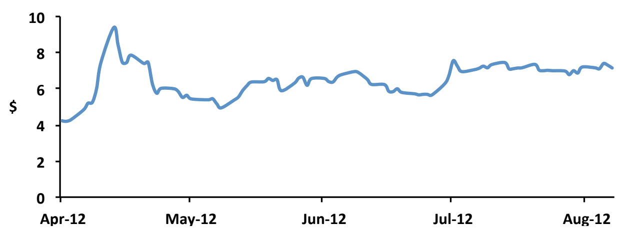
ClearSign Combustion Corporation

RESEARCH INITIATION | SEPTEMBER 7, 2012

Company Details

Company	ClearSign Combustion Corporation
Headquarters	Seattle, WA
Employees	Approximately 10
Fiscal Year End	December 31
Listing	CLIR (NASDAQ)

Price Performance



	YTD	3m	6m	12m
Return	N/A	17.67%	N/A	N/A

Last Price	$7.26
Date of Price	9/7/12
52-week Range	$4.00 - $9.75
Shares Outstanding (mm)	8.75

Analyst Information

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Please read the disclosures beginning on page 26 for important required information, including analyst certification.

Investment Summary

MDB Capital Group is initiating coverage of ClearSign Combustion Corporation ("ClearSign," or the "Company"). ClearSign is developing innovative combustion technology ("Electrodynamic Combustion Control™" or "ECC™") that could disrupt the market for traditional combustion systems in industrial and commercial applications.

Disruptive Combustion Technology

ClearSign's Electrodynamic Combustion Control technology has the potential to improve control of flame shape and heat transfer, while minimizing harmful emissions of combustion systems. It could also effect more complete combustion, which would mean greater system efficiency. The combination of these two could mean the first emissions control technology that leads to a positive return on investment.

Large Addressable Market

As an innovative system that can simultaneously improve combustion efficiency and control emissions, ECC offers potentially disruptive applications in the commercial and industrial combustion and energy generation markets. Worldwide, these are multi-billion-dollar markets.

IP Licensing Strategy

As a development stage company, ClearSign has yet to finalize its business model. We believe ClearSign is likely to pursue a licensing strategy (at least in part), so we view the Company's intellectual property strategy as one of its core value drivers. ClearSign is well ahead of schedule in this respect; the Company has indicated that it often creates 2-3 inventions in a week, and has plans to file over 100 patents by Q1 2013.

Contents

Background

ClearSign is a young, development stage company with innovative technology that has the potential to make combustion systems more flexible and efficient, while reducing or eliminating pollutants.

History

ClearSign was founded in 2008 and had a successful IPO in April 2012. The Company has approximately 10 employees, who work primarily from its headquarters in Seattle, Washington.

The goal of ClearSign's ECC technology is to improve key performance characteristics of industrial and commercial combustion systems, including energy efficiency, emissions control, fuel flexibility and overall cost effectiveness.

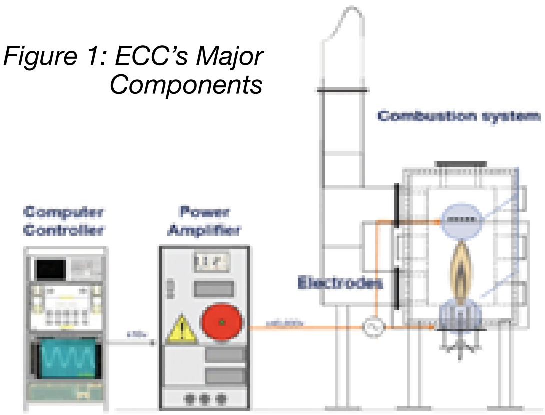
Product

Summary

Throughout history, engineers have principally employed two forces to shape flames: *buoyancy* and *momentum*. (To illustrate the difference: A candle is an example of buoyancy-driven flame; if you tilt a lit candle downward, the flame remains upright. A butane torch, because it has pressurized fuel, is an example of a momentum-driven flame; if you tilt a lit torch downward, the flame from the torch stays in line with the nozzle and tilts downward as well.)

These two forces have shaped industrial and commercial combustion for years. As it turns out, however, there is a third force that can modify flames: *Electrodynamic force*. The goal of ECC technology is to commercialize recent discoveries on electrodynamic forces, which influence and enhance the ions that are naturally found in flames. ECC technology controls flame shape and chemistry by directing these ions within the flame. ClearSign can use ECC technology to affect positive changes in the combustion process (including reduced emissions, increased heat transfer and improved flame stability). ECC accomplishes this by passing an electric field through a flame through electrodes placed in the combustion chamber. These electrodes are connected (via a high voltage power amplifier) to a computer controller, which uses ClearSign's proprietary software to modify the electric field and manipulate the shape, direction and chemistry of the flame. (See Figure 1.) ClearSign has indicated that

Figure 1: ECC's Major Components



Source: ClearSign

it can modify this basic system to fit a wide variety of combustion environments.

Target Markets

Modifying the shape and chemistry of flames can have a massive impact on emissions and combustion efficiency. The Company believes these impacts may be most keenly felt in two broad market segments: industrial combustion, which comprises natural gas-fired boilers, as well as industrial solid fuel applications; and petrochemical, and power generation, consisting of both coal-fired and natural-gas fired electric utilities. The Company therefore considers these its initial target markets, and estimates their size at between $5.1 and $12.2 billion in the United States alone. (See Figure 2; See "Industry Landscape: Market Opportunity" for a deeper description of this market.)

Background

Figure 2: ClearSign Total Addressable Market

	Natural Gas Fired Boilers	Industrial Solid Fuels	Utility Coal	Petrochemical
ClearSign Revenue Unit	$450k - $800k	$5m - $25m	$35m - $80m	$20m - $40m
Inventory Estimate	163,000 (US)	2,500 (US)	1,665 (US)	137 (US)
Estimated Replacement Rate	3%	5%	4%	10%
Total Addressable Market	$2.2b - $3.9b	$0.6b - $3.1b	$2.3b - $5.3b	$0.3b - $0.5b

Source: ClearSign S-1

Business Model

ClearSign is a development stage company, so its business model is still subject to change. The Company anticipates there will be multiple ways to monetize its technology, including product sales, licensing, joint venture agreements (or a combination thereof).

We believe that ClearSign will ultimately seek to commercialize ECC through licensing or royalty arrangements with existing manufacturers, as these arrangements would represent earlier and less capital-intensive paths to market. We also believe there are multiple markets and verticals in which ClearSign can sell ECC. Finally, we are persuaded that ClearSign can deploy ECC in a variety of places within the combustion value chain, including to burner manufacturers, system integrators, utility companies, and industrial boiler production companies.

