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INITIATION REPORT

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Crown Electrokinetics Corp. (NASDAQ: CRKN)

August 3, 2021

Buy: Initiate with Buy Recommendation and $8.50 Price Target

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We initiate coverage of Crown Electrokinetics with a Buy recommendation and $8.50 price target. Crown is a new entrant into the Smart Glass market with its DynamicTint window insert and believes its superior technology will drive wide adoption.

Crown Electrokinetics has developed a smart glass solution that controls the amount of UV (ultraviolet), visible and IR (infrared) light that comes through a window. The applications for this technology include skylights in residential structures, sunroofs in automobiles and windows in residential and commercial office buildings. In commercial office buildings, the benefit includes comfort and productivity gains for the occupants, reduced HVAC costs, avoided costs of installation and maintenance of blinds, complying with increasing regulations, and societal demands to lower the release of greenhouse gases.

The Department of Energy estimates 30% of a building's heating and cooling energy is lost through inefficient window stocks and commercial buildings are responsible for about 22% of non-transportation energy consumption in the U.S. Crown's EK technology can lower a building owner's operating costs.

Prominent companies such as Apple, Amazon, Google, JP Morgan and Coca-Cola have aggressive goals for greenhouse gas reductions. Property owners such as Jones Lang LaSalle and Hudson Pacific Properties are also looking to lower their portfolios' greenhouse gas emissions. Regulatory mandates by U.S. cities, states and the federal government, as well as by the European commission, add to the demand for solutions that lower greenhouse gas emissions. Crown's EK solution can help satisfy that demand.

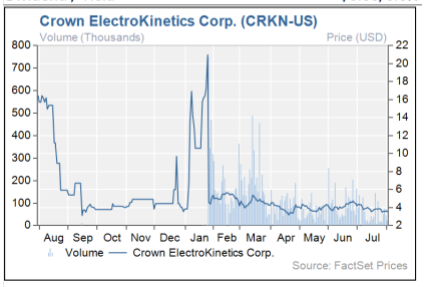
We believe property owners will be required by market forces to upgrade their properties in order to maintain occupancy levels. We believe companies will have to offer incentives to lure workers back to the office. A more pleasant environment that can be created with Crown's glass is a possible incentive.

In the near term, we believe Crown will focus on the office market given the investment made by Hudson Pacific and the company's discussions with other REITs. Over the mid and long term, we believe there is a large available market in automobile sunroofs and residential skylights.

Valuation: Our price target of $8.50 is based on an EV/Sales multiple of 5.5x and the $100 million in revenue we believe the company can achieve in 5 to 7 years. We have discounted the target EV at a 25% discount rate and included an estimate of the cashless exercise of warrants and options.

Risks: Risks to achieving our price target include an interruption in the economic recovery, closure of offices in response to the COVID-19 pandemic and obtaining the necessary manufacturing partnerships to satisfy demand.

Current Price			**$3.55**
Price Target			**$8.50**
Estimates	F2021A	F2022E	F2023E
Revenues ($000s)	$ -	$ 1,425	$ 13,875
1Q June	$ -	$ -	$ 1,875
2Q September	$ -	$ -	$ 2,625
3Q December	$ -	$ 300	$ 3,750
4Q March	$ -	$ 1,125	$ 5,625
	F2021A	F2022E	F2023E
EBITDA ($000s)	$ (5,123)	$ (8,734)	$ (5,066)
1Q June	$ (1,216)	$ (2,237)	$ (2,226)
2Q September	$ (1,092)	$ (2,337)	$ (1,797)
3Q December	$ (1,062)	$ (2,291)	$ (1,113)
4Q March	$ (1,753)	$ (1,969)	$ 71
EV/Sales	NM	34.2 x	3.5 x
EV/EBITDA	NM	(5.6) x	(9.6) x
Stock Data			
52-Week Range	$1.53	-	$27.00
Shares Outstanding (mil.)			17.9
Market Capitalization (mil.)			$64
Enterprise Value (mil.)			$49
Debt to Capital			2%
Book Value/Share			$1.12
Price/Book			3.2x
Average Three Months Trading Volume (K)			23
Insider Ownership			15.2%
Institutional Ownership			6.5%
Short interest (mil.)			0.7%
Dividend / Yield			$0.00/0.0%



Highlights and Investment Summary
Utilizing intellectual property licensed from HP Inc., Crown Electrokinetics has developed a smart glass solution that controls the amount of UV (ultraviolet), visible and IR (infrared) light that comes through a window. Control of the window can be automated to respond to the intensity of the sun or can be controlled manually. The applications for this technology include skylights in residential structures, sunroofs in automobiles and windows in residential and commercial office buildings. In skylights and sunroofs, the benefit is mostly comfort for the occupant. In commercial office buildings, the benefit includes comfort and productivity gains for the occupants, reduced HVAC costs, avoided costs of installation and maintenance of blinds, complying with increasing regulations and societal demands to lower the release of greenhouse gases.

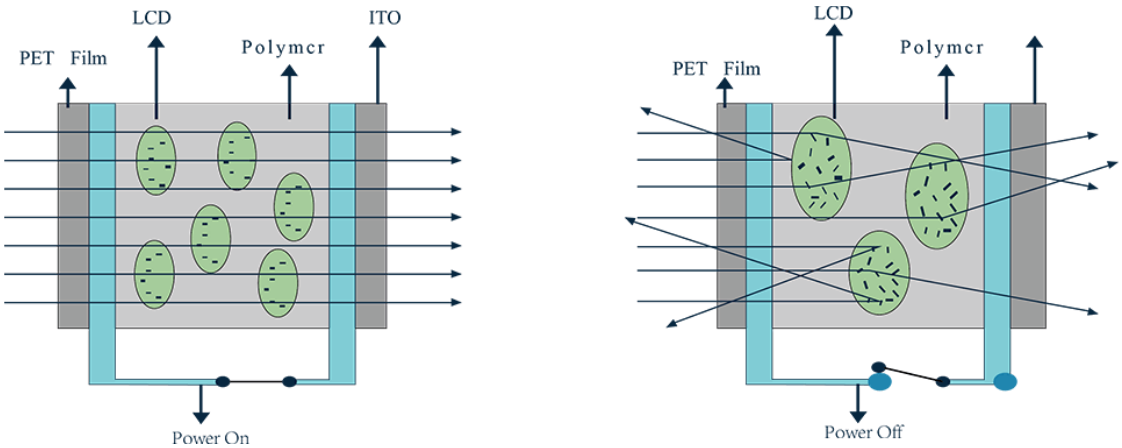
The ordinary window is made from a single vertical pane of glass. A double-glazed window improves heat insulation and reduces sound by separating two panes of glass with an air gap. Low-e (low-emissivity) heat-reflective glass is coated with a thin layer of metallic chemicals that reflect solar heat, so buildings stay cooler in the summer and warmer in the winter. Smart glass works in a similar way as low-e but is activated by an electric charge.

"Active" smart glass technologies, by applying an electric charge, automatically or manually control light coming through the glass. "Passive" technologies react to ambient conditions such as changes in lighting or temperature. The four primary active technologies, polymer-dispersed liquid crystals (PDLC), suspended particle device (SPD), electrochromic (EC), and electrokinetic (EK) broadly work in the same way: a charge applied to the film or smart glass moves particles between two layers, allowing light to come through. After removal of the charge, the particles will move to block light.

The amount of visible light, solar heat and UV light blocked, the response time, power required and cost vary for each of these technologies. Visible light transmission (VLT), or the amount of visible light waves that transmit through a material, also varies considerably across the technologies, as does the solar heat gain, a measurement of the percent of solar heat that passes through the window

Prices also vary. The typical glass price, per View, Inc. (VIEW $6.09, Not Rated), in its November 2020 Investor Presentation, is $12 per square foot. Polyceed pegs the global annual market for architectural window glass at $250 billion and 10.8 billion square feet, or about $25 per square foot, although this may include installation. The Department of Energy states "Windows manufactured with low-e coatings typically cost about 10% to 15% more than regular windows." Gauzy states its Smart Glass offering "is approximately 20% more than traditional glass and window treatments combined," although it is ambiguous if it applies to its PDLC, SPD solution, or both. A 2013 DoE program review of electrochromic windows puts market prices of electrochromic windows between $50 and $100 per square foot. View, Inc., in its November 2020 investor presentation, suggests a cost of $60 per square foot for its EC window, and Crown quotes in its June 2021 investor presentation a $25 per square foot price for its EK window insert.

PDLC, SPD and EC Glass
PDLC (polymer-dispersed liquid crystals) consists of a film interlayer of a polymer-dispersed liquid crystal formulation coated between two sheets of transparent materials each with an ITO (indium tin oxide) conductive coating. When electricity is applied, the ITO conductive coating forces the crystals in the chemical layer of the film to align, creating transparency. The film interlayer can be laminated or retrofitted onto glass.

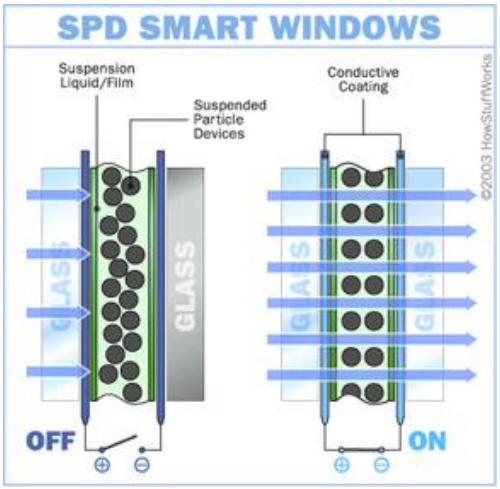


Source https://www.inno-glass.com/switchable-pdlc-film-glass/

Switching speed (the transition from light to dark) is nearly instantaneous with PDLC but requires considerably more energy than competing technologies to change states (see table below) and that amount of energy must be applied to maintain the clear state.

