EDISON

Pixium Vision

Clinical outlook

Restoring eyesight in advanced dry-AMD

Healthcare equipment & services

Pixium Vision is developing Prima 2, a potentially breakthrough wireless bionic vision system (BVS) that generates electrical impulses at the retinal bipolar cell level to restore a form of central visual perception. It is on track to file to start a pivotal study in H220 for the treatment of advanced dry age-related macular degeneration (dry-AMD) involving geographic atrophy (GA). We obtain an enterprise value valuation of €105.9m, vs €98.0m previously. A rights offering is underway, expiring in July, which could raise €7.8m and increase the number of shares outstanding by 57.7%.

Year end	Revenue (€m)	PBT* (€m)	EPS* (€)	DPS (€)	P/E (x)	Yield (%)
12/18	1.6	(7.7)	(0.42)	0.0	N/A	N/A
12/19	1.8	(9.8)	(0.44)	0.0	N/A	N/A
12/20e	1.7	(8.1)	(0.30)	0.0	N/A	N/A
12/21e	1.6	(11.7)	(0.42)	0.0	N/A	N/A

Note: *PBT and EPS are normalised, excluding amortisation of acquired intangibles, exceptional items and share-based payments.

Prima 2 can provide benefit in severe dry-AMD cases

Prima seeks to address a largely unmet market indication, advanced dry-AMD involving GA. The 18-month data from the European feasibility study suggest the Prima 2 system, enhanced with second-generation augmented reality (AR) glasses and improved analytics, can provide between three and seven lines of improvement on the Landolt visual acuity (VA) scale. This could make the difference in being able to read a street sign or not. We estimate Prima 2 could potentially provide benefit in a target GA market subset estimated at about 64,000 patients in Europe and 50,500 in the US. The product may potentially enable the recognition of shapes and symbols in patients who may not have been able to identify them before the implantation, and aiding in task completion. Evidence of functional benefit may support reimbursement discussions if the product obtains regulatory approval.

Pivotal study expected to start in H121

Pixium intends to file a regulatory submission in H220 with at least the European regulators, for approval to start a pivotal study (called PRIMAvera). Due to the current COVID-19 pandemic and the potential vulnerability of the targeted demographic group, we do not expect the trial to start until H121. We forecast that EU commercialisation may occur in H223 and US market registration may follow in H225. However, US launch could occur sooner if the FDA accepts the PRIMAvera pivotal study protocol and would permit inclusion of US centres in the same trial.

Valuation: €105.9m rNPV

After rolling forward our estimates and adjusting FX, we determine a risk-adjusted NPV of €105.9m, up from €98m previously. We believe Pixium's cash on hand prior to the rights offering (€8.2m gross H120e cash) should be sufficient for it to maintain its operations into Q221. We model that Pixium will raise €45m in debt between H220 through FY23 to fund Prima development. The current rights offering (75% committed), if fully subscribed, would raise €7.8m (and increase shares outstanding by 57.7%), fulfil part of our projected funding need and extend the cash runway into Q421.

22 June 2020

Price	**€0.64**
Market cap	**€17m**
Gross cash (€m) at 31 March 2020	4.8
Shares in issue	27.0m
Free float	49%
Code	PIX
Primary exchange	Euronext Paris
Secondary exchange	N/A

Share price performance

%	1m	3m	12m
Abs	(2.5)	15.6	(49.5)
Rel (local)	(12.4)	(10.4)	(44.0)
52-week high/low		€1.35	€0.47

Business description

Pixium Vision develops bionic vision systems for patients with severe vision loss. Its lead product, Prima, is a wireless sub-retinal implant system designed for dry-AMD. The firm completed five implantations in an EU feasibility study and recently started a US feasibility study.

Next events

File application to start pivotal study	H220
36-month data from EU feasibility study	Q121

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Investment summary

Company description: Restoring sight to dry-AMD patients

Pixium Vision was founded in France in 2011 and initially raised €24.3m in venture funding. It then raised €39.5m in its IPO in 2014. The firm purchased Iris epi-retinal implant assets from Intelligent Medical Implants in 2012 for €11m, but since shifted its focus to a more advanced sub-retinal implant, Prima, which was developed in conjunction with Stanford University for which the company has a worldwide licence for all markets and indications. The wireless Prima platform is theoretically capable of approaching facial recognition levels of VA and as such is being advanced for the much larger and currently unmet market need of patients with severe vision loss from advanced dry-AMD involving GA. Positive 18-month data from an EU feasibility study was reported in March 2020, and the firm plans to file for the approval of the PRIMAvera pivotal study programme in H220.

Valuation: Pipeline rNPV of €105.9m

We value Pixium using an rNPV approach, applying a 12.5% cost of capital. Our valuation is based on the Prima opportunity in advanced dry-AMD involving GA, in the EU and US geographies. We apply a 20% probability of success estimate for Prima 2 (which embeds both regulatory risk and the risk of obtaining satisfactory reimbursement coverage to meet our market penetration forecasts). After rolling forward our estimates and adjusting forex assumptions for US sales, we now obtain a pipeline rNPV (enterprise value) of €105.9m, up from €98.0m, previously. After including €0.8m estimated H120 net cash (which excludes any proceeds from the rights offering), we obtain an equity valuation of €106.7m, or €3.95 per share (compared to €3.85 previously).

Financials: Rights offering underway to fund into Q421

We believe that Pixium's gross funds on hand (€4.8m as of 31 March; H120e estimated to rise to €8.2m partly due to €3.75m in bond issuances announced in Q220) should enable it to maintain its operations and fund its Prima strategy into Q221. As we expect a pivotal study to start in H121, we expect the burn rate to then increase and we model that Pixium will raise €45m in illustrative debt financing between 30 June 2020 and year-end FY23, to bring Prima to commercial launch (expected in H223). In June 2020, Pixium announced a rights offering initiative (expiring in early July) that we believe can fulfil part of the funding need. If fully subscribed, the offering would raise gross proceeds of €7.8m, which we expect would extend Pixium's cash runway into Q421, but would increase the number of shares outstanding by 15.6m (57.7%).

Sensitivities: Regulatory, commercial and funding

Meaningful development risk remains with Prima as it has only been implanted in a small number of patients to date, and in vivo longevity will need to be confirmed over time in the larger pivotal study programme. Further, the visual improvements offered must be sufficient to persuade patients and insurers to cover the implant and be competitive vs potential emerging alternatives. The EU feasibility study showed the device can add up to seven lines of VA and enable recognition of shapes and symbols in patients who previously had no light perception in the treated eye; such functional benefit may support discussions for obtaining reimbursement coverage upon approval. Pixium will also depend on maintaining access to additional capital to fund Prima development. While our model accounts for these financings as long-term debt, the firm may have difficulties raising funds or need to issue equity instead, and there is a potential risk that pricing is not favourable for current shareholders, which would lead to significant dilution. The current rights offering could dilute the ownership stake of non-participating investors.

Company description: Bionic vision system

Pixium Vision is a French medical device company, which is advancing a clinical-stage retinal implant, or BVS, that aims to provide a new form of vision to those with profound vision loss attributable to retinal diseases. These diseases permanently damage photoreceptor cells and impair their ability to translate visual stimuli into electrical signals transmittable into the optic nerve. The BVS combines an implanted chip, external AR glasses and a separate handheld pocket computer, and intends to replace the signal processing functions of damaged photoreceptors by electrically stimulating other healthy retinal cells. These cells would then transmit the information towards the brain via the optic nerve.

Having brought its initial BVS, the Iris II epi-retinal[1] implant, to CE mark commercial stage in 2016, with market access innovation reimbursement in Germany and France, Pixium has been focusing its efforts on a more advanced sub-retinal system, Prima BVS. Prima is a tiny wireless sub-retinal chip powered by near-infrared light, which delivers the electrical impulses at a more upstream level in retinal signal processing than epi-retinal devices, allowing a more natural neural network mediation of the information. This could potentially provide superior VA while involving a less invasive and time-consuming surgical technique. These attributes make it more suitable for the advanced dry-AMD market, a substantially larger opportunity than the retinitis pigmentosa (RP) market targeted by Iris II, and currently without a proven treatment.

Following positive six and 12-month results from the five-patient European feasibility study (PRIMA-FS), Pixium refined the system's AR glasses and image processing analytics/pocket computer, and patients in the trial were transitioned to the new second-generation system, termed Prima 2. 18-month data using Prima 2 showed measurable improvements in VA, and Pixium is now planning to file applications in H220 to commence the PRIMAvera pivotal study programme. We expect the first implantations could occur in H121, which, in our view, could support a potential EU market approval and launch in H223. While we model a separate US pivotal trial with US registration in H225, the US launch could occur sooner if the FDA accepts the PRIMAvera pivotal study protocol thus permitting inclusion of US centres in that same (PRIMAvera) trial.

Prosthetic vision platform targeting the AMD market

The Prima 2 platform is an integrated prosthetic visual system comprising an implant chip, AR glasses, and an external pocket computer that processes the image data captured by the glasses before it is transferred wirelessly (by the AR glasses) to the implanted chip. The core element is a miniaturised photovoltaic wireless sub-retinal implant that is implanted underneath the retina in a surgical procedure that may take less than 90 minutes under local anaesthesia. The current Prima chip iteration under human clinical development is a 2mm × 2mm wireless chip (with 30 micron thickness) consisting of 378 electrodes (pixels) in total. Each photovoltaic pixel is independently controlled and self-powered by near-infrared light projected from the AR glasses worn by the patient (the glasses consist of a camera and digital mirror projector, which emit a near infrared light pattern through the patient's eye carrying the Prima implant, designed to be processed by the Prima pixels).

Located underneath the retina, the pixels embedded on the device aim to stimulate the patient's bipolar cells, which are located mid-stream in physiological visual signal processing. In normal visual function, photoreceptor cells (located on the outer portion of the retina, or closer to the choroid) send information to bipolar cells (located within the retina), which then relay information into retinal ganglion cells (RGCs, which are on the inner portion of the retina), and onto the brain through the optic nerve. The Prima 2 system is designed to restore the function of individuals

1 Located at the surface of the retina.

whose retinal photoreceptors have been damaged by retinal disease such as severe GA associated with dry-AMD.

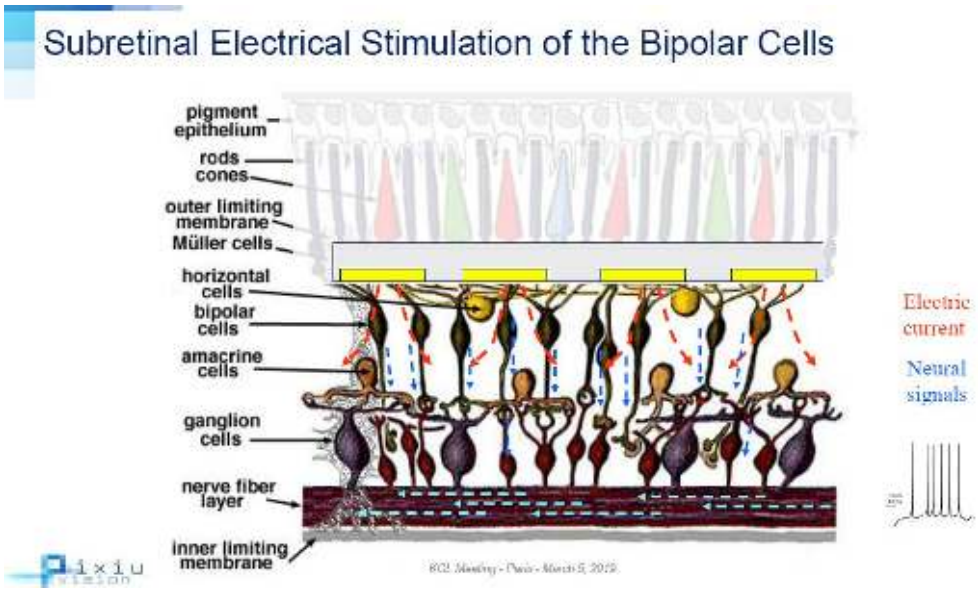
Exhibit 1: Diagram of Prima including camera integrated into specialised glasses

Source: Pixium Vision presentation

Fully wireless chip enables optimal sub-retinal placement

While epi-retinal implants (Pixium's Iris II and Second Sight's Argus II) reached commercial stages for advanced RP, a rare blinding disease, a sub-retinal wireless chip such as that within Prima 2 can provide potential benefits such as a less invasive surgical approach. While the existing epi-retinal implants stimulate RGCs, the more biomimetic sub-retinal approach applied by Prima 2 enables a more upstream level of interfacing in vision processing (by aiming to stimulate bipolar cells in the visual pathway). This can potentially lead to improved vision and helps enable a wireless implant solution (thereby reducing surgical complexity), as explained below.

Exhibit 2: Location of sub-retinal implant and intended communication with bipolar cell layer



Source: Pixium Vision

Prima 2 aims for a more physiological neural network mediation or natural image signal processing. By intending to stimulate first the bipolar cells (as opposed to RGCs), the implanted chip leverages

the retina's existing intrinsic physiological pathways, as bipolar cells require lower electric neural activation thresholds to elicit a perceptual response (compared to RGCs). The implant's proximity to the bipolar cell network and the independent electrical circuit design of each pixel are designed to enable precise control of the emitted electrical signals. As Prima is powered with near-infrared light, it does not require permanent trans-scleral wires or cables (as needed by the wired epi-retinal implant designs such as Iris II and Argus II). Prima 2's fully wireless approach aims to ensure a less invasive surgical procedure, while also mitigating the risk of potential long-term complications that can result from permanent scleral openings (a potential risk with wired epi-retinal implant designs). Altogether, the surgical procedure to implant the Prima device into the human eye should likely take under two hours.

Prima requires clear optical media to function effectively, so patients with significant central corneal scarring may be contraindicated (and cataracts would need to be removed prior to implantation).

Improved resolution opens door to larger dry-AMD market

Prima 2 is intended to deliver VA superior to what can be achieved with epi-retinal implants (eg Argus II). This level could be sufficient to provide meaningful improvements and justify implantations in patients in late stages of dry-AMD, such as those with retinal scