into applied research ready to commercialize. For instance, the company received grant funding for the water reuse consortium from the Canadian government to determine whether China could benefit from Canadian water reuse technology. This funding allows NovaTec to perform technical and market research in China but does not provide funding to then use this research for business development. NovaTec would have to invest their own time and energy into sales and marketing to realize any contracts. There are no business development specialists who understand China within NovaTec so actualizing the value of the research gained from this grant funding may not occur. Secondly, NovaTec favours their consultants working on billable projects only. A decision will have to be made to risk investing in someone engaging in business development activity using the research gained and hope these efforts will return a profit within their allotted time frame. This loss averse practice does not support their goal of differentiation.

4.2.2 Structure

NovaTec is a decentralized work environment with a flat hierarchy. The office is organized so that people can speak directly to whoever is needed. All information on past projects

is available on the network. All resources are available to anyone on an as needed basis, if they happen to be available. There is an open-door policy for everyone.

With the change in strategy and focus toward the new business units, they have begun to relax the requirement that the leaders of those units are 100% billable, recognizing that project and product development takes an investment of time and resources. But this tolerance stretches for a limited period of time only.

New projects like the consortium have increased the need to form informal teams to manage the projects. NovaTec consultants typically work independently, not in a team environment. Senior consultants are now learning by trial and error about collaboration and project management. Structural issues will have to be addressed if any of these business units start to succeed. More support will be required and knowledge and resources will have to be managed and distributed in a more functional manner to support the decentralized environment. While these factors are noted, no planning or discussion is currently being held in case the business effort fails.

4.2.3 Decision Making

All consultants at NovaTec are autonomous with respect to decisions about how they will work, when they will work and even if they will work on a project. Decisions on expenditures are made by the partners. They meet as needed formally and informally and generally come to a conclusion about expenditures very quickly, as long as the request is backed up by well-thought out analysis. Getting buy-in from one partner often gets buy-in from the other two partners. Their rapid decision making process might signal that they have put greater thought into their strategic direction than they have disclosed to the company as a whole.

4.2.4 Production

Most of their work involves solving the same kinds of problems year after year with new approaches. Competitors have a high learning curve in this field. This factor differentiates NovaTec from other environmental engineering firms. These kinds of troubleshooting projects require flexibility, economies of scope, confidence in their research and a willingness to take risks on behalf of their clients that traditional engineers would not attempt. To mitigate this risk, they also ensure that adequate training and maintenance support at client sites is part of their solutions set, something other firms also do not provide. The partners transfer this knowledge to their junior engineers through rigorous debate. Junior engineers spend time proving their theories through empirical research at NovaTec's technology testing site in Squamish.

However, most production is completed individually and independently of any other effort. Each consultant is expected to do their own business development work and delivery. Since most other employees are wrapped up in similar undertakings, there is very little capacity to devote to projects like the consortium or Green Due Diligence that might need combined talents or more concerted effort.

4.2.5 Labour

NovaTec has 15 employees including three partners, four senior consultants, four junior engineers, and four support staff. Partners and two of the senior consultants are expected to bring in their own business. The partners manage the practice and lead billable work. Senior consultants are specialists in their area. They act as project managers, marketing managers, project administrators and research and development specialists. Junior consultants get assigned

to projects and are expected to be billable 100% of the time. Support staff provides CAD/technical support, accounting, reception and research services.

The new senior consultants are expected to build their business units to profitability and then will be invited to become a partner. Everyone is expected to be self-motivated, self-managed and self-responsible for their part of the work. Most consultants have a master's degree or a PhD or they are concurrently working on advanced degrees. NovaTec employees are able to work independently. They are strong in their ability to deliver service. The downside to this is that all the senior people have many talents. In resource-constrained firm, they often get called on or volunteer to resolve technical problems, billing problems, quality control issues or other troubleshooting that other less valuable resources could be doing. Outsourcing support is often seen as a last resort. This approach minimizes labour efficiency.

4.2.6 Marketing

To date, NovaTec has built its reputation on word of mouth as the engineering firm to turn to when an organization has water, wastewater and treatment problems. The phone rings reliably year after year for work related to troubleshooting. Other business units such as the testing centre, shipping, consortiums and Green Due Diligence must educate their market place and constantly network to attract business.

4.2.7 Risk Profile

NovaTec's risk profile is more in keeping with a cost-leader not a differentiator. They have no debt and are fiscally conservative. However this approach to decision making about investing in new revenue areas is inconsistently applied. They take risks in hiring new senior consultants to expand their product strategies but provide little in the way of support to ensure the hired resource will be successful.

The partners are clear that they will review the progress made by the new business unit every three months and pull the plug on the effort if billable results are not evident. They are consistent in this approach. Yet they realize that it takes time to do the research to develop the business unit and launching it too early could defeat the efforts. Despite their interest in growing their revenues cash flow is the first priority. NovaTec tends to support too many large new projects without adequately determining if they have the resources to support it for longer than they hope. Needing to produce results quickly and wanting to develop products and services that are well designed so they will be valued and needed causes tension.

4.2.8 Capital Structure

NovaTec is debt free and banks its annual retained earnings after profit sharing. It holds a large and unencumbered line of credit available for special projects. The partners have analysed many different investment opportunities over the years, but have invested only in a not-for-profit which seems counter to their interest in growing their organization. They have not used the line of credit. They prefer to invest in opportunities through contra deals involving time and expertise rather than actual cash investments. They have invested in a partnership structure that minimizes taxes and maximizes returns for the equity fund that will provide retirement income for each partner when they are ready to exit.

Their strategy is to attempt to grow others types of revenue enhancing businesses but at the same time, they are opportunistic: if there appears to be a short term project that would earn revenue faster, other less active projects are immediately dropped. Staff are often confused as to the company's long term direction when the partners suddenly drop new projects and people they have invested in, just because short term results have not occurred within a desired time frame. As long as the consortium looks like it will attract business soon enough and has grant

funding, the effort will continue. When the grant funding is consumed, the conservative partner has suggested he will pull the plug on the consortium project if the team has not sold a project in China.

Such short sighted planning in favour of immediate revenues will ensure that NovaTec stays viable but will not build a cohesive differentiated strategy for the company. This loss averse approach may be a barrier to further growth and does not maximize the synergies of a focused team effort.

4.2.9 Conclusion on Strategic Fit

The new business units are in early days still and it will take at least a year to determine whether they can succeed. They are high risk ventures being managed on shoe string budgets. While NovaTec has some brand name recognition in the field of environmental engineering, it is not known for managing consortiums, delivering innovative and integrated technology solutions to the world or providing commercialization advisory services. There is a lack of fit in how they are attempting to grow their differentiation opportunities.

Michael Porter (1996) suggests that sustaining a strategic fit across many activities is fundamental to competitive advantage. Porter says that poor performance in one activity will degrade the performance in others. This will expose weaknesses which will need attention.

NovaTec cannot sustain growth in any one of its new business units and its current business without additional investment in labour and marketing. Their ability to grow these new units to maintain a competitive advantage in emerging industries is at risk. New

industries are difficult to predict. Uncontrollable variables especially in emerging markets such as China and new entrants can change the landscape quickly.

In terms of the advisory service, existing consulting companies such as KPMG and PriceWaterhouseCoopers with horizontal scale are well known for stepping into emerging industries such as CleanTech quickly and capturing market share. Their brand names are well-known and trusted and they have a network of resources in many locations so they are able to go where companies are located, thereby negating the lack of clustering that challenges NovaTec's Green Due Diligence service. There are several new consulting companies now moving into the sector that have significant teams with broad expertise who have won name-brand clients such as GE and Office Depot.

NovaTec will have to carve out a smaller more focused market niche that consulting giants would not be able to compete with.

While the partners have positioned themselves to address some of their resource needs by securing a line of credit, their inherent inclination away from taking capital risks could retard the growth of either the advisory service and/or the consortium and their goal of enhancing revenue will not come to fruition.

While it is commendable that they are able to sustain profitability year after year with the activities they do well, they are making new investments without adequate support for growth. The issue of how much growth they want to achieve has not been clarified. Given their previous experience downsizing from a company of 60 people, the partners might be reluctant to retain the resources they may need to support these projects. At the same time, perhaps their strategy of under-funding business units until they prove themselves will deliver revenue growth without added risk.

Until the company can build its network and a visible track record in the CleanTech advisory service market and the water reuse market, NovaTec will not see a return on their investment on these projects or their goals.