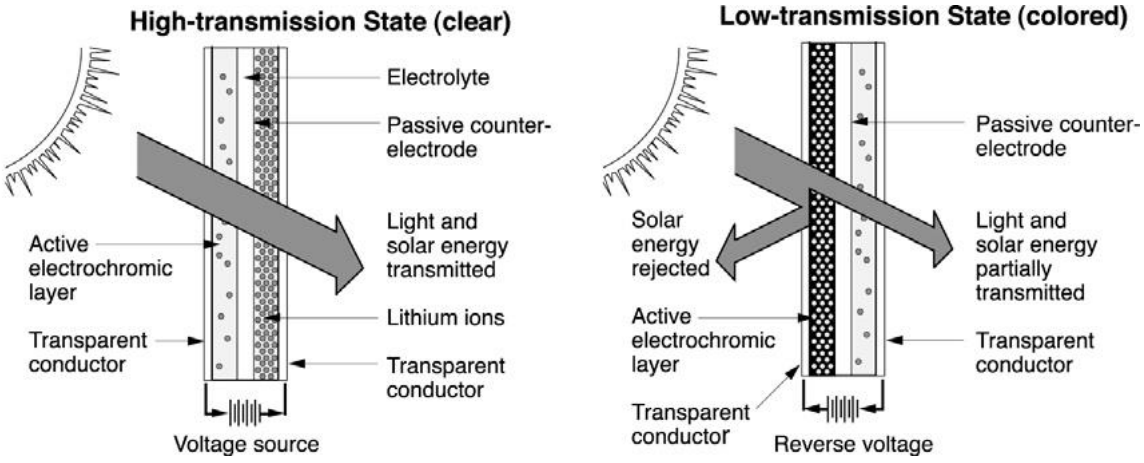
PDLC film can be manufactured on roll-to-roll equipment. For a variety of reasons, including operating temperature, cost, power needs and a higher solar heat gain coefficient (a measurement of how much solar heat passes through the window), PDLC is mostly an interior glass solution.

SPD (suspended particle device), like PDLC, utilizes a film interlayer, coated between conductive coatings and clear substrates. The power requirement to change the state of the glass is less than PDLC, and like PDLC, a charge must be maintained to sustain the clear state of the glass. SPD, like PDLC, can be manufactured on roll-to-roll equipment. The switching speed is one to three seconds for SPD, far faster than EC windows, which can take 5 minutes or longer for larger windows or in lower temperatures.



Source: "How Smart Windows Work"

Electrochromic (EC) requires a coating directly onto ITO conductive glass. (Source: Gauzy) There are different configurations of EC windows, but a common configuration has five ultra-thin layers: in the middle, an electrode separator; on both sides of the separator, two electrodes; on both sides of the electrode, two transparent electrical contacts. Lithium ions migrate back and forth between the two electrodes through the separator. For an outdoor window, when the lithium ions reside in the electrode closest to the interior, the window is clear. When a voltage is applied to the electrodes, the ions migrate through the separator to the electrode closer to the exterior. This makes the glass reflect light and the window turns opaque. Additional current is not required once the ions have moved. One drawback to EC glass is that it takes longer, compared to PDLC and SPD, to change the state of the window. Switching speed is proportional to the size of the EC window and temperature (source: LBNL), and the windows in the darkened state can take on a blue tint.



Source: "Advancement of Electrochromic Windows," Lawrence Berkeley National Laboratory, April 2006

Relative to PDLC and SPD, which utilize widely available roll-to-roll manufacturing, EC is complex and costly. Manufacturing of EC glass starts with a large, high-quality, very clean, nearly defect-free glass substrate. A stack of metal oxide films are sequentially deposited on the glass substrate in a large vacuum deposition machine. Conductors are applied after the film coatings are deposited on the glass. (Source: Environmental Assessment for Department of Energy Loan Guarantee for SAGE Electrochromics Sageglass High volume Manufacturing (HVM) Facility in Faribault, MN).

Due to costs and technical capabilities, PDLC is mostly used for interior spaces, SPD has had the most success in auto sunroofs, and EC is mostly targeted to exterior window solutions.

Main active chromogenic technologies on the market.

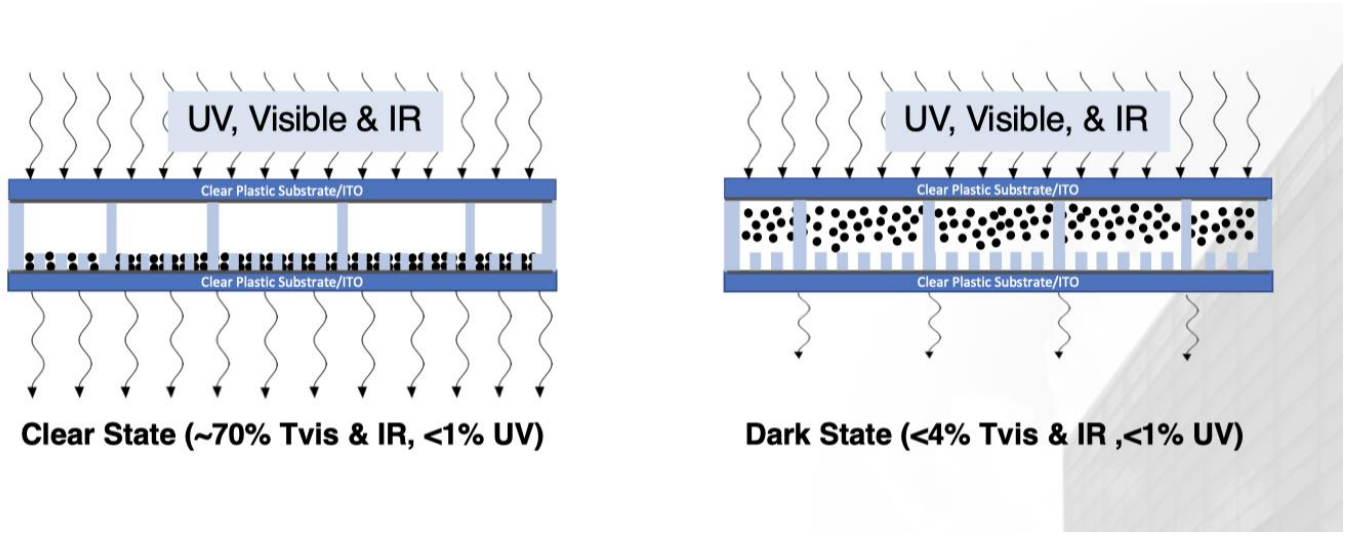
Properties	Active Dynamic glazing		
	EC	SPD	PDLC
Technology	Electrochromic	Polarized particles	Polarized particles
Clear state - Dark state	Off-On	On-Off	On-Off
Visible Light Transmission (Clear-Dark)	60%–1%	65%–0.5%	75%–50%
Solar Heat Gain Coefficient (Clear-Dark)	0.46–0.06	0.57–0.06	0.69–0.55
UV transmission (Clear-Dark)	0.4%–0%	0.1%–0.1%	0.5%–0.5%
Privacy in dark state	No	Limited	Yes
Number of light control levels from clear to dark	Typically 4 states	Unlimited	2 (Transparent and frosted)
Continuous states between dark and clear	Yes	Yes	No
Operating temperature	from −20 to 70 °C	from −40 to 120 °C	from −20 to 70 °C
Maximum size	1550 × 4400 mm	1524 mm x any length	1828 × 3567 mm
Shapes	Rectangle, square, trapezoid, triangle	Any shape, curved, including holes anywhere	Any shape, curved, including holes anywhere
Colors	Typically Blue or Green	Typically Blue	Clear, Bronze, Gray, Green tint
Operating voltage	12 V DC	65-110 V AC	65-110 V AC
Power requirement for state transition	2.5 W/m^2	5 W/m^2	5-10 W/m2
Power requirement for state maintenance	0.4 W/m^2	0.55 W/m^2	5-10 W/m2
Switching speed	Typically 5–12 min	Typically 1–3 s	Instantaneous (40 ms)
Control	Wall switch, Remote control, Movement sensor, Light and temperature sensor, Timer		
Integration with BMS	Yes		
Cost	Medium	Highest	High
Durability	>30 years	>20 years	>10 years

Source: "Active dynamic windows for buildings: A review" by Marco Casini

Electrokinetic (EK) Smart Glass

Crown Electrokinetics entered the smart glass market using technology developed by HP originally targeted for displays. Electrokinetic refers to the movement of particles within a fluid under the influence of an electric field. Crown's EK film technology electrically charges nanometer-sized pigment particles suspended in a liquid. This layer is sandwiched between two clear substrates coated with a transparent conductor oxide (TCO) film.

Schematic cross-section of electrokinetic film in clear and dark states



Source: Crown Electrokinetics Investor Presentation, June 9, 2021.

In the non-energized, or dark, state, the pigment particles are uniformly distributed between the plastic films, and depending on the properties of the suspended pigment, will absorb, transmit, or reflect light. The exterior side of the film has micro-embossed holes in a layer of polymer resin covering the transparent conductor surface. With an applied charge, the pigment particles collect in the holes and the glass becomes highly transparent (clear state). Color density and opaqueness can be changed by applying a different electrical signal.

Crown intends to market its EK technology under the DynamicTint name. It has significant advantages over competitive offerings, particularly in the office window market. Like SPD and PDLC, it utilizes roll-to-roll manufacturing technology and leverages a

large global supply base that should enable cost-effective manufacturing. Power usage is considerably lower than that of EC, SPD and PDLC. This is an important advantage for commercial office window applications, as installation, management and maintenance costs increase if power has to be integrated into the building's power supply network. Crown's DynamicTint can utilize solar or battery power, resulting in an overall lower total cost of ownership. DynamicTint has rapid transition speed, on par with SPD and PDLC, and far superior to EC, its primary competition in the commercial office window market. In the clear state, 70% of the light passes through the glass, far in excess of EC and SPD. PDLC is superior to other technologies on light transmission in the clear state but is mostly an interior solution.

Technology	Can Retrofit	Power Usage	Can Tint to Black	Solar or Battery Powered	Tint Transition Speed	Light Transmission
DynamicTint™ Electrokinetic (EK)	✓	**<0.01 W/M2**	✓	✓	**<2 sec**	**1.0% - 70%**
Electrochromic (EC) (View, Inc., Kinestral, Sage/Saint Gobain)	×	0.3 – 2 W/M2 (30X EK)	×	×	5-40 min	1% - 58%
Suspended Polymers in Particles (SPD) (Research Frontiers)	×	~1.3 W/M2 (130X EK)	×	×	3 - 5 sec	3% - 62%
Polymer Dispersed Liquid Crystal (PDLC) (Various Manufacturers)	×	5 – 20 W/M2 (500X EK)	×	×	1 – 3 sec	~80% *Does not block light

Source: Crown Electrokinetics Investor Presentation, June 9, 2021.

Crown's DynamicTint will be initially targeted to the office market, where it will compete directly with EC products from SAGE Electrochromics, owned by Saint-Gobain, View, Inc. and Kinestral Technologies, Inc. Crown also faces competition from Research Frontiers (REFR $2.55, Not Rated), which has developed SPD technology and licensed it to multiple manufacturers, including, in the auto market: American Glass Products, Asahi Glass, Custom Glass, Daimler AG, Isoclima, Pilkington Glass, Pittsburgh Glass Works, Saint-Gobain, SER, and Vision Systems, and in the architectural market: American Glass Products (AGP), Asahi Glass, Cricursa Cristales Curvados, Gauzy, Glatic, Innovative Glass, Isoclima, LTI SmartGlass, NSG UMU Products Co., Ltd Prelco, Isoclima, Smartglass International and Traco (a business unit of Alcoa).

Reducing Heating and Cooling Costs in Office Buildings

There is significant energy savings to be had by improving the window stock of commercial buildings, and commercial buildings are a major source of energy consumption in the U.S. The Department of Energy estimated 30% of a building's heating and cooling energy is lost through inefficient window stocks and commercial buildings are responsible for about 22% of non-transportation energy consumption in the U.S.

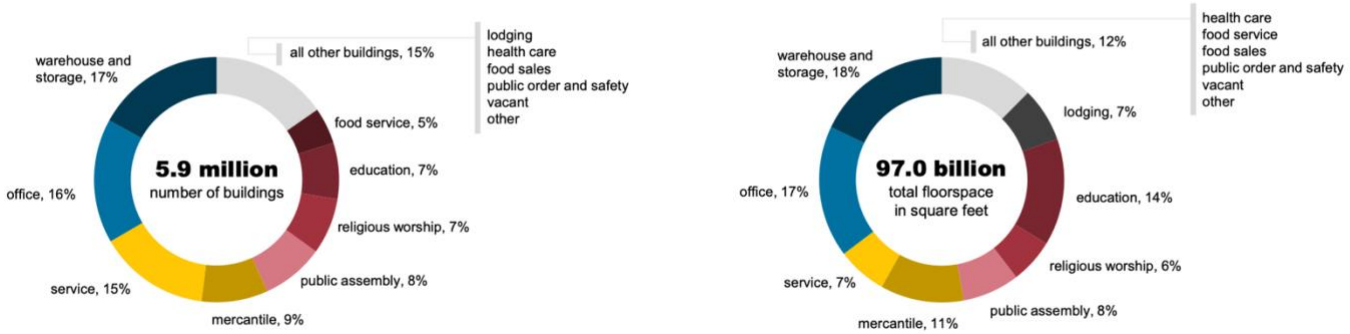
Total energy consumption in 2019 in the U.S. was 100,293 trillion BTU, which includes energy losses in the generation, transmission and distribution of electricity. (We use 2019 data since 2020 was greatly impacted by the pandemic. Energy consumption in 2020 was 7.3% lower. [Source: DoE/EIA July 2021 Monthly Energy Review]) Consumption in the Commercial sector was 18,011 trillion BTU in 2019, about 18% of total consumption and 25% of non-transportation related energy consumption. The most recent detailed data from the Department of Energy's Commercial Building Energy Consumption Survey (CBECS) is for 2012, when commercial buildings were estimated to consume 15,657 trillion BTU of energy, about 90% of total energy consumption by the commercial sector.

Office Market

Offices are the largest consumer, by type, of energy in the commercial market. In this section, we develop estimates for office window space in the U.S.

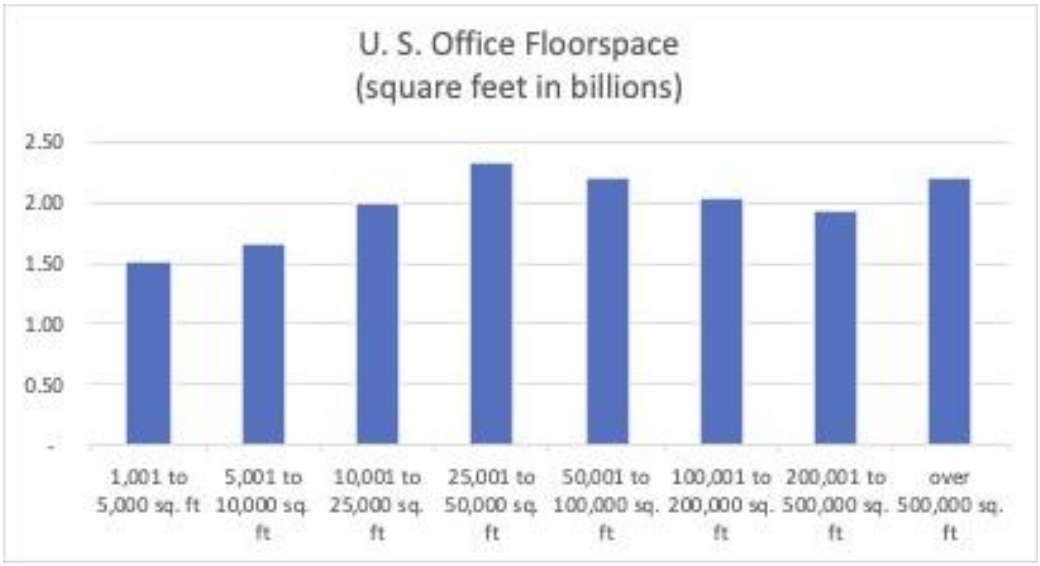
According to the Department of Energy's (DoE) 2018 Commercial Buildings Energy Consumption Survey, there were 5.9 million commercial buildings in the United States with 97 billion square feet of floorspace. Commercial office space in the U.S. includes buildings used primarily for lodging, education, health care, mercantile, public order and safety, warehouse and storage, office, public assembly, religious worship, service, food sales, food service, and other, and totals 97 billion square feet of floorspace. Of the total U.S. commercial space, there were 972,000 office buildings with 16.85 billion square feet of floorspace.

Percentage of commercial buildings and floorspace by principal building activity



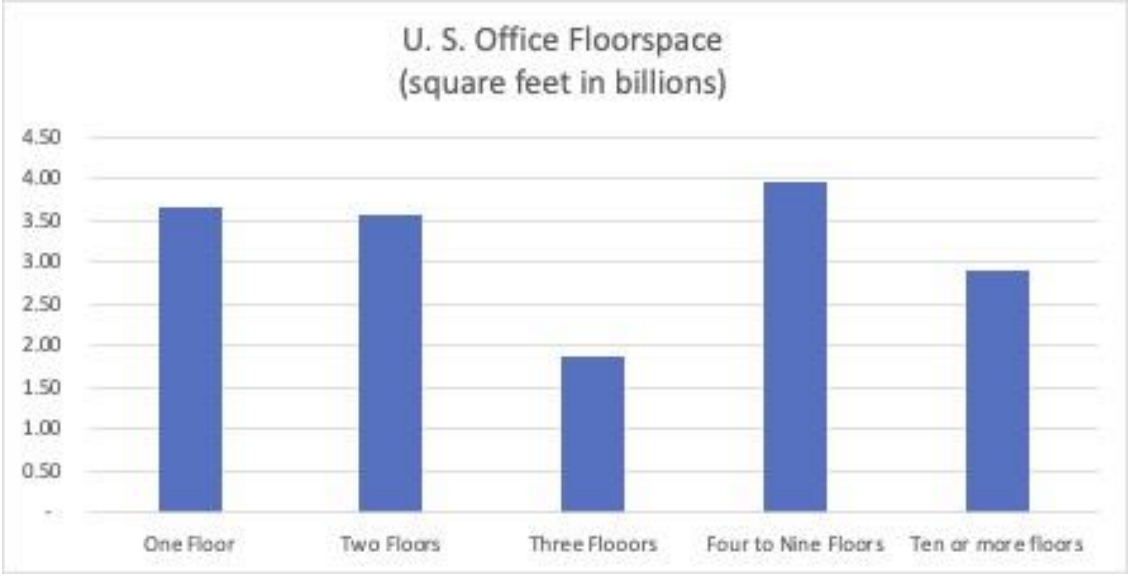
Source: U.S. Energy Information Administration, 2018 Commercial Buildings Energy Consumption Survey

Detailed data for the 2018 EIA survey is not yet available. The breakdown of floorspace, by building size, is available for 2012 and presented below.



Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey, Table B7

About 55% of total U.S. office floorspace in 2012 was in buildings 3 stories or taller. In 2012, of the 1 million office buildings in the U. S., about 181 thousand were three stories and taller.