> The combustion industry is highly regulated, and regulations are growing more onerous.
>
> Many combustion operators would like to switch to natural gas, but their systems are not flexible enough to support that switch.

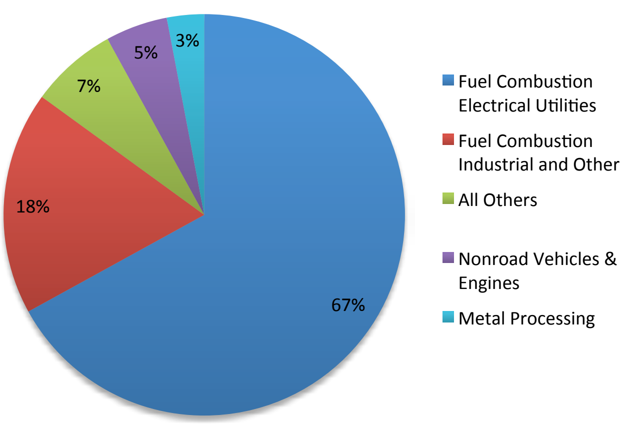
Emissions Control Regulation

Though ClearSign may sell or license ECC into several different combustion verticals, we have chosen here to primarily highlight the power generation industry. This is mainly because we believe this industry provides an effective case study of ECC's value proposition, and partially because the industry has significant publicly-available data.

United States

The United States Environmental Protection Agency ("EPA") sets National Air Quality Standards for what it calls *criteria pollutants*. These criteria pollutants are carbon monoxide, sulfur oxides ("SOx"), nitrogen oxides ("NOx"), ground-level ozone, lead, and particulate matter (which is a mixture of small particles and liquid droplets). Combustion processes create all six of these criteria pollutants; in some cases, utility-scale combustion is responsible for creating a large majority of the pollutant (See Figure 3.)

Figure 3: EPA stated sources of SOx



Source: Environmental Protection Agency

Regional authorities, in turn, are responsible for interpreting and enforcing local guidelines to meet EPA goals, which they do by restricting the sale of certain appliances within their own air districts. For example, the Bay Area Air Quality Management District ("BAAQMD") prohibits the sale of certain large natural gas-fired boilers that emit more than 55 ppm of NOx.

Both the EPA and regional authorities have recently become significantly stricter on the acceptable emissions levels of the criteria pollutants. In 2008, the EPA reduced the acceptable level of lead in the ambient air by 90%, from 1.5 micrograms per cubic meter of air to 0.15 micrograms per cubic meter. In 2010, it reduced the acceptable level of SOx by 99.5%, from 14 parts per million ("ppm") to 75 parts per billion ("ppb").In 2013, the BAAQMD will strengthen it existing regulations by reducing the acceptable level of NOx new burners can emit by 45%, to 30 ppm.

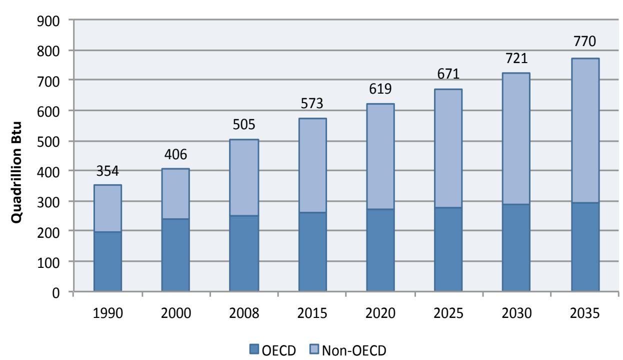
This trend towards stricter emissions regulation shows little sign of abating. In 2011, the EPA finalized the Cross State Air Pollution Rule ("CSAPR"), which would require states to significantly improve air quality standards by reducing power plant emissions as soon as 2014. CSAPR is sometimes called the Good Neighbor Rule, as it requires upwind states to reduce emissions that blow into downwind states. The EPA estimates that CSAPR would cut nationwide SOx emissions by 73% and NOx emissions by 54%. (We note that, in August 2012, the US Court of Appeals for the DC Circuit struck down CSAPR, saying it represents an overreach of federal authority. Regardless of the ultimate settlement of CSAPR, we expect the trend of increased regulation on emissions to persist, and that the EPA and regional authorities will continue to impose stricter standards with respect to these criteria pollutants.)

Combustion Industry Pain Points

Emerging Markets

This focus on emissions control is hardly a US-only phenomenon, as many other countries are starting to enforce their own air pollution regulations. The most famous of these is the Kyoto Protocol, which primarily regulates the emission of greenhouse gases. However, emerging economies are also regulating criteria pollutants. For example, China recently enacted new NOx regulations as part of its most recent Five Year Plan. We believe this growth in regulation in emerging economies is highly significant, as these economies are likely to drive world energy consumption over the next 25 years. (See Figure 4.)

Figure 4:
World Energy Consumption Driven by Developing Countries



Source: Energy Information Administration

Current Approach

There is no current "one size fits all" approach to remediating all six criteria pollutants. Instead, operators must used several siloed solutions to remediate these emissions.

NOx

NOx forms in the high temperature portions of the flame (a good rule of thumb is that the hottest 10% of the flame is responsible for 90% of the NOx). There are two main approaches to controlling NOx emissions.

The first approach is to use low and ultra-low NOx burners which stage the combustion process, lowering the peak flame temperatures of the system. The problem with this approach is that staging combustion this way increases the probability of "flame out." This is similar in consequence to a pilot light burning out in your home, as it fills the combustion chamber with hot, pressurized fuel (which is of course highly dangerous).

To counteract that risk, low and ultra-low NOx burners reduce what is called their *turndown ratio*. Turndown ratio is the ratio of maximum setting of the system compared against its minimum setting. While a normal burner is able to operate at turndown ratios of 10:1 (meaning the lowest setting is 1/10th the energy usage of the highest setting), low and ultra-low NOx burners often have ratios as low as 3:1. (A lower turndown ratio means, among other things, a waste of fuel, akin to idling your car at a high rpm at a stop sign.)

The second approach to controlling NOx emissions is using selective catalytic and non-catalytic reducers to control NOx downstream. (These are used because, in some regions, low and ultra-low NOx burners cannot adequately meet regulations, so operators must resort to other methods). Selective catalytic and non-catalytic reducers work by injecting certain materials (such as ammonia) into the flue gases to react with and eliminate some of the NOx. The main problems with these solutions is that they can be very expensive, do not control for all of the NOx, and have a large physical footprint.