4.3 Trend Analysis and Strategic Fit – Advisory Services

To review, while NovaTec's Green Due Diligence team has experience in most of the segments referred to in CleanTech, NovaTec is known for water and wastewater treatment. Green Due Diligence was branded separately in order to ensure both groups could develop separate reputations without confusing the marketplace about the services offered. Within the Vancouver and Ottawa markets and in a few other locations in Canada, Green Due Diligence does enjoy some reputational advantages because it is a NovaTec company. These advantages do not accrue beyond Canada.

Green Due Diligence must build its own reputation based on merit and results. A consulting firm attracts clients based on its reputation for results and its expertise in specific industry and functional areas. It is not the kind of service that is easily sold through cold calls. Consulting is a relationship-based business where trust is extended based on face to face connections. A company looking for assistance will trust a colleague for a referral to a consulting firm over one that has arrived at the door unannounced. Both firms may have equal capability, but the work will go to the trusted colleague's referral, not the cold caller.

In order to build these face to face relationships, it is important to go to industry events where people working on similar problems gather.

An important fact to note is that each CleanTech segment has a steep learning curve and many kinds of industry groups that influence investors and companies in the market. It

is difficult for a company the size of NovaTec to participate in industry groups as varied as solar energy, water reuse and carbon separation and find any opportunities to gain visibility to earn referrals through clients in each sector.

Selecting the right industry group that bridges several areas can alleviate this problem. For instance in a community that is currently as small as CleanTech (400 people attend each Cleantech Venture Investor Forum on average), referrals might be forthcoming once the Green Due Diligence team is seen at several events and has maintained contact between events. As the community gets bigger, it will be important for NovaTec personnel to get involved at a leadership level in this community to maintain visibility and grow their reputational capital.

There are other methods of gaining visibility to become a trusted referral source. In a geographic region there are a diverse set of prospective customers representing most CleanTech segments. NovaTec can gain visibility in a geographic market like Vancouver more easily than it can in Silicon Valley or Boston where there are many more CleanTech companies because it already has a reputation here. In other markets, advisory service companies are already known and working with local companies.

Without cluster effects, it might be difficult to select only one market segment and hope to build a business that can return 2.3 time salary each year. Taking this avenue would mean spending resources to belong to and regularly attend a much wider variety of industry associations and groupings to build a network. This might strain the company's capacity as there are 1.5 FTE assigned to this business unit. NovaTec might benefit from starting a local chapter of the CleanTech community in Vancouver so that it can gain a perceived leadership position locally to enhance its ability to attract referrals. This might also help gain visibility on the national stage

as well. Starting a local CleanTech chapter would remove the challenges inherent in trying to network across multiple industry associations and functional groups.

The Green Due Diligence team has a different set of core competencies than the original NovaTec team. They offer marketing and business development strategies. This team has experience in building market entry strategies for pioneering technologies not yet known in the market. They have worked in many market segments including waste management, waste to energy, water treatment technologies, and agricultural products, GHG technologies, enabling technologies (software and testing), alternative energy and green building materials but are not well known in any of these individual areas. This is due in part because the team is only 8 months old and the business unit lead gained her experience in the US, not in Canada. They are starting to become known within the CleanTech community, but they do not yet have a record of successes to point to within any one segment to gain access to being trusted advisors within the investment community.

If the investment community is the lynch pin in the CleanTech referral system, then Green Due Diligence needs to ensure it has built a wide network that includes investors. Therefore, the team has begun to offer introduction services to financing sources for CleanTech developers. The team is building their networks to a range of financing sources from seed capital and angel funding to investment banking and project finance.

A strategic conundrum still exists with identifying the right focus for the Green Due Diligence service. From the consultant's perspective, each client project has a similar set of problems indicative of a pioneering company. They have to enter a market that does not know it needs the product or service or why they would buy it. Rather, they have a set of problems that result in operational inefficiencies, reputational damage or have goals that are incongruent and

must be rectified. The seller must learn to communicate the value of their offering in the language that the buyer can understand. Specifically, the buyer understands the nature of their problems but does not know that a specific technology will provide a relevant solution to remedy their situation. In simple terms, this disconnect is at the heart of every project that Green Due Diligence accepts. In essence, helping a technology developer build a bridge across this communications divide is actually the team's core competency. However, to the CleanTech developer, the relevant experience that they trust is a consultant who has worked in their specific field.