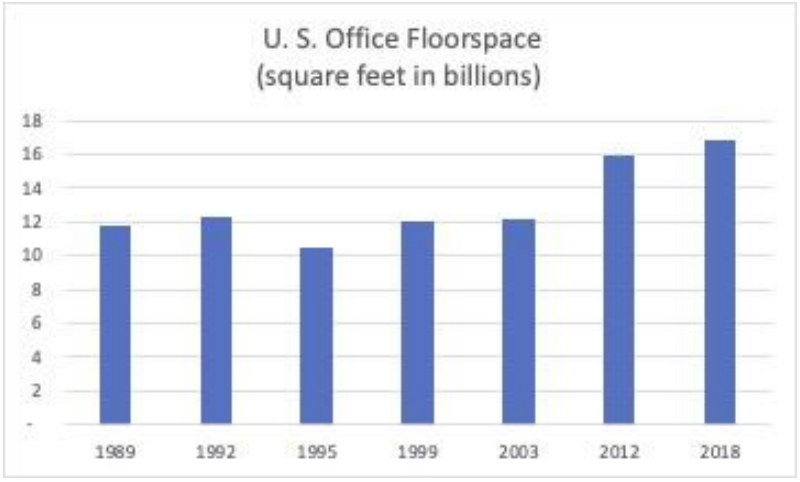


Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey, Table B10

The CBECS data shows the average office building is about 17,000 square feet. Using EIA data from the 2012 CBECS survey, average floorspace for one-story office buildings is about 6,600 square feet, almost 13,000 square feet for two-story buildings, 15,900 square feet for three-story buildings, 70,500 square feet for four-to-nine-story buildings and 415,000 square feet for buildings 10 stories and higher.

As a frame of reference, the average office building of Hudson Pacific's in-service office property portfolio as of December 31, 2020 was 289 thousand square feet, and ranged from 10,000 square feet to just over 1 million square feet. Crown is testing its window inserts at Hudson Pacific's Wilshire Boulevard, 500,000 square foot, 25-floor, Class A property.

The compound annual growth rate of office space in the U.S., based on data from the CBECS surveys to 2018 ranges between 1% and 2.2%. U.S. population growth, based on U.S. census data, has been 0.8% from 2000 to 2020.



Source: Commercial Buildings Energy Consumption Survey (CBECS)

We used the 2012 CBECS data to estimate total office window square footage in U.S. office buildings. Pacific Northwest National Laboratory (PNNL) used 2003 CBECS data to estimate typical building envelope characteristics for buildings built after 1980 (54% of U.S. office building floorspace in the 2012 CBECS survey was built after 1980 and 48% in the 2003 CBECS data. At that rate, about 60% of U.S. office floorspace today has been constructed since 1980.)

Converting floorspace to window space requires a number of assumptions. PNNL estimated an aspect ratio (length to width) of 2.01 for office buildings. Using CBECS data, we calculated average floorspace per building for each of the height categories. For the category of four-to-nine-story buildings, we assumed an average of 6.5 stories, which is consistent with PNNL estimates. For buildings with greater than 10 stories, we used a range of 15 to 20 stories, which is consistent with PNNL estimates and data samples

from skyscraperpage.com. PNNL also estimated window-to-wall (WWR) ratios of 54% for large office buildings (buildings with greater than four stories) and 31% for medium office buildings (buildings with two to four stories) and 19% for small office buildings (single story).

Using the assumptions above, we arrive at an estimated window space for U.S. office buildings of between 3.0 billion square feet and 4.1 billion square feet.

Window Space in U.S. office buildings

	Millions of square feet
One Story	535.7
Two story	866.0
Three story	501.4
Four to nine story	578.6 to 1,511.7
Ten and more stories	483.3 to 683.2
Total range	2,964.8 to 4,098.1

Source: CBECS, PNNL, Dawson James estimates

We estimate the market size in Europe is just as large as in the United States. A 2011 report by The Buildings Performance Institute Europe (BPIE), "Europe's Building Under the Microscope," estimates there is 269 billion square feet (25 billion square meters) of floor space; of that, 25% is non-residential and 23% is office space, or 15 billion square feet of office space, about equal to U.S. office space in 2012.

Smart Glass Market Size and Growth Estimates

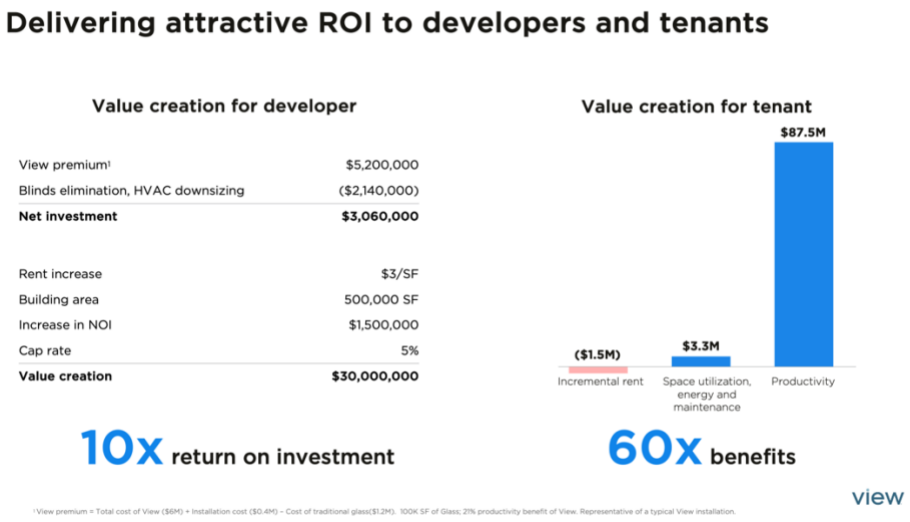
There are various estimates of the smart glass market. In "Smart Glass 2017-08 Polymer dispersed liquid crystal technology industrial evolution and current market situation," Hakemi estimates the "the worldwide market value of total 'Smart Glass' (including PDLC, SPD, EC, TC, TT and PC) has been around $2.6 billion in 2016 and is expected to reach over $8 billion by 2022. Also, the Smart Glass market shares were estimated to be around $1.0 billion in Europe/Mideast, $1.0 billion in the Americas and $0.6 billion in Asia-Pacific regions." Grand View Research estimates a global smart glass market of $4.5 billion, about half for transportation applications and ~45% for architectural glass. View, in its November 2020 investor presentation, estimates a $120 billion North American total addressable market (TAM) and a $1.2 trillion global TAM. Research Frontiers, in its May 2021 investor presentation, projects a $200 million annual revenue opportunity in the automotive sunroof market, a $24 million annual revenue opportunity for new aircraft windows, with additional potential in the aftermarket. Crown cites a University of Michigan study of the U.S. office market of 87 billion rentable square feet of space. Using a ratio of 15% to 20% window to rentable square feet (based on View and Crown projections in the investor presentations cited above), an estimated 13 billion to 17 billion square feet of window area is available, and at $30/sq. foot, the price of a DynamicTint window insert in Crown's June 2021 investor presentation, this is a TAM of $390 billion to $510 billion.

Using CBECS survey data and Crown's price of $30 per square foot results in an addressable retrofit market between $89 billion and $123 billion. In addition to the retrofit market, the net growth of U.S. office space has been 174 million square feet per year since 1989, and window space growth between 30 million and 41 million square feet per year, or $880 million to $1.2 billion per year for the new installation market.

Drivers for Smart Glass Demand

View, in its 2020 investor presentation, points to studies that show dramatic reductions in eyestrain and headaches, higher cognitive ability and increased productivity from the installation of smart glass. For building owners, View shows a net investment of $3 million for 100,000 square feet of glass enabling a $3 per square foot increase in rent, a 10x return on investment and 49% IRR for building owners over a 20-year horizon. For tenants, View claims productivity benefits, better space utilization, and lower energy and maintenance costs.

In its investor presentation, View quotes a price of $60 per square foot of its glass, a significant premium to $12 per square foot for traditional glass. However, for new construction, View believes its glass can eliminate the need for blinds and reduce HVAC equipment needs, by $21.40 per square foot for a building with 500,000 square feet of office space and 100,000 square feet of window space. View has disclosed 20 million square feet of its product has been installed. Since the company's cumulative revenue is far less than $1.2 billion (20 million sq. ft x $60 per square foot), it is clear to us that View has been greatly discounting its product.



Source: View, Inc. Investor Presentation, November 2020

Crown has not made the specific claims View has regarding value creation for tenants, and instead, focuses on the payback to building owners. Crown is pursuing a lease model, and based on an existing pilot program, cites a 12- to 16-month payback. For its pilot program, Crown uses a 500,000 square foot building with 75,000 square feet of glass. The company cites a cost of $750 for a 5' x 5' insert, or $30 per square foot, half the price View is quoting. It assumes a 10-year lease and with a minimal or zero residual value, we assume a lease rate of $3/square foot of glass per year. If all the windows in this building were retrofitted with Crown's inserts, the total annual costs would be $225 thousand (3,000 windows x $750/insert over 10 years), and at a 12- to 16-month payback, this suggests reduced costs of $170 to $225 thousand per year in energy savings and avoided costs of window blind replacement. Over a ten-year timeframe, this is comparable to the space utilization energy and maintenance cost reductions cited by View.

CBECS data for 2012 estimated electricity consumption for offices of $1.64 per square foot of floorspace and natural gas consumption of $0.22 per square foot. Total energy costs, including fuel oil and district heat was $1.93 per square foot. The July 2021 Monthly Energy Review shows commercial electricity prices were 6% higher in 2020 than in 2012 and commercial natural gas prices were 7.5% lower. This would put electricity prices at $1.74 per square foot and natural gas costs at $0.20 per square foot, for a total cost of about $2 per square foot. Excel Energy, using EIA data, estimates the amount of energy used for heating, cooling, ventilation and lighting ranged from 62% to 76% of total energy consumption depending on the location of the building and the climate. For a 500,000 square foot building, these costs would range between $620K and $760K per year.

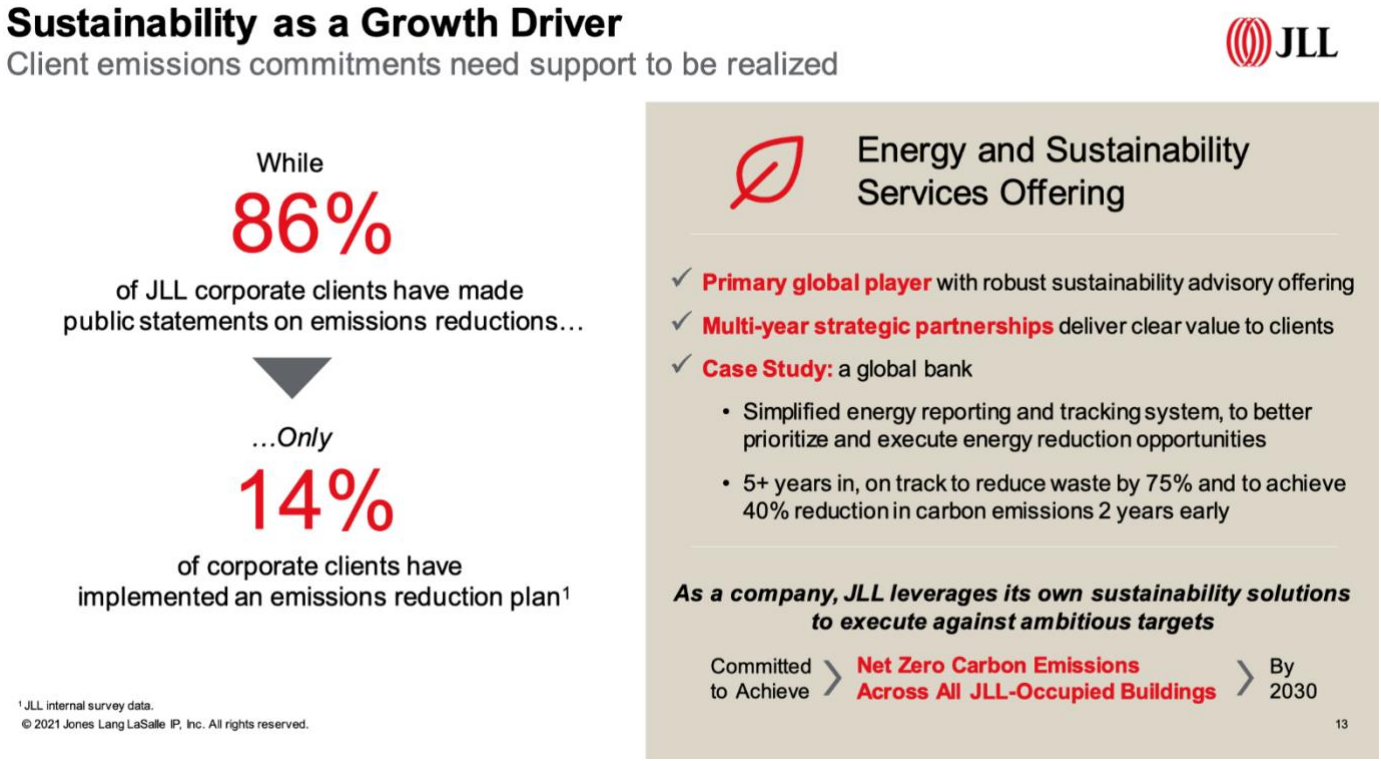
The Department of Energy estimated 30% of a building's heating and cooling energy is lost through inefficient window stocks. View, Inc., in its November 2020 investor presentation, estimates energy savings from its EC windows at 20%. In "Electrochromic dynamic windows for office buildings," it was estimated energy savings with EC glass was greater than 45% compared to single pane glazings and greater than 20% compared to more energy-efficient glazings. Casini cites studies demonstrating savings of up to 60% in artificial lighting, a 20% reduction in cooling load and peak power reduction of 26% with the installation of EC windows. These estimates are dependent on items such as climate, the ratio of heating and cooling costs and building orientation. These estimates suggest annual energy savings of $124K to $456K per year for a 500,000 square foot building.

A major driver for window retrofits is the increasing number of local, state, national and international regulations and tax policies mandating and incentivizing reductions in GHG (greenhouse gases), carbon, energy use or some mixture of all three. For instance, in 2019, the New York City Council passed the Climate Mobilization Act (CMA), which included Local Law 97 that established an "office of building energy and emissions performance," that, among other things, would be responsible for "Monitoring buildings' energy use and emissions, and reviewing building emissions assessment methodologies, building emissions limits, goals and timeframes to further the goal of achieving a 40 percent reduction in aggregate greenhouse gas emissions from covered buildings by calendar year 2030, relative to such emissions for the calendar year 2005." In 2006, The Global Warming Solutions Act (AB32) was passed in California, which "requires California to reduce its GHG emissions to 1990 levels by 2020." In 2017, the California Assembly passed AB 398, which requires the State Air Resources Board to implement plans to reduce greenhouse gas emissions by "at least 40% below the 1990 level by 2030." The Federal government authorized the Energy-Efficient Commercial Buildings Tax Deduction in the Energy Policy Act of 2005. This tax deduction was made permanent in The Consolidated Appropriations Act, 2021. In May of this year, Senator Edward Markey (D-MA) introduced the Dynamic Glass Act, co-sponsored by Roger Wicker (R-MS) and Michael Bennet (D-CO), which would make "glass which uses electricity to change its light transmittance properties in order to heat or cool a structure…eligible for federal energy tax credits." The European Commission has adopted aggressive targets for greenhouse gas emissions, which it is calling the "European Green Deal." "On 14 July, the

European Commission adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels." The goal is to create "the world's first climate-neutral continent by 2050 and making the European Green Deal a reality."

Private companies have also committed to reducing GHG, regardless of government mandates. In 2020, Apple "unveiled its plan to become carbon neutral across its entire business, manufacturing supply chain, and product life cycle by 2030." Amazon has developed "meaningful carbon reduction strategies to reach net-zero carbon emissions across our business by 2040." Coca Cola has targeted a 25% GHG emission reduction by 2030 and a "net zero ambition" by 2050. JPMorgan Chase announced a goal of reducing "greenhouse gas emissions from the operation of its buildings, branches and data centers by 40% by 2030, based on a 2017 baseline," as well as launching a program at its commercial bank to "finance and facilitate more than $2.5 trillion over 10 years - including $1 trillion for green activities - to advance long-term solutions that address climate change and contribute to sustainable development."

Property owners are also incorporating reduced greenhouse gas emissions in their strategies. For instance, Jones Lang LaSalle Incorporated (JLL $222.57, Not Rated) is "committed to achieve net zero carbon emissions across all JLL-occupied buildings by 2030."



Source: Jones Lang LaSalle Investor-Presentation, March-2021.

Hudson Pacific Properties, an investor in Crown, had also committed to reducing the amount of carbon released across its portfolio and achieve net zero release in 2020. This is one of the company's achievements listed in its latest 10-K.

Hudson Pacific 2020 ESG achievements:
• *100% of properties are net zero carbon across all operations;*
• *100% of properties use renewable electricity;*
• *100% of (re)developments and major repositionings adhere to our Sustainable Design Vision , which includes a commitment to obtaining a minimum of LEED Gold certification on all projects;*
• *80% of our in-service office portfolio is LEED certified and 71% is ENERGY STAR certified; and*
• *99% of our in-service office portfolio has recycling services and 71% has composting services.*
Source: Hudson Pacific Properties 2020 10-K

In addition to the energy savings, private demand for reduction in greenhouse gas emissions, public mandates for lower energy consumption and/or lower greenhouse gas emission, there are quality of work and productivity impacts from the use of smart glass. View, Inc. estimates productivity improvement is the overwhelming benefit for tenants and is more than 25x the benefit from lower energy, maintenance, and space costs. View also cites a survey showing workers prefer buildings with EC windows. This is validated by a GSA study of EC windows.

Crown Electrokinetics Corporate History

Crown Electrokinetics, incorporated in 2015 as 2D Nanocolor, was formed to acquire a research license from HP Inc. and determine the feasibility of incorporating HP's electrokinetic display technology into smart glass products for use in automobile sunroofs, skylights, and residential and commercial windows. The company's name was changed to 3D Nanocolor in January 2016 and to Crown Electrokinetics Corp. in October 2017. Prior to August 2017, 3D Nanocolor was a wholly-owned subsidiary of Marathon Patent Group (now Marathon Digital Holdings [MARA, $27.63, Not Rated]). Marathon transferred its ownership in Crown to management in 2017. The shares began trading on the OTCQB in June of 2020 and were uplisted to the NASDAQ in January of this year.

Crown acquired worldwide rights, and the option to acquire patents and associated technology to HP Inc.'s electrokinetic (EK) intellectual property assets and technology in January 2016. HP had spent 6 years developing this technology for electronic media applications with low-power usage and fast switching speeds. Company management believes that the technology's fast switching time, which is not area-dependent, low-power requirements, high stability, and the ability to retrofit existing windows should position the company to compete effectively against other smart glass technologies, including electrochromic (EC), Suspended Particles in Polymer (SPD) and Polymer Dispersed Liquid Crystal (PDLC).

HP and Crown entered into an initial intellectual property (IP) agreement in January 2016, and this agreement has been amended multiple times, most recently in February this year. Under the terms of the agreement, Crown has agreed to pay a royalty fee based on the cumulative gross revenue as shown in the table below:

Time Window	Lifetime Cumulative Gross Revenue	Royalty Rate
Prior to December 31, 2029	Less than $70,000,000	0.00%
	$70,000,000 - $500,000,000	1.25%
	$500,000,000 and beyond	1.00%
January 1, 2030 onward		0.00%

Source: Crown Electrokinetics 10-K, March 31, 2021

Crown has built a substantial patent portfolio with the acquisition of patents from HP as well patents granted based on work done since the company's founding.

Crown-Owned Patents

Application No.	Country	Filing Date	Publication No.	Status	Title
16/259,078	USA	January 28, 2019	20190256625	Pending	REFRACTIVE INDEX MATCHED RESIN FOR ELECTROPHORETIC DISPLAYS AND OTHER APPLICATIONS
201980018649.7	China	January 28, 2019	CN111918894A	Pending	REFRACTIVE INDEX MATCHED RESIN FOR ELECTROPHORETIC DISPLAYS AND OTHER APPLICATIONS
19704995	Europe	January 28, 2019	3752867	Pending	REFRACTIVE INDEX MATCHED RESIN FOR ELECTROPHORETIC DISPLAYS AND OTHER APPLICATIONS
2020-566194	Japan	January 28, 2019		Pending	REFRACTIVE INDEX MATCHED RESIN FOR ELECTROPHORETIC DISPLAYS AND OTHER APPLICATIONS
10-2020-7024977	Korea	January 28, 2019		Pending	REFRACTIVE INDEX MATCHED RESIN FOR ELECTROPHORETIC DISPLAYS AND OTHER APPLICATIONS
PCT/US2019/015464	WO	January 28, 2019	WO 2019/160675	Expired	REFRACTIVE INDEX MATCHED RESIN FOR ELECTROPHORETIC DISPLAYS AND OTHER APPLICATIONS
62/631,623	USA	February 16, 2018		Expired	REFRACTIVE INDEX MATCHED RESIN FOR ELECTROPHORETIC DISPLAYS AND OTHER APPLICATIONS
16/741,622	USA	January 13, 2020	2020-0225552	Pending	APPLICATIONS OF AN ELECTROKINETIC DEVICE FOR AN IMAGING SYSTEM
PCT/US2020/013396	WO	January 13, 2020	WO2020/150166	Pending	APPLICATIONS OF AN ELECTROKINETIC DEVICE FOR AN IMAGING SYSTEM
62/793,250	USA	January 16, 2019		Expired	APPLICATIONS OF AN ELECTROKINETIC DEVICE FOR AN IMAGING SYSTEM
15/204,505	USA	July 7, 2016	10377909	Issued	INKS INCLUDING SEGMENT COPOLYMER GRAFTED PIGMENTS VIA AZIDE CHEMISTRY
12/951,348	USA	November 22, 2010	8179590	Issued	ELECTRO-OPTICAL DISPLAY
12/865,255	USA	July 29, 2010	8054535	Issued	ELECTROPHORETIC DISPLAY DEVICE
15/552,924*	USA	August 23, 2017	10,852,615	Issued	TWO PARTICLE ELECTROPHORETIC LAMINATE FOR USE WITH SMART WINDOWS WITH REDUCED DIFFRACTION
15823847.7*	EPO		3256903	Pending	TWO PARTICLE ELECTROPHORETIC LAMINATE FOR USE WITH SMART WINDOWS
15810715.1*	EPO	December 2, 2015	3250962	Issued	TWO PARTICLE ELECTROPHORETIC LAMINATE FOR USE WITH SMART WINDOWS WITH REDUCED DIFFRACTION
US20180046055A1*	USA		2015/063365	Pending	TWO PARTICLE ELECTROPHORETIC LAMINATE FOR USE WITH SMART WINDOWS
17/106,646*	USA	November 30, 2020		Pending	TWO PARTICLE ELECTROPHORETIC LAMINATE FOR USE WITH SMART WINDOWS WITH REDUCED DIFFRACTION

* Co-owned with University of Cincinnati

In-Licensed Patents

Patent No.	Country	Patent Date	Status	Title
8,183,757	USA	May 22, 2012	Issued	DISPLAY ELEMENT
8,184,357	USA	May 22, 2012	Issued	DISPLAY ELEMENT
8,331,014	USA	December 11, 2012	Issued	PIGMENT-BASED INKS
8,384,659	USA	February 26, 2013	Issued	DISPLAY ELEMENT INCLUDING ELECTRODES AND A FLUID WITH COLORANT PARTICLES
8,432,598	USA	April 30, 2013	Issued	TRANSPARENT CONDUCTOR STRUCTURE
8,896,906	USA	November 25, 2014	Issued	INKS INCLUDING BLOCK COPOLYMER GRAFTED PIGMENTS VIA AZIDE CHEMISTRY
8,018,642	USA	September 13, 2011	Issued	ELECTRO-OPTICAL DISPLAY

Source: Crown Electrokinetics 10-K, March 31, 2021

A major advantage EK technology has over EC is the ability to utilize roll-to-roll-equipment for manufacturing of electrokinetic film. EC requires deposition onto glass and expensive equipment to accomplish this. For instance, View has invested over $400 million in its factory with nameplate capacity of 5 million square feet of smart glass per year from one production line. It expects to spend an additional $160 million for a second production line, and automation, that would bring total nameplate capacity to 12.5 million square feet of smart glass per year (Source: View March 31, 2021 10Q). View has also stated it will need quarterly revenue of $40 million to $50 million in order to reach a positive gross margin. (Source: May 12, 2021 EPS Transcript). At $60 per square foot, this is annual production of 3.3 million square feet of glass, or about 1% of the new glass market. (See our estimates above on the new glass market). In 2012, it was reported Sage Electrochromics invested $150 million in a plant with annual capacity of 3.2 million square feet of glass. Crown, in contrast, is able to utilize the global base of roll-to-roll equipment and estimates it can price its film at a 50% discount to the price quoted by View.

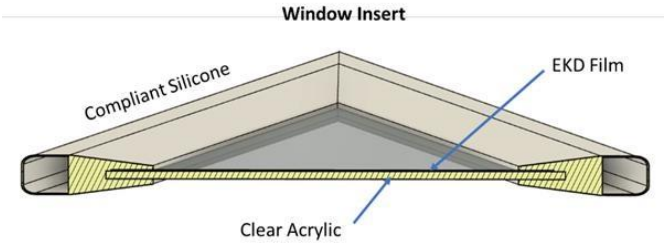
For the past three years, Crown has been using roll-to-roll equipment capable of the deposition, embossing and lamination steps needed in the manufacturing process. To date, it has been producing film with a 6" width and intends to have proto-manufacturing roll-to-roll equipment at 12" width available in 2021. Volume manufacturing is planned with a minimum film width of 24," and ultimately, the company plans to develop the capability to manufacture the DynamicTint product with a width of at least 60." (Source: Crown 2021 10K)

The manufacturing process requires 1) Deposition, 2) Embossing and 3) Lamination. The deposition step entails vacuum sputtering of indium-tin oxide (ITO) on clear polyethylene terephthalate (PET) plastic film. The company believes this can be provided by a number of suppliers since millions of square feet of ITO on PET is provided for many display touch screens. Embossing is proprietary to Crown and protected by its patents and trade secrets. The process is performed on a roll-to-roll machine by laying a UV-curable resin in a 3-D pattern on plastic film. The pattern determines the movement of the ink pigment. Lamination is also a roll-to-roll process that laminates the two PET layers with the pigment-containing fluid.

The company originally targeted the automobile sunroof and skylight markets, and in August of 2017, entered into a collaborative agreement with Eastman Chemical Company to jointly develop electrokinetic films and determine commercial suitability for automobile windows. In November 2017, Crown entered into an agreement with Asahi Glass to evaluate EK technology for laminated glass for automotive and train applications.

The company began shifting its focus to the office window market in June 2020 after Hudson Pacific Properties purchased a convertible promissory note and warrants to purchase common stock in Crown. At the time of the investment, the company indicated Hudson would implement the DynamicTint technology at select properties across its West Coast portfolio. In March of 2021, the $750,000 convertible promissory note balance was exchanged for 380,000 shares of Crown common stock and 500,756 shares of Series C Preferred stock, which converts into 560,757 shares of common stock. In addition, the warrants held by Hudson were amended to purchase 470,578 common shares of Crown at an exercise price of $1.116 per share. Assuming full conversion and exercise of the warrants, Hudson would hold 1.4 million shares, or almost 9% of shares outstanding.

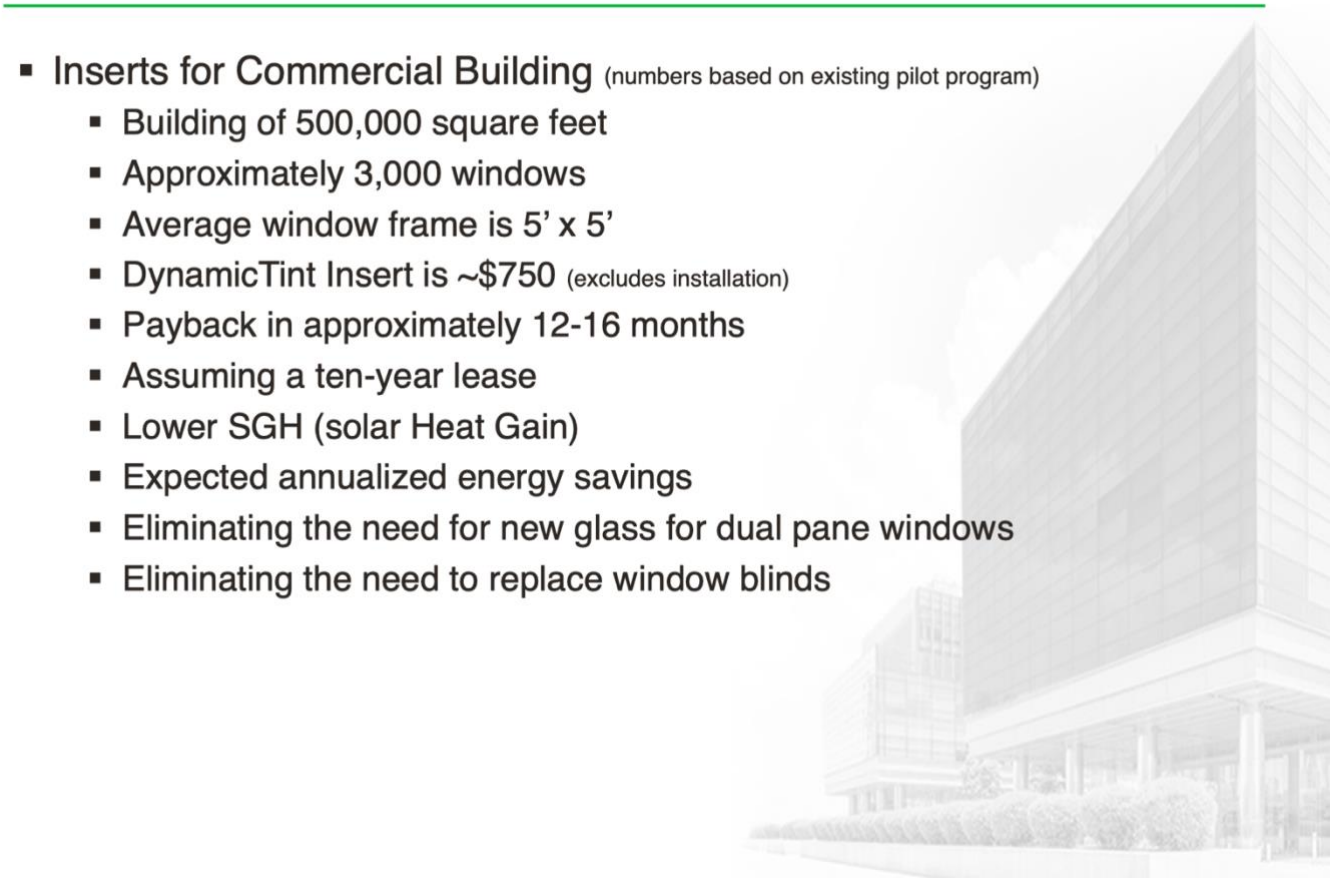
One of the key advantages of Crown's technology is the ability to cost-effectively address the retrofit market. The Crown window insert can be installed easily, can be powered by solar and battery power and does not need to be wired into a building's electrical system.



Source: Crown Electrokinetics Corp. 2020-11-04 S-1

Crown has been in active discussions with Hudson regarding deployment of the DynamicTint film as a retrofit insert product on Hudson's existing external glass for a majority of its portfolio buildings. Crown has designed the insert to enable building owners to convert their single pane window units to a dual pane window unit, with Crown's insert as the second pane. The insert can be integrated into the building HVAC control system, requires very little energy to transition from a clear to a dark state, can be powered with a solar cell and battery backup and eliminates the need to hardwire the insert into a building's electrical system.

At an investor conference in June, Crown presented details on a pilot program that we believe is underway at the Hudson Pacific Property building on Wilshire Boulevard in Los Angeles. We believe the results of the trial could drive deployment of DynamicTint at the Hudson properties and for other REITS Crown is in discussions with.

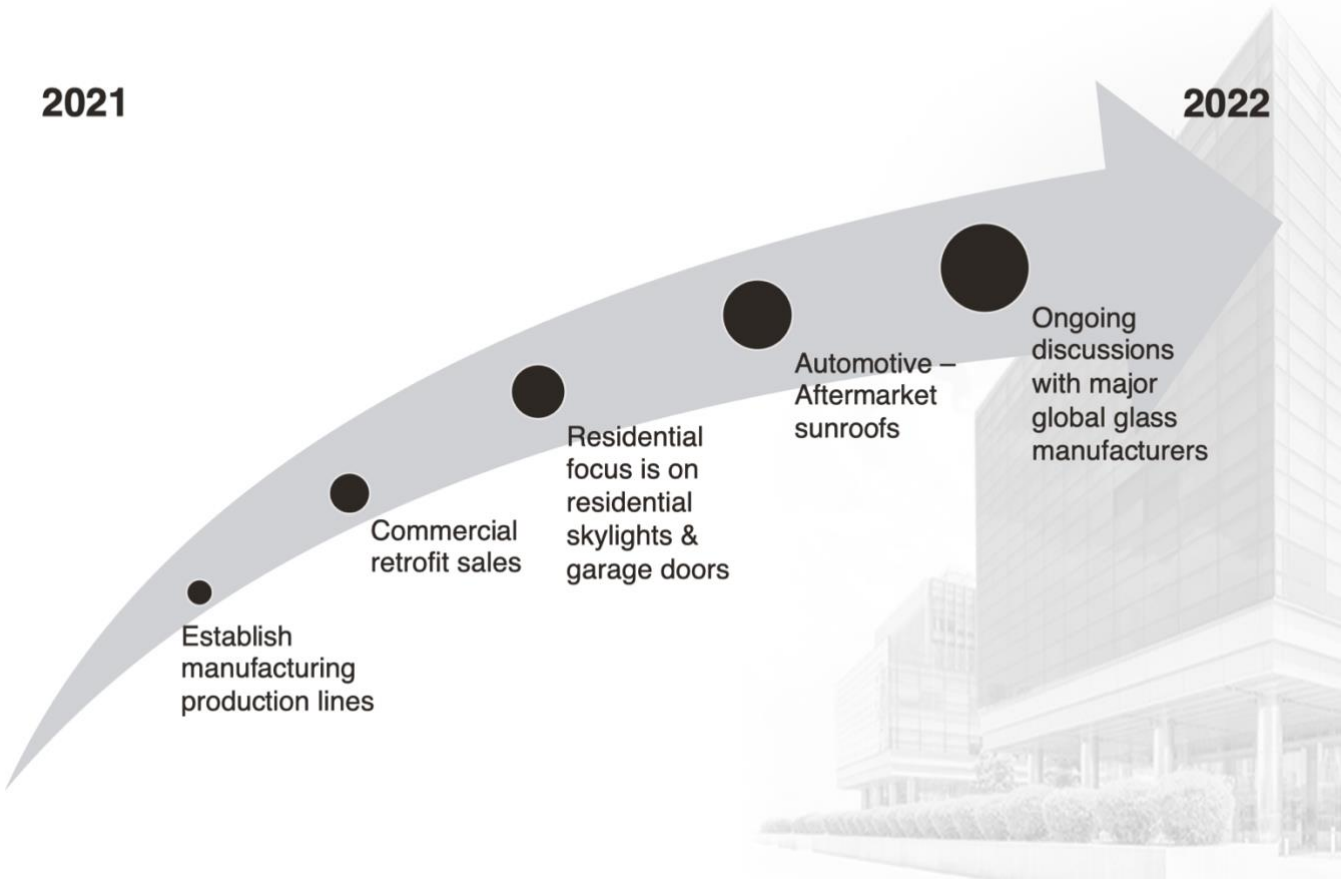


Source: Crown Investor Presentation, June 2021.

As of December 31, 2020, Hudson Pacific's office portfolio comprised 15.6 million square feet of space. The building in the Crown pilot program has a total window space of 75,000 square feet, 15% of the total floor space. Using that same ratio of window to floor space for the entire portfolio (which implicitly assumes the aspect ratio, average number of floors and floor height for the portfolio is similar to the pilot building) results in potential window space of 2.34 million square feet and a total addressable opportunity of $70 million.

The company has indicated it is in various stages of discussion with other REITS, and we believe favorable results of the tests with Hudson Pacific will strengthen Crown's ability to obtain orders from these discussions.

The company's commercialization strategy is to focus first on the office window retrofit market, the largest addressable market, and, given the investment in Crown by Hudson Pacific and the subsequent trial, the most likely to generate revenue in the near term. The company expects to target next residential skylights, the automotive aftermarket for sunroofs and licensing the technology to glass makers as an OEM solution. Crown estimates the skylight market will be a $1 billion market by 2025 and the automotive market $5.6 billion by 2025. The company's path to market for both are the agreements signed with Eastman Chemical and Asahi Glass.



Source: Crown Investor Presentation, June 2021

The company has indicated the existing pilot program has a payback of 12-16 months, assuming a 10-year lease. A lease has the advantage of a short payback and limited up-front capital costs for the customer. We believe this will accelerate adoption of the product. It also increases the capital required by Crown since it will be financing the transaction over the life of the lease. If the leases are structured as sales-type leases, revenue recognition will be similar, compared to outright sales. However, if the leases are structured as direct-finance leases, revenue recognized at the time of the transactions will be much lower. It remains to be seen how much of potential future sales will be structured as sales, sales-type leases, and direct-finance leases. We have assumed in our model leases will be structured as sales-type leases.

Valuation

We believe Crown can achieve $100 million in revenue over the next 5 to 7 years. The closest comp to Crown, with a high-growth profile, a product addressing a large market and the potential to capture meaningful share, is View, Inc.; the company's shares have traded between 5x and 13x forward-twelve-month revenue since March of this year, when sales estimates from FactSet were first available. Using this multiple range and a $100 million revenue bogey results in a 5- to 7-year enterprise value target of $550 million to $1.3 billion. We discount this to arrive at an 18-month enterprise target range of $161 million to $595 million. Using a share count of 17.9 million, which includes conversion of the convertible preferred, leads to a price target of $9 to $33. There are also substantial warrants and options outstanding with cashless exercise provisions. The amount of additional shares will be determined by the share price at time of exercise. Using a price exercise range of $3.70 to $9.00 (the current price to the low end of the target price above) leads to 4.2 million to 10.5 million additional shares. Adjusting the target range for these additional shares brings the price target range to $5.66 to $26.92 per share. This is a wide range.

For our price target, we focus on the lower EV/Sales multiple of 5.5x to reflect the risks of achieving our revenue estimate. An 18-month EV target range, with a 25% discount rate and assuming 5-7 years to achieve $100 million in revenue is $161 million to $251 million. With a share count of 17.9 million, this equates to a price target of $9 to $14 per share. Including the exercise of the existing warrants and options, using the share price at the time of exercise shown above leads to a price target range of $5.72 to $11.35. Our price target of $8.50 is the midpoint of this range.

Our price target of $8.50 is based on an EV/Sales multiple of 5.5x and the $100 million in revenue we believe the company can achieve in 5 to 7 years. We have discounted the target EV at a 25% discount rate and included an estimate of the cashless exercise of warrants and options.

Risk Analysis

There are meaningful risks to achieving our price target. Our price target assumes a substantial share of revenue in the short and medium term will come from the office retrofit market. The sales cycle can be long and installation time could hinder the pace of sales. The Federal Reserve has had a highly accommodative policy, but this could change due to increased inflation, and policy changes could lead to a slowdown in economic growth, demand for office space, and capital available for retrofitting windows. We have assumed the comfort of offices will be a factor in retrofitting windows. This assumption could be incorrect. Many employees have been working from home and it is unknown when they will return to the office, or how many will return or how often they will utilize existing office space. These factors could have an impact on demand and our estimates. Crown requires manufacturing partners to fill orders. There is no assurance the company will be able to obtain capacity on terms that are consistent with our model. Bills have been introduced in the previous legislative session and the current session that would give buyers a tax credit for smart glass purchases. Pending legislation could incentivize buyers to pause purchases until these bills are passed or killed. Crown is pursuing a model that includes leasing its window inserts to customers. This would place a burden on the company's balance sheet. Also, accounting for leases is complex and revenue recognition could be meaningfully different than what we have estimated. The market is competitive. The are many options available for building owners, including double-paned windows, low-e windows, and products from, among others, Gauzy, SAGE and View. Crown is smaller than many of these competitors. We believe View has been selling its smart glass at a significant discount. At the end of the March quarter, View had over $500 million in cash, and given its current burn, will likely be able to continue discounting for the coming year. We have assumed a driver of demand is customers' desire to lower greenhouse gas emissions. That desire could fade and have an impact on our estimates.

Exhibit 1. Income Statement

($ in 000's) (except per share data)	31-Mar-20 FY 2020A	31-Mar-21 FY 2021A	31-Mar-22 FY 2022E	31-Mar-23 FY 2023E
Revenue	100	0	1,425	13,875
COGS	620	0	941	7,669
Gross Profit	(520)	0	484	6,206
R&D	1,826	3,540	2,350	4,000
SG&A	5,492	15,812	13,150	14,000
Opex	7,318	19,352	15,500	18,000
Operating Income	(7,838)	(19,352)	(15,016)	(11,794)
Interest expense and other	(1,766)	(21,403)	0	0
Pretax Income	(9,604)	(40,755)	(15,016)	(11,794)
Taxes	0	0	0	0
Net Income	(9,604)	(40,755)	(15,016)	(11,794)
Basic Shares	4,117	8,851	15,078	15,371
Diluted Shares	4,117	8,851	17,846	18,139
Basic EPS	$ (2.33)	$ (4.60)	$ (1.00)	$ (0.77)
Diluted EPS	$ (2.33)	$ (4.60)	$ (0.84)	$ (0.65)
Depreciation & Amortization	77	103	282	728
Stock Compensation	4,496	14,126	6,000	6,000
EBITDA	(3,265)	(5,123)	(8,734)	(5,066)

Source: Crown Electrokinetics Corp. and Dawson James Securities estimates

Exhibit 2. Balance Sheet and Cash Flow Statement

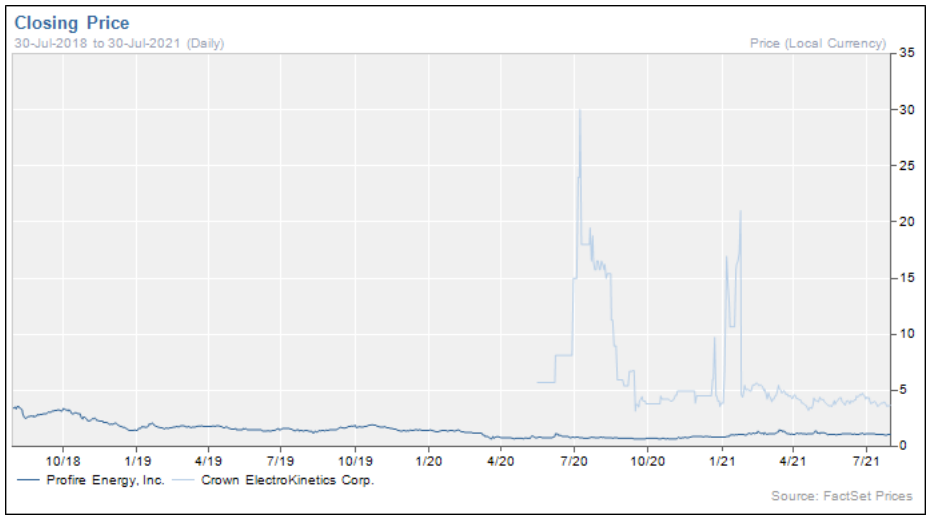
($ in 000's)	31-Mar-20 FY2020A	31-Mar-21 FY2021A	31-Mar-22 FY 2022E	31-Mar-23 FY 2023E
Cash & Equivalents	48	15,297	5,939	3,338
A/R	0	0	231	1,156
Inventory	0	0	150	578
Prepaid & other assets	13	346	750	1,300
Current Assets	$ 61	$ 15,643	$ 7,071	$ 6,372
PP&E	93	209	1,056	7,399
Intangible assets	235	1,650	1,462	1,274
Deferred offering costs	0	20	20	20
Total Assets	$ 389	$ 17,522	$ 9,609	$ 15,066
A/P	1,262	285	1,000	1,733
Accrued expenses	765	211	500	867
Accrued interest	455	0	0	0
Notes payable	3,083	439	439	439
Warrant liabiliity	1,734	0	0	0
Related party payable	50	0	0	0
Current Liabilities	$ 7,349	$ 935	$ 1,939	$ 3,039
Equity	(6,961)	16,587	7,671	12,027
Total Liabilities & Equity	$ 389	$ 17,522	$ 9,609	$ 15,066

	31-Mar-20 FY2020A	31-Mar-21 FY2021A	31-Mar-22 FY 2022E	31-Mar-23 FY 2023E
Net Income	(9,604)	(40,755)	(15,016)	(11,794)
D&A	77	103	282	728
Stock Comp.	4,496	14,126	6,000	6,000
Other	2,270	21,232	0	0
Working Capital	1,717	(1,290)	218	(802)
Operating CF	$ (1,044)	$ (6,584)	$ (8,516)	$ (5,868)
CapEx	(27)	(159)	(941)	(6,883)
Other	0	(1,475)	0	0
Investing Activities	$ (27)	$ (1,634)	$ (941)	$ (6,883)
Equity	0	20,655	200	10,150
Debt	1,020	2,812	0	0
Financing	$ 1,020	$ 23,467	$ 200	$ 10,150
Change in Cash	$ (51)	$ 15,249	$ (9,257)	$ (2,601)

Source: Crown Electrokinetics Corp. and Dawson James Securities estimates

Important Disclosures:

Price Chart:



Price target and ratings changes over the past three years:
Initiated – Buy – August 3, 2021 – Price Target $8.50

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Although the statements in this report have been obtained from and are based upon recognized statistical services, issuer reports or communications, or other sources that the Firm believes to be reliable, we cannot guarantee their accuracy. All opinions and estimates included in this report constitute the analyst's judgment as of the date of this report and are subject to change without notice.

Information about valuation methods and risks can be found in the "Valuation" and "Risk Analysis" sections of this report.

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Ratings Definitions:

1) **Buy**: the analyst believes the price of the stock will appreciate and produce a total return of at least 20% over the next 12-18 months;
2) **Neutral**: the analyst believes the price of the stock is fairly valued for the next 12-18 months;
3) **Sell**: the analyst believes the price of the stock will decline by at least 20% over the next 12-18 months and should be sold.

The following chart reflects the range of current research report ratings for all companies, followed by the analysts of the Firm. The chart also reflects the research report ratings relating to those companies for which the Firm has performed investment banking services.

As of: 28-Jul-21

	Company Coverage		Investment Banking	
Ratings Distribution	# of Companies	% of Total	# of Companies	% of Totals
Market Outperform (Buy)	24	71%	4	17%
Market Perform (Neutral)	10	29%	0	0%
Market Underperform (Sell)	0	0%	0	0%
Total	34	100%	4	12%

Analyst Certification:

The analyst(s) whose name appears on this research report certifies that 1) all of the views expressed in this report accurately reflect his (their) personal views about any and all of the subject securities or issuers discussed; and 2) no part of the research analyst's compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst in this research report; and 3) all Dawson James employees, including the analyst(s) responsible for preparing this research report, may be eligible to receive non-product or service-specific monetary bonus compensation that is based upon various factors, including total revenues of Dawson James and its affiliates as well as a portion of the proceeds from a broad pool of investment vehicles consisting of components of the compensation generated by investment banking activities, including but not limited to shares of stock and/or warrants, which may or may not include the securities referenced in this report.