CO

The two principal means of controlling for CO are better fuel/air mixing and using excess air. Both of these make it likelier that the fuel will find (and therefore mix) with oxygen; a system that is starved of oxygen is likelier to generate CO. One method of increasing mixing and reducing peak flame temperatures is flue gas recirculation, which takes the exhaust from combustion and mixes it with the combustion air.

The main problem with these systems is that they are parasitic, in that they drain the output of the power plant to run the fans that generate the excess air and flue gas flow. (In general, a power plant that adds the standard 20% flue gas to its combustion air will reduce its capacity by almost one third.)

SOx and Lead

The primary means for remediating SOx and lead is sorbent injection. This process injects limestone (or some other alkaline material) into the combustion process to convert the SOx to gypsum. Afterwards, a particulate collector captures the large gypsum particles and removes them from the exhaust.

The main problem with these systems is that they are expensive, parasitic, and create a recurring cost for limestone and particulate filter replacement.

Particulates

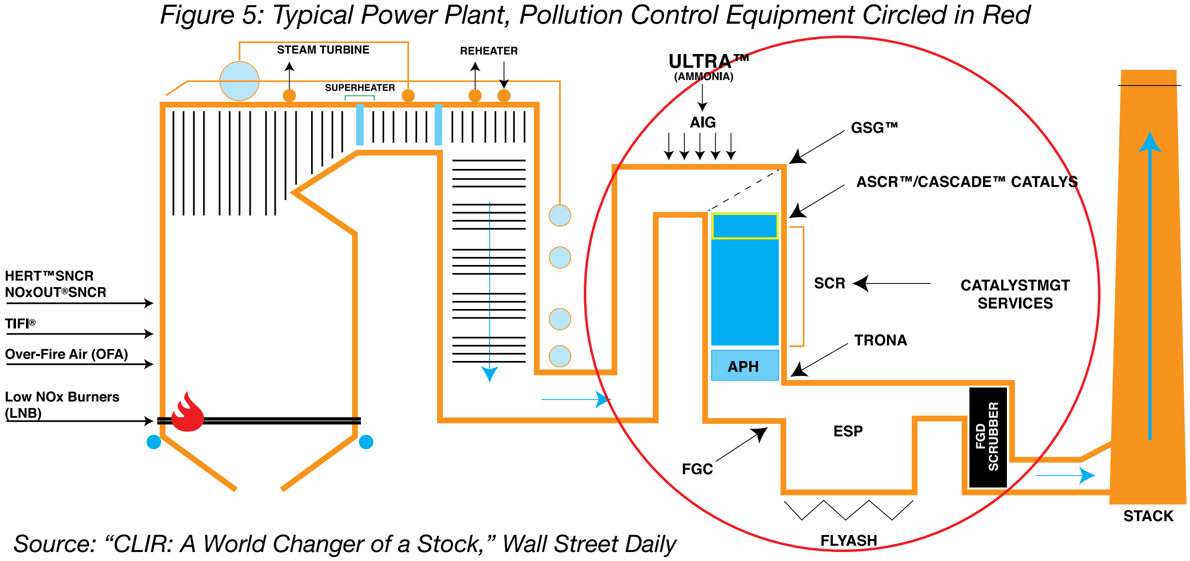
Operators remediate particulate pollution in two ways. The first way is to use an electrostatic precipitator (“ESP”). ESPs create electrostatic forces within the exhaust to pull out solid matter, including smoke and particulates. Though effective, these precipitators are also parasitic, requiring significant amounts of electricity to operate and sapping overall system efficiency.

The second way is baghouse filtration, in which a large filter is placed within the exhaust stream. This series of fabric filter bags collects and captures particulate. The problem with these filters is that they must be replaced periodically, can reduce efficiency and can be a fire risk.

Ozone (O_3)

Ozone (a primary component of smog) is somewhat different from other criteria pollutants, in that it is formed only during secondary reactions, outside of the combustion site. NOx emissions from the exhaust mix with volatile organic compounds, which can create O_3 under certain ambient conditions. Consequently, the current solutions around O_3 revolve around the elimination/reduction of NOx emissions.

Figure 5: Typical Power Plant, Pollution Control Equipment Circled in Red



Source: “CLIR: A World Changer of a Stock,” Wall Street Daily

Combustion Industry Pain Points

Cost of Compliance

Pollution control regulations require utilities and other combustion system operators to spend substantial amounts on Air Pollution Control ("APC") equipment. The McIlvaine Company estimates that the market for APC equipment was $42 billion in 2011. A typical power plant contains several components solely for the purpose of emission control, including ammonia injection grids, catalytic converters, and flue gas recirculators. (See Figure 5; the items circled in red serve solely to reduce emissions.)

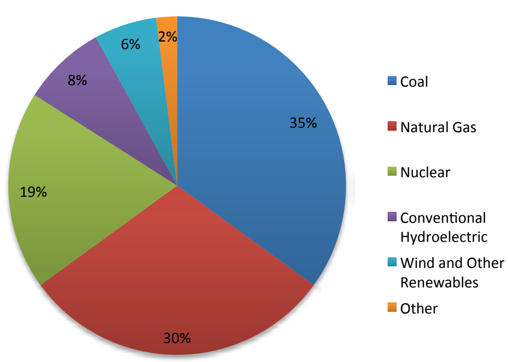
In addition to the capital cost, this emissions control equipment also imposes a tax on operational efficiency, sapping energy output to power the emissions control equipment.

Retrofitting

Industry Context

The two largest sources of electricity generation in the United States are coal and natural gas. (See Figure 6.)

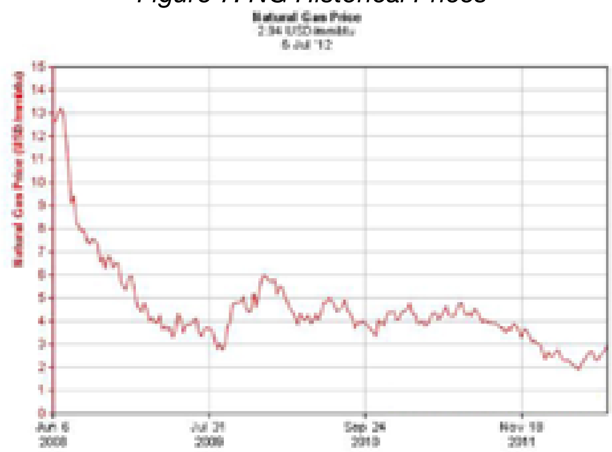
Figure 6: US Electric Power Generation, Jan – Jun 2012



Source: United States Energy Information Administration

Natural gas has always had certain advantages as a fuel source over coal; according to the EPA, compared with coal, natural gas produces half as much carbon dioxide, one-third as much NOx, and only 1% as much SOx. However, historically, the cost of natural gas prevented its widespread adoption for energy generation. That has changed dramatically in recent years, as natural gas production has surged through the process of hydraulic fracturing, or "fracking," which has reduced the price of natural gas significantly. (See Figure 7.)

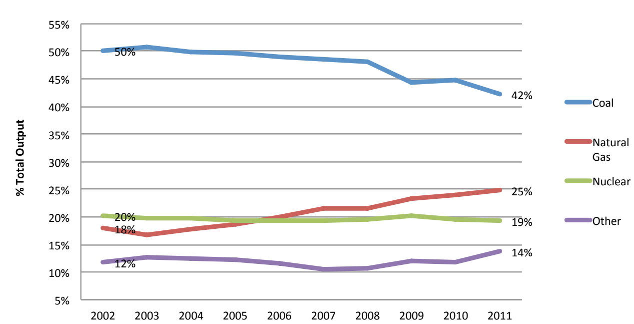
Figure 7: NG Historical Prices



Source: Infomine.com

As a result, combustion operators have recently been shifting from coal to natural gas and other renewables. In 2008, coal accounted for almost half of all power generated in the United States; for the first six months of 2012, that number is down to 35%. (See Figure 8.) Only one new coal plant came online in the first half of 2012 (at the Prairie State Energy Campus in Illinois).

Figure 8: Net US Power Generation by Energy Source



Source: U.S. Energy Information Administration

However, coal-fired plants are still the largest source of electricity in the United States. According to the U.S. Energy Information Administration ("EIA"), there are over 1,400 utility-scale coal power plants in the US.

The combustion market is of course not limited to electricity-generating utilities. Industrial boilers also comprise a huge market; according to Energy and Environmental Analysis Inc., there are over 163,000 natural gas boilers in the United States alone. These boilers can be as small as the units that power apartment complexes and hospitals, and as large as the units that power large commercial sites (for example, in food processing). Typical thermal output from these systems ranges from 5 million British thermal units per hour (Btu/hr) to 50 million Btu/hr. In the United States, these installations are primarily natural gas-fired, though that is not the case in the rest of the world; according to the Post Carbon Institute, there are about 500,000 industrial scale coal-burning systems currently in use in China.

Difficulty in Retrofitting

Due to the improved economics of natural gas, several coal plant operators are considering changing their source of fuel. Indeed, in 2011 even the Big Sandy coal-fired power plant in the Kentucky Appalachians (where coal mining has historically dominated the local economy) announced it would be "switching" to natural gas. However, retrofitting coal plants for use with natural gas presents a variety of problems.

First, natural gas burns differently from coal, so combustion chambers are specifically designed for one or the other. To illustrate how these designs can affect fuel choice: combustion systems transfer heat in two different sections, the *radiant* section and the *convection* section. In the radiant section (typically right next to the site of combustion) a luminous flame transfers heat to boiler tubes. The radiant section is where the majority of the system's heat transfer occurs, and is equipped to handle very high temperatures. Adjacent to the radiant section is the convection section, which captures any leftover heat. The fact that natural gas and coal burn very differently (as it happens, natural gas burns much less brightly than coal) affects the way engineers design combustion chambers for each fuel.

Just as importantly, making these retrofits would take the coal burner out of service for a relatively long time. According to a report by the Aspen Environmental Group, an effective retrofit of a coal-fired plant might take four to six months. As many of these plants are the primary source of electricity for their geographical areas, an extended period of being "off line" would leave certain geographic areas with insufficient system reserves, leading to brownouts or blackouts.

These difficulties have led the Government Accountability Office to opine that it would be more cost-effective to build new natural gas-fired burners than to retrofit existing coal-fired units to burn natural gas. Indeed, according to the Aspen Environmental Group, there have been "no instances of coal plant retrofits to natural gas and, in fact, virtually all of the public references to conversion of coal to natural gas or repowering turn out instead to be replacements." The same report estimated the cost of replacing all of the coal-fired generation in the United States at approximately $335 billion. Therefore, we believe that a cost-effective means of retrofitting would have a significant impact on the marketplace.

> ECC technology enables the control of flame shape and chemistry using electric fields that direct ions within the flame, which has significant positive results for combustion operators.

ECC can dramatically change the combustion industry by healing many of its pain points. First, it represents a simple way to reduce the emission of several criteria pollutants. Second, it may aid in retrofitting coal plants to natural gas (or another choice of fuel, such as municipal solid waste). Most importantly, however, it can have these impacts in tandem with improved combustion efficiency.

To illustrate how this could be, it might be helpful to think of some of the emissions that result from combustion as being the byproduct of suboptimal combustion. Combustion may be suboptimal for several reasons that have little to do with fuel choice—the air-to-fuel ratio may be too low, or an erratic buoyant flame may have created hot and cold spots in the chamber.

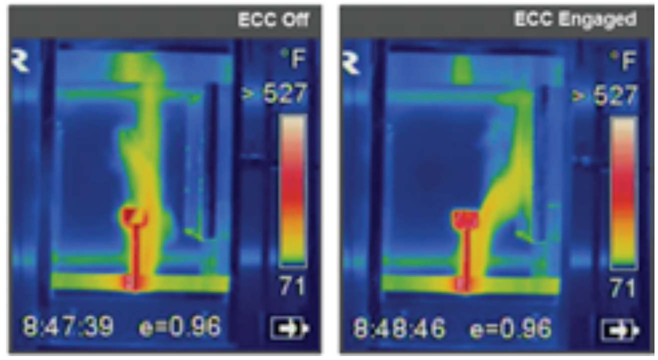
Most existing systems mitigate emissions that result from suboptimal combustion through remediation the emissions-- essentially, by putting a giant sock at the end of the chimney. By contrast, ECC mitigates the problem at the source by bringing combustion closer to optimal conditions. This means it should be able to prevent emissions *before* they are formed. It also means ECC should be able to promote more complete combustion, reducing the cost of energy generation.

ECC Influence

Control Flame Shape and Direction

ECC uses electrostatic fields to direct the ions within a flame. This can allow operators to control flame shape and length, as well as to anchor the flame to the burner tip. All of this means that ECC can allow operators to move flames in a specific direction. (See Figure 9.) This means that operators can set a flame to a specific length based on conditions in the combustion chamber.

Figure 9: ECC Flame Directionality



Source: ClearSign

Turbulent Mixing

By dynamically changing the electrostatic fields ECC propagates, the Company is able to increase the turbulence within the combustion process. This leads to better mixing between the fuel and air. Critically, this means ECC is able to achieve this superior mixing without introducing excess air to the system.

Benefits of ECC Influence on Flames

Flame Stability

Setting a specific location for the flame has several benefits. First, there is a lower chance of flame out, which increases system safety. Second, this also allows for the increase in the system turndown ratio, which saves fuel and increases efficiency. Finally, it reduces the variability within a flame, which eliminates the hot spots at which NOx forms.

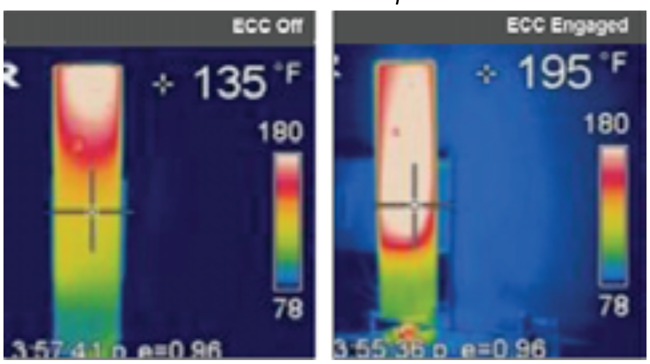
Radiance Control

ECC can also enhance the radiance of a flame. As discussed above, certain types of fuel, such as coal, rely more on the radiant section of the combustion process, which drives the design of the combustion chamber. The ability of ECC to control radiance may make retrofitting from coal plants to natural gas-fired plants more economically feasible, since it may avoid redesigning their entire combustion chamber to match the new fuel.

Temperature Control

With improved mixing and flame directionality, ECC can create a homogenized surface temperature. (See Figure 10.) This may improve system safety and increase throughput by providing more even heat distribution and eliminating the 'hot spots' typical of traditional burners.

Figure 10: ECC Leads to a More Uniform Surface Temperature



Source: ClearSign

The homogenization ECC offers should also increase system efficiency. First, it should enable operators to point the heat directly at the product they want to heat, increasing product yield. Second, it should allow for a higher output temperature (see the higher temperature in the right panel of Figure 10), which means the system is transferring more heat to the load.

Homogenization can also direct heat away from sensitive areas, which can reduce wear and tear. For example, ECC can direct heat away from the expensive and temperature-sensitive metals in turbine blades.

More Complete Combustion

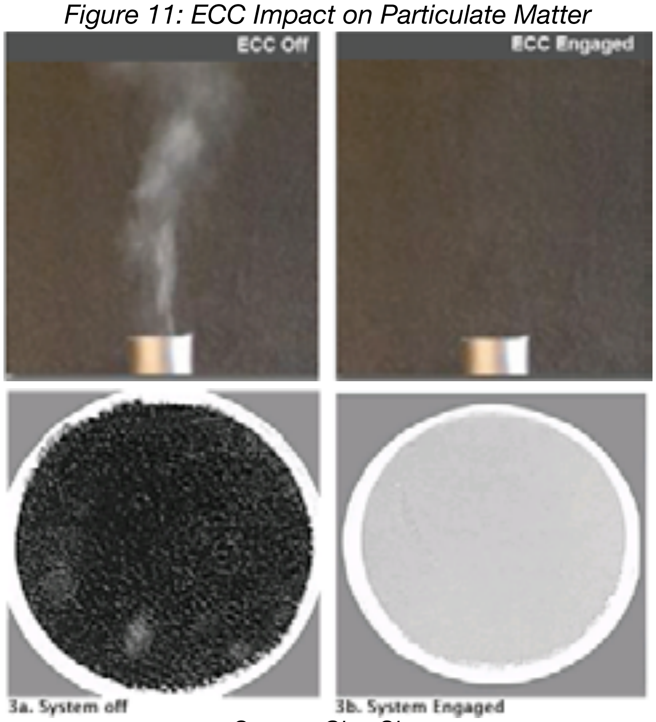
ClearSign can optimize ECC for each type of fuel used in each specific system, enabling the most complete combustion for that system type. Among other benefits, this reduces the amount of "coking," or sludge buildup, within the system, improving system uptime and reducing shutdowns for routine removal of coking.

In addition, more complete combustion, combined with better mixing, limits the amount of CO the system produces (without flue gas recirculation).

Emissions Control

As noted above, ECC can simultaneously reduce NOx (which also reduces near-ground ozone) as well as CO. ClearSign has demonstrated that ECC can control the emission of particulate matter. (See Figure 11.) ClearSign also believes that ECC may be able to remediate SOx and lead emissions through a process called *differential ion mobility*. This process works on the principle that combustion creates several different ionic species, each of which vary in size and weight depending on the pollutant type. Therefore, ECC may may be able to pull different ions in specific directions,

Figure 11: ECC Impact on Particulate Matter



Source: ClearSign

which would mean that combustion operators could use ECC to place pollutant ions into an area specifically earmarked for control.

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Competition

No existing technology currently competes directly against ECC. There are, however, a variety of players who produce solutions to reduce emissions of some criteria pollutants (i.e., ultra-low NOx burners or selective catalytic reducers), but none of these provides the efficiency benefits and payback to operators that ECC can provide.

Incumbent Players

The boiler manufacturer supply chain broadly consists of three categories: boiler and burner manufacturers, power plant designers, and system integrators.

Boiler and burner manufacturers design and build combustion chambers. Examples of these manufacturers include John Zink, Fives North American Combustion, and Cleaver-Brooks.

Power plant designers build entire utility-scale power generation solutions. Though these companies may have proprietary product solutions to offer, they also use other suppliers to complete their projects. Examples of these manufacturers include General Electric and Fluor.

System integrators engineer, design, and build power generation systems, often by bringing together a variety of components from various suppliers. These companies usually offer consulting services alongside any project start. Examples of these companies include Kellogg Brown and Root, Parsons, and Halliburton.

Complementary Positioning

Because of ECC's unique positioning in the market, we believe that these incumbents are not necessarily competitors, but are indeed all potentially ClearSign partners. Depending on the needs of the burner operator, ClearSign can pair ECC with other solutions to create a system that meets regulatory requirements, while simultaneously increasing efficiency. John Zink may look to offer ECC with its boilers, or General Electric may choose to employ an ECC-enabled John Zink boiler in its system, or Halliburton may choose to cite ECC as a differentiating factor on its next integration bid. We find this flexibility the most attractive component of ClearSign's business model.

Market Opportunity

ClearSign estimates that its market opportunity is between $5.1 and $12.2 billion in the United States alone. (See Figure 2.) Though this is a huge potential market size, we find it reasonable, since no offering currently on the marketplace is adaptable to so many different fuel types (in addition to natural gas and coal, ClearSign can also deploy ECC into the industrial solid fuels and petrochemical markets). In addition, no other offering can plug into as many different places in the value chain, as we have discussed.

Finally, and perhaps most critically, no other emissions control solution offers what ECC does in the form of reduced operating cost and great efficiency. While the concept of the "payback period" is a foreign one to other emissions control offerings on the market, ClearSign estimates that it might be able to pay operators back for ECC in nine to 24 months.

These are highly significant differences, and in our opinion more than justify ClearSign's market sizing estimates.

Recent Developments

> ClearSign has recently made significant announcements that validate its technology and management competency.

Non-Contact Electrode Control

ClearSign recently announced it demonstrated ECC technology without having to physically place electrodes within the flame area, by using a pilot flame as the conductor or electrode.

In our opinion, this was a bullish indicator on several fronts. First, it should enhance the value of ECC to potential customers, since not having to use electrodes would mean not having to replace them as they corrode (though electrodes are not expensive, shutting down a plant as they are being replaced might be). Therefore, this represents a further value proposition for the Company's targeted end customers. Second, this provides concrete evidence of the Company's continued innovation and evolution, as it grows this green-field technology into uncharted areas.

Demonstrated Stability at 400,000 Btu/hr

ClearSign also recently announced it has demonstrated stable combustion using ECC at 400,000 Btu/hr. This exceeded our expectations, as the Company only promised it would achieve 250,000 Btu/hr by this stage. (ClearSign's stated goal is 1 million Btu/hr by Q4 2012).

We believe this announcement further validates the Company's technological approach, and also boosts our confidence in management to over-deliver on expected results.

Reduced NOx Emissions

Just as relevantly, ClearSign also recently released test data showing that ECC reduced NOx emissions to 15 ppm (at 400,000 Btu/hr). This control is already superior to that of low NOx burners, and is equivalent to that of many ultra-low NOx burners. In our opinion, this represents a powerful sign that ECC technology can be a highly valuable part of the emissions control supply chain in the near term.

Intellectual Property Position

ClearSign is ahead of the typical early development stage company in terms of protecting its existing product portfolio and developing strategic intellectual property.

ClearSign has significant "white space" to continue broadly innovating within the field of electrodynamic combustion control.

Using MDB Capital's proprietary PatentVest™ database ("PatentVest"), we mapped ClearSign's patent filings and the intellectual property landscape for the industry.

IP Capability Matrix

Criteria

We measure corporate capability with respect to intellectual property goals on two dimensions: the ability to protect the Company's existing product portfolio, and the ability to generate future licensing revenues from related technologies.

In order to develop appropriate benchmarks for these dimensions, we consider which phase of its lifecycle a company is in. We broadly categorize technology growth companies as falling into three phases:

- Development: Marked by advanced prototypes, as well as the beginning of third party validation of its technology.
- Validation: Marked by OEM or channel partner agreements, as well as joint development agreements.
- Commercialization: Marked by product launch, as well as rapid revenue growth.

Our assessment is that ClearSign is currently at the beginning of the "Development" phase of its lifecycle.

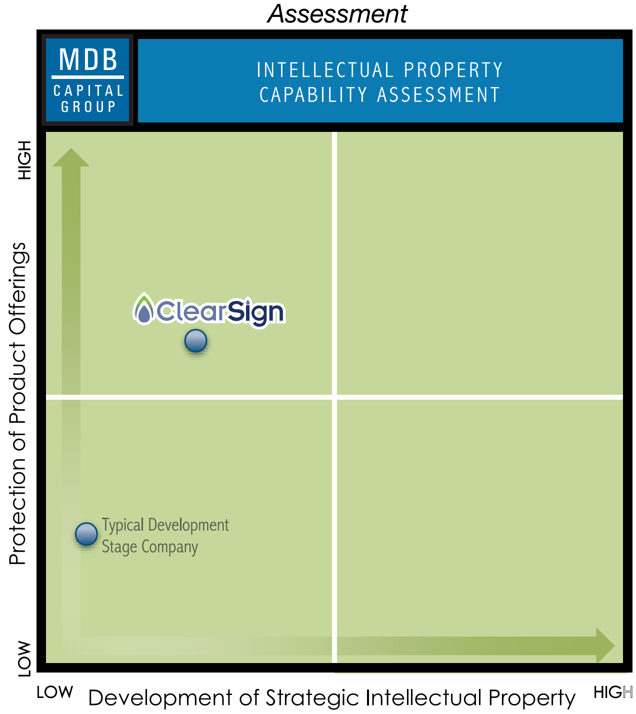
We then develop qualitative scores across these dimensions using data from PatentVest. In particular, we consider the relative age of a company's intellectual property portfolio and the breadth of the technology focus, as measured by the distribution of a company's innovations across a number of United States Patent and Trade Organization ("USPTO") primary classifications.

At this early stage of the "Development" phase, we would expect to see a company score a 3 along the "Protect Existing Product Portfolio" dimension, and a 1 along the "Develop Strategic Intellectual Property" dimension.

Scoring

We rate ClearSign as being ahead of the typical early development stage company on both dimensions. (See Figure 12.)

Figure 12: Intellectual Property Capability Assessment



- ***Protect Existing Product Portfolio:*** On this dimension, we measure the progress of the Company in ensuring that it is effectively protecting its technology from infringers. A company can achieve that by exhaustively considering every patentable dimension of their innovations, including all materials, processes, logic, and applications.

  We rate ClearSign a 6 out of 10 on this dimension. The Company has been actively protecting its innovations, as management has provided guidance that it plans to file 100 patents by the first quarter of 2013. From what we can determine from our interviews with management, these patents are strongly aligned to the underlying ECC technology. We also note that management has prioritized patent filing as a use of proceeds from its IPO, which demonstrates to us a focus on IP that puts it ahead of companies at similar stages of development.

- ***Develop Strategic Intellectual Property:*** On this dimension, we measure the progress of the Company in patenting ancillary technologies that may not relate directly to its own key products, but may have value within a broader ecosystem. IP of this sort may have licensing or transactional value separate and apart from the core business.

  We rate ClearSign a 3 out of 10 on this dimension. ClearSign has necessarily focused on patents relating to its core technology. However, CTO Joseph Colannino has stated that due to his team's extensive lab work, the Company often creates 2-3 inventions in a week, which create a backlog for future patent filings. We are confident ClearSign will continue these efforts and file complementary patents when its business model allows.

IP Landscape

In order to determine the intellectual property landscape in this space, we performed a search in PatentVest for patents that referenced the technological basis for ECC.

Using PatentVest, we searched USPTO Class 431, "Combustion" for the keywords "emission AND "coal OR natural gas OR petro OR solid." (Please note that keywords searches are by their nature incomplete, since often patents may extend to cover complementary standards, products or even industries.)

The first thing we note is that there are very few patents that pass through even this relatively wide filter. PatentVest found only 21 granted patents and 11 pending patent applications that matched these search terms. We then examined all of these filings, and found that none of them were directly related to ECC technology. Thus, we believe that ClearSign has significant "white space" to continue innovating within the field of electrodynamic combustion control; indeed, the Company is likely the first (and only) company innovating in this area.

IP/Product Strategy

As noted above, ClearSign has provided guidance that it plans to file over 100 patents by Q1 2013. However, the Company has not provided specific details on what those patents might cover. This is understandable, since to do so would be tantamount to sharing plans on future product offerings with lurking fast followers.

We do, however, expect that the Company's prospective strategy will be to license ECC to several different market verticals, so we expect its future patent filings to reflect that strategy. This might mean that some of its patent filings will be foundational in nature, while others will be specific to verticals for which it is developing applications. We view the Company's intellectual property strategy as being one of its core value drivers, so we will continue to monitor its patent filing progress and strategy closely.

Company Competencies

ClearSign has strong research and development capabilities to continue improving its ECC technology.

The Company is building its sales and marketing capabilities to reach original equipment manufacturers.

If ClearSign follows a licensing strategy, it may be able to push several other needed capabilities to other parts of the supply chain.

Research and Development

We consider ClearSign to have a very strong research and development ("R&D") competency. CTO Joseph Colannino, who was the former head of R&D, IP, and Learning for noted combustion industry leader John Zink, leads the R&D team. In addition, the team retains the original inventor of ECC, Chief Scientist David Goodson, who founded Air Pollution Systems and holds multiple US patents.

Further, ClearSign has the lab facilities to be able to test for a variety of flame and pollution control effects in-house. ClearSign has built its own combustion chamber capable of generating 1 million Btu/hr, so it will not need to rely extensively on third parties as it ramps up its testing schedule.

Production and Manufacturing

We believe ClearSign has the manufacturing capacity to continue producing ECC at its present scale. We note that all of the hardware components of ECC (which primarily consist of electrodes, cabling, computer hardware and power amplifiers), are either commodities, off-the-shelf parts, or sourced from competitive markets. The Company has indicated that it is not reliant on the development of any new third-party technology in order to develop ECC.

Sales and Marketing

Though the Company has not yet determined the precise product it will be selling, we believe it will likely attempt to either license ECC or sell it to original equipment manufacturers ("OEMs") in narrow verticals throughout the combustion industry. The Company is still building the capability to make these sales, though its business development team has already begun to make contact with initial target partners.

Order Fulfillment

If ClearSign ultimately pursues a licensing strategy for ECC, it probably will not need significant order fulfillment competency.

Customer Support

While ClearSign does expect to initially create beta-sites and complete installations, the Company intends to ultimately train its channel partners to be able to support ECC on their own. Depending on a number of factors related to the business model the Company chooses, ClearSign may need to be able to push software updates and other upgrades through the channel. We believe the Company already has much of this capability, and will be able to develop it further as needs progress.

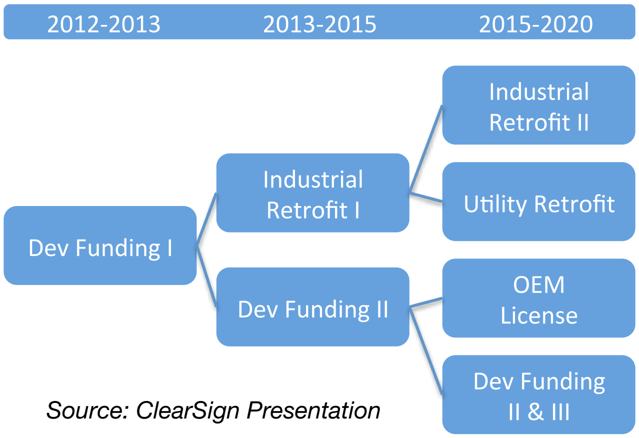
Financial Position

ClearSign is an early development stage company that does not currently generate any revenues. We believe the Company's stock price in this pre-revenue stage will be driven primarily by certain key announcements that may reduce the risk of commercializing ECC.

Revenue Timeline

ClearSign is still in its development stage, and does not currently generate any revenues. Indeed, it has not yet finalized entirely what its product offering will be, though it has made clear it does not intend to manufacture its own boilers and burners. The Company has, however, provided guidance related to an expected timeline to revenue. (See Figure 13.)

Figure 13: Revenue Sources



Source: ClearSign Presentation

Cash Position

ClearSign has approximately $10.8 million cash on hand. Over the six months ended June 30, 2012, the Company had a net loss of approximately $1.9 million. We therefore estimate the Company's annual burn rate at approximately $4 million per year. Therefore, given current cash reserves, assuming it receives no contribution from co-development agreements or grants, ClearSign should have approximately 2.5 years before it needs to raise additional capital. We consider this a safe cash runway, particularly because we expect the Company will attract significant interest from strategic partners in the near term.

Key Stock Price Drivers

Despite ClearSign's bright future, we do not consider it likely that the Company will generate meaningful earnings within the next 12 months. Therefore, we expect the major drivers of the stock price will come in the form of several key announcements.

- Achieve ECC Results at 1 million Btu/hr: As noted above, 1 million Btu/hr is a commercially significant level of heat generation, as it represents the low end of the industrial natural gas boiler market. Demonstrating that the results we have seen thus far will work at that scale would be a powerful validation of the Company's approach, and remove partner and investor doubts on ClearSign's ability to create a commercially viable product.

- Co-Development Partners: The Company will likely need to conduct beta-site testing to move its lab work into the field, specifically to customize ECC modules for specific vertical applications. An announcement of co-development partners, of which there are potentially many, should further serve to validate the ECC technology and reduce the level of risk investors place on the stock.

- Grant Funding: ClearSign's work is also likely to be of interest to government, non-government and academic organizations interested in emissions control innovations. Any or all of these organizations could give the Company a grant or some other type of assistance for continued development of ECC. Such an announcement should also serve to validate the ECC technology and reduce the level of risk investors place on the stock.

Financial Position

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- Key Hires: ClearSign has already had a great deal of success attracting top talent to its mission. Continuing to attract highly sought-after industry leaders to its team will further serve to reassure investors on the direction of the Company.

- International Engagement: The US is only part of the energy market, and ECC technology is applicable worldwide. Though the company's stated focus is on the US for the near term, any international agreements would increase their available target market and should therefore boost investor sentiment.

Risk Factors

As a small company that has yet to deliver revenues, ClearSign carries certain risks of which investors should be aware.

Technology Risk

Though the Company has made exceptional technological progress, there remains a risk that ECC will not work on a commercial scale. If ECC does not progress past its current level of 400,00 Btu/hr, The Company will need to find alternative markets.

Intellectual Property Risk

The electrodynamic combustion control area is largely unpatented, with significant white space for innovation. ClearSign currently has a first mover advantage in the space; however, the space is also open to competitors, so investors should note this risk.

Stock Risk

ClearSign's stock has little market liquidity, so material announcements may cause large swings in its price.

Executive Management

ClearSign has a strong and experienced management team and board with deep domain and start-up expertise, both of which are lead by co-founder, chairman and CEO Rick Rutkowski. (See Figure 14 and 15.)

Figure 14: Biographies of Key Management

Rick Rutkowski **Co-founder, Chairman, and CEO**	Founding CEO of Microvision, Inc. Co-founder of two public companies
Joe Colannino **Chief Technology Officer**	Former Head of R&D, IP, and Learning for John Zink and Coen Combustion Companies
Jim Harmon **Chief Financial Officer**	Former CFO of Sabey Corporation Former CPA at Price Waterhouse
David Goodson **Co-founder and Chief Scientist**	Founder of Air Pollution Systems, Inc. Multiple US patents
Geoff Osler **Co-founder and SVP Marketing**	Technology and product marketing Channel director at Adobe Business development at Apple
Bob Breidenthal Ph.D. **Senior Scientist and Chief Eddy Chaser**	UW Professor of Aeronautics & Astronautics Research support from ABB, NASA, NSF
Andrew Lee **SVP Business Development**	Chief Revenue Officer at Adapx, Inc. SVP Sales at Microvision, Inc.

Figure 15: Biographies of the Board of Directors

Rick Rutkowski **Co-founder, Chairman, and CEO**	Founding CEO of Microvision, Inc. Co-founder of two public companies
Lon E. Bell, Ph.D. **Director**	Founder and former CEO of Amerigon, Inc. Founder and former CEO of Technar, Inc. (sold to TRW) Five inventions into mass production
Stephen E. Pirnat **Director**	President of Quest Integrated, Inc. Former CEO of John Zink Company Former CEO of Pangborn Corporation
Scott P. Isaacson **Director**	VP, Environmental Programs, CalPortland Cement Environmental compliance principal advising attorney Former Chief Environmental Law Unit, US Army
David Goodson **Co-founder and Chief Scientist**	Founder of Air Pollution Systems, Inc. Multiple US patents

Exhibits

ClearSign Combustion Corporation: Historical Balance Sheet

ClearSign Combustion Corporation: Historical Income Statement

ClearSign Combustion Corporation: Historical Statement of Cash Flows

ClearSign Combustion Corp.: Historical Balance Sheet

($ in thousands)	4Q11	1Q12	2Q12
Assets			
Cash & Near Cash Items	930	241	10,758
Prepaid Expenses	437	944	263
Other Current Assets	-	-	-
Total Current Assets	1,367	1,186	11,021
Fixed Assets, net	162	175	263
Patents and Trademarks	87	114	155
Other Assets	21	11	11
Total Long-Term Assets	269	300	428
Total Assets	1,636	1,486	11,449
Liabilities & Shareholders' Equity			
Accounts Payable	443	882	130
Promisory Note	48	35	-
Accrued Compensation	254	459	384
Total Current Liabilities	744	1,376	514
Deferred Rent	17	35	35
Total Long-Term Liabilities	17	35	35
Total Liabilities	762	1,411	549
Share Capital & APIC	5,365	5,430	17,275
Deficit Accumulated in Development Stage	(4,490)	(5,355)	(6,375)
Total Equity	874	75	10,900
Total Liabilities & Equity	1,636	1,486	11,449

Totals may not sum due to rounding.

ClearSign Combustion Corp.: Historical Income Statement

($ in thousands, except per share data)	1Q11	2Q11	1Q12	2Q12
Total Revenue	-	-	-	-
Cost of revenues	-	-	-	-
Gross Profit	-	-	-	-
Research and Development	23	97	265	291
General and Administrative	869	610	600	734
Total Operating Expenses	892	707	864	1,025
Operating Income (Loss)	(892)	(707)	(864)	(1,025)
Interest Income	-	1	-	6
Interest Expense	-	-	(1)	(1)
Income (Loss) before income taxes	(892)	(706)	(865)	(1,020)
Provision for (benefit from) income taxes	-	-	-	-
Net Income (Loss)	(892)	(706)	(865)	(1,020)
Preferred stock dividends and amortization of discount	-	-	-	-
Net Profit (Loss) attributable to common shareholders	(892)	(706)	(865)	(1,020)
EPS diluted	$(0.29)	$(0.16)	$(0.17)	$(0.13)
Weighted Average Shares fully diluted	3,084	4,505	5,153	7,705

Totals may not sum due to rounding.

ClearSign Combustion Corp.: Historical Statement of Cash Flows

($ in thousands, except per share data)	1Q11	2Q11	1Q12	2Q12
Cash Flows From Operating Activities				
Net Loss	(892)	(706)	(865)	(1,020)
Common Stock Issued or Issuable	689	318	18	46
Shared Based Payments	-	-	48	47
Depreciation	5	6	13	17
Deferred Rent	-	-	18	-
Changes in Current Assets & Liabilities	102	65	147	406
Cash From (Used In) Operations	(96)	(317)	(621)	(504)
Cash Flows From Investing Activities				
Acquisition of Fixed Assets	-	(28)	(26)	(104)
Disbursements for Patents and Trademarks	-	-	(28)	(41)
Cash From (Used In) Investing Activities	-	(28)	(54)	(145)
Cash Flows from Financing Activities				
Proceeds from Issuance of Common Stock for Cash, net	89	2,747	-	11,200
Proceeds from Issuance of Short Term Promissory Note	-	-	-	98
Principal Payments on Promissory Note	-	-	(13)	(133)
Cash From (Used In) Financing Activities	89	2,747	(13)	11,165
Net Changes in Cash	(7)	2,403	(688)	10,516

Totals may not sum due to rounding.

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