The building of this bridge allows for economies of scope on most CleanTech projects despite the wide variety of companies the team currently works with. While it might be true that the Green Due Diligence team can apply the same strategic template to each project, there is still a learning curve with each new client due to the complexities highlighted in Chapter Two which makes working across multiple market segments inefficient in some respects.

Business strategists must focus on the needs of the customer. NovaTec's customer wants their water treatment problem fixed. Green Due Diligence's customer wants help to attract investors to fund their companies so they can enter the right market with their environmental solution and be rewarded by growing revenues for solving environmental problems. In looking at the big picture, NovaTec's clients (government and industry) will be the buying the products placed in the market as a result of the efforts made by the Green Due Diligence team. As discussed earlier in this paper, buyers are looking for complete solutions or technology platforms they can build on. Green Due Diligence's clients are making components that might be more effective in the market if they were part of these complete solutions.

The Green Due Diligence team often includes the option of helping clients find relevant joint venture partners with either complementary technology or established distribution channels to accelerate business development. Part of the project fee includes a commission for arranging such deals and a percentage of revenue that eventually occurs as a result of the joint venture. This is another source of enhanced revenue not based on billable hours. Joint ventures can help CleanTech developers learn how to work collaboratively and build technology linkages that will lead to full solution technology platforms. These are vital first steps for many young companies essential to their growth. Facilitating the forming of joint ventures may start to provide some early synergies between the Green Due Diligence service and the consortium projects. In projects related to water and wastewater technologies, NovaTec's other technical services will be needed which provide better synergies of the firm's core competencies.

Green Due Diligence may be able to enhance NovaTec's revenue by taking on projects that involve making introductions to financial sources. Developing these connections takes time that NovaTec might not be willing to allow. Typically an introduction fee is paid as a percentage of capital raised. This might be anywhere from 3 to 8 percent. There is a risk that some projects will never attract funding or that the client will not pay a consulting fee during the time period necessary to source the funds. If a typical project earns NovaTec $30,000 in consulting fees and once per year the Green Due Diligence is successful at making an introduction to a financial source that completes the deal, this team could add between $30,000 and $500,000 depending on the nature of the project. For instance, a current client needs project financing for eight "waste to energy" system sites in Europe. Should the team be successful in locating a funding partner able to invest in all the projects, the fee would be almost $1,000,000.

As the company's financial cushion increases, NovaTec may also be willing to take equity positions in some companies in lieu of fees which could also increase partner wealth.

However, as noted, there are not enough companies in the local market focusing on the water and wastewater treatment segment of CleanTech to sustain the kind of growth that the Green Due Diligence advisory service needs to attain the 2.3 times salary expectations. This fact makes synergistic strategic fit difficult to attain.

4.4 Trend Analysis and Strategic Fit – Consortium Management

NovaTec has managed to gain visibility in the local market and within the wastewater treatment industry in North America for its work on improving policy and regulations for wastewater treatment and locally for water reuse. It has no reputation or competency as yet in managing a consortium to the point that it wins businesses and executes on water reuse projects in China.

NovaTec has managed to gather together a group of fifteen companies to develop a water reuse consortium and another group of six companies to develop a small water system management plan. These consortiums are in the business development stage and do not yet have a plan of action as to how they will search for and win contracts.

NovaTec has less visibility in water reuse than water and wastewater treatment. This is partly due to the fact the water reuse market is new, there are no industry associations and many jurisdictions as yet do not have regulations governing effective water reuse. Water reuse is a function of design and equipment specification. There is no one company that can provide an entire solution as yet. This is why NovaTec has formed a consortium of companies to design a technology platform and sell water reuse solutions.

NovaTec realized that the lack of complete solutions was an issue every time they worked on a water reuse project. A water reuse system in essence is a scaled down

wastewater treatment plant located within a building or a distributed water treatment system. Today's wastewater treatment companies have complete systems built to the scale of cities, not buildings. When NovaTec started designing these systems, locating scaled down technologies was difficult. In designing solutions, they would have to assemble components from a variety of solutions and then engineer linkages to enable the suite of technologies to work together seamlessly within the confines of a building.

They started their own testing centre to ensure their designs would work under many different conditions. The question became, how could NovaTec realize value from the work they had done assembling and integrating these technologies? As process engineers, they could be the lead group in introducing the concepts to new markets. Managing and leading consortiums seemed like a natural next step.

The opportunity in China is substantial and hopefully worth the current effort. The following spreadsheet defines the revenue opportunities. NovaTec's consortium management team will begin business development by focusing on Beijing and Tianjin only.

The typical water reuse project for buildings greater than 30,000 m^3 is worth $1 million. The Chinese government and Nankai University, the designing centre responsible for water reuse in China, state they have 330 rural villages in Tianjin that will need water reuse systems to be able to survive. This is a five year project. If NovaTec won 30% of these projects, they would be installing 20 projects per year which would require additional engineering and project staff as well as a Chinese office.

Table 5 - Water Reuse Projected Revenue

NovaTec Water Reuse Revenue					
Tianjin Only			Annual	Annual	
	% of fees	Per Project	# of Projects	Revenue	
Consortium Project Fee	100%	$ 1,000,000.00	66		
NovaTec's portion of Fees from Projects			30%		
% of fee process engineering	14%	$ 140,000.00	20	$	2,772,000.00
% of fee management	8%	$ 80,000.00	20	$	1,584,000.00
% of fee business development	4%	$ 40,000.00	20	$	792,000.00
Total Incremental Revenue		$ 260,000.00		**$**	**5,148,000.00**
Additional Fixed Costs					
China office	1			$	90,000.00
FTE Engineers China	6			$	360,000.00
FTE Engineers Canada	3			$	300,000.00
Project Support Staff	3			$	180,000.00
Travel and Communication	$ 10,000.00		8 visits x 3	$	240,000.00
Total Incremental Fixed Costs				**$**	**1,170,000.00**
Total Incremental Profit				**$**	**3,978,000.00**

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This consortium project would provide a 61% increase in revenue growth for NovaTec. It should be noted that the while the Tianjin project represents less than 1% of all available water reuse projects in China, NovaTec will only be able to handle more projects if it increases capacity by hiring more engineers and project support staff. It is uncertain at this point if this is the company's goal and if they could support an increase in fixed costs. However, a project like this could provide the funding to grow, allow the founders to exit or to retain a better percentage of profits for the partners and the staff, if they did no other business development in China.

Consortiums can be difficult to manage. The consortium members retain title to their technologies and are responsible for their part of the integration and maintenance. They receive revenues for their part of a project but collectively they market the solution under one

[13] Source: Spreadsheet developed by author after data gathered from Water Reuse consortium members.

brand, have one leader managing the collective, an independent third party providing administration and governance and operate with one voice from the perspective of the customer. When problems occur in product production, delivery or execution, it will be difficult to manage who is responsible and remedy the problems easily without a clear delineation of authority.

A consortium needs the following core competencies to manage it properly:

1. Sourcing
2. Consulting
3. Project management
4. Process engineering
5. Business development
6. Alliance management

NovaTec has core competencies in some of these areas but will need to improve business development and alliance and project management capabilities. They will have to learn how to manage the alliance effectively. One of the benefits of consortiums is that if core skills are lacking, companies with those skills can be added to the consortium. NovaTec is using this strategy to full effect.

An added complicating factor in NovaTec's situation is that they have targeted China as their first market. They have had to learn how business is done there and retain local partners to provide this advice as well access local networks. NovaTec has previous experience working in China so leaders understand some of the critical success factors and how to find them. Their agreement with Nankai University to provide training to local engineers will greatly enhance their business development opportunities. The greater question still remaining is whether NovaTec will be able to or willing to wait through the start up process and lengthy sales cycles to reap the benefits of what they have built so far.

4.5 Trend Analysis and Strategic Fit – Gap Analysis

NovaTec's goal is to enhance their revenues. They have chosen to invest in two new business areas, advisory services and consortium management. Given the trends in CleanTech, are these the most appropriate projects to pursue? After analyzing the emerging trends in CleanTech, the biggest gap in the market is in the supply chain. Technology developers have no systemic method of distributing their wares as complete solutions to end users. Systems integration is the evolutionary next step after the formation of a joint venture and a consortium. For instance, in the personal computer industry's early days, computers were built by computer experts, assembled from a variety of parts sourced from many manufacturers. They were expensive, not always reliable and seen as beyond the reach of non-technical people. It was not until known organizations like IBM and Hewlett Packard began producing branded machines that were tested and reliable that computers became more accessible to other markets. However, market acceleration did not happen until Microsoft developed enabling software. Then the business market took notice and demand for computers grew exponentially and were adopted across many industries. Even ten to twelve years ago, critics doubted that the personal computer would ever be in every home.

The role of the integrator is vital to every new pioneering industry for new technology to take root in business. The CleanTech sector has few integrators at this stage of development. The integrator is the bridge builder and aggregator of technologies. They sell solutions in a way that meets the needs of buyers, in the language that they understand. An integrator is more than a distributor or middleman. They bring new knowledge or research and development to shape the components into a complete and seamless system. They are also skilled at marketing these solutions to buyers who think in terms of their own problems, not in terms of components or systems. Therefore a good integrator has the following core competencies:

1. Sourcing
2. Engineering
3. Consulting
4. Business Development
5. Installation
6. Maintenance

A consortium is really an early evolution of the systems integrator. If systems integration is an opportunity in the market place, could NovaTec become a solution provider within the water and wastewater treatment segment? Perhaps if they are able to follow through with the consortium project, eventually that form of business organization will evolve to the point that some company within the consortium may take the lead and become the systems integrator licensing and reselling the complete suite of technologies. Given NovaTec's current approach and attitude toward business, it might not be the right fir for the partners to become the systems integrator. Their best fit would be to sell their services through the systems integrator, having helped establish the consortium and educated the Asian market for water reuse solutions.

4.6 Conclusion

At this stage of development, the CleanTech industry is still in early formation. There is a need for consultants, consortiums, integrators, investors and new solutions. The birth of a new movement is an exciting time but it is also fraught with risk. NovaTec must maintain its core business to remain profitable yet be willing to wade into riskier areas to increase revenues and decrease dependence on selling billable hours.

5 RECOMMENDATIONS

NovaTec must preserve its core business revenue plus take risks to expand into new business areas that use the best of what they do in order to enhance and grow revenues. While the consortium model and the Green Due Diligence service have yet to be proven in terms of returning profits to the firm, they both have many advantages if the firm can be successful in China and within the CleanTech community.

Both brands can continue to earn revenues regardless of what happens to the consortiums or the CleanTech community as there are always companies that need both process engineering and marketing strategies. So even if the new initiatives in China and the CleanTech community fail to materialize, the company should most likely remain a going concern. This is more likely to be the case if NovaTec continues their policy of under resourcing new initiatives and finding grant money to pay for their development.

The firm has some of the necessary core competencies for the consortium and can gain others by adding new members to the consortium. Green Due Diligence has the advantage that it can add project-specific expertise when needed and not incur additional overhead to compete on larger projects. However, overall the advisory service may not to be a good strategic fit for NovaTec if there are limited resources and capacity as well as intolerance for risk.

If NovaTec can continue to support Green Due Diligence for at least a year to eighteen months (which would represent an investment of about $134,000 in salary, benefits and

marketing expenditures over 18 months), then it would appear that the safest way to participate in this market is to continue to build a presence within the CleanTech community by offering marketing strategy, introductions to financing sources and joint venture partners. As discussed on page 27, revenue potential is about $210,000 per year or $315,000 which would provide a return of 57% on invested capital. While revenue growth might not happen quickly, staying the course by building the right networks and gaining reputational capital within a focused market segment may diminish the effects that geographic dispersion creates. Should NovaTec decide not to invest in this business over the full 18 months, then their chances for a loss increase.

In light of the fact that more integration needs to occur for the industry to mature, the Green Due Diligence team could be a conduit and bridge builder for companies to form joint ventures as well as a strategic guide for NovaTec in helping it form new consortiums. There are several synergistic connections that the two brands can bring each other. However, at the current time, these synergies are not well developed or focused.

Green Due Diligence may also be able to provide interim management services to some companies providing NovaTec with an annuity revenue stream. There is very obviously a problem identified by many investors that there are not enough mature companies worthy of investment (Makower 2005) and at the same time, demand for their innovations is growing. There is obviously a chicken and egg scenario playing out here. While demand for innovation grows, investment in innovation before it is commercialized is scarce. While the need for mature management to guide the emerging company through the commercialization process is great, the nature of innovators is to resist moving aside in favour of seasoned executives. Many seasoned executives emerge from the Fortune 1000 world or utilities eager to try their hand at being entrepreneurs. Yet, while they understand the industry, they do not have the entrepreneurial skills and experience to guide a company through the choppy waters of commercialization to get to

cash flow. Venture capitalists therefore appreciate the fact that there are many serial entrepreneurs emerging from other industries who might serve as the solution to the management problem.

However the CleanTech industry is so new, that experienced commercialization leaders only exist in the high tech sector where they lack the CleanTech industry experience. Such conundrums may be where the opportunities lay for the team in Green Due Diligence to provide interim management guidance and resources unavailable from permanent sources.

Of greater concern for NovaTec should be the fact that the population of prospects in the commercialization process may shrink based on whether the developer gets funding. From experience, government statistics and through discussions with several funding sources, one business out of every ten in this sector will succeed (Cornford 2004). Of the 900 companies being tracked by the CleanTech investment community, this may mean that only 90 will grow into viable businesses. They will do so because they have learned how to listen and adapt their activities with the advice they receive. Some of these 900 companies may become clients regardless of whether they succeed in the long run, however their geographic dispersion will be a greater barrier to winning these developers as clients.

For NovaTec, the future might be in developing more consortiums for Green Due Diligence clients to join. While NovaTec is currently focused on China as a first market to enter, they are exploring other markets where integrated solutions may be needed. Municipal governments are wrestling with how to adopt innovation, but on a significantly larger order of magnitude than just water reuse systems. City infrastructure is aged, inefficient and technologically inferior to deal with growing populations and increasing regulations.

In the US, cities have banded together to attempt to deal with this problem. The Innovations Group represents 350 US cities and one Canadian city ready to take early adopter risks to try and solve these problems in new ways. Cities are searching for novel strategies to finance change and reduce the risks of early technology adoption. Community sustainability is the focus and regulations are being re-written to allow for new thinking and new methods. From re-using water, to tracking water quality to finding solutions for landfills and wastewater sludge, governments are looking for complete platforms with solutions that are financed through public private partnerships (P3) (Damm 2004). There is an effort in some jurisdictions to combine forces with local utilities which already provide metering and develop joint solutions for demand management of all resources flowing into and out of buildings, both residential and commercial.

NovaTec may be able to play a role in some of these projects by joining with other organizations involved with P3 initiatives to play their traditional role of process engineer or to bring a portion of a platform solution such as water reuse to the table.

Depending on their willingness to stay the course with consortium management, NovaTec should form an industry association for Water Reuse in China and other markets they intend to pursue, to establish themselves as local experts and to attract developers and engineers who need this knowledge. They may want to consider establishing a water reuse industry association in North America if they want to develop opportunities to provide services to the booming green building market. For this effort to be successful, they may need to form a joint venture with an American engineering firm to enable them to work in the US.

Locally, the Green Due Diligence team should attempt to form a chapter of the Cleantech Venture Network and lead the effort to attract developers and investors to form a community. In the meantime, it should focus on building relationships with those investors

focused on the water sector to help establish ties for NovaTec's services. With each client, the Green Due Diligence team should maximize the opportunity to build customer lifetime value by serving as a trusted advisor able to provide introductions to financing, the CleanTech community, joint venture partners, and consortiums as well as marketing and business development advisory services.

In the interim as these efforts are building momentum, NovaTec should continue to maintain its core business and secure its continued revenue base which is now supporting these new efforts. Staff should have clear roles and responsibilities that delineate who will work on billable versus business development efforts. If this goal is hampered by managing two high risk projects, it would appear that ceasing operation of the Green Due Diligence service would be the better alternative than shutting down the consortium project that has many more fiduciary responsibilities now that fifteen companies are involved and expecting NovaTec to return results.

It is clear there are tremendous opportunities for NovaTec in the coming years which will come to fruition if they can stay the course and remain focused on providing their core clients with the same level of service they have come to expect. The partners could increase their retirement portfolios with the aid of the Chinese water reuse consortium. Green Due Diligence may soon be able to develop more synergies to support new consortiums for NovaTec. However, with the pace of building in China and their extreme water shortages, NovaTec's capacity may be consumed for the foreseeable future with these projects alone.

The consortium is the best strategic fit for NovaTec's core competencies. If resources are constrained and maintaining profitability and stability is important to the NovaTec partners then the Green Due Diligence service does not provide the same clarity or enhanced revenue growth as the consortium would.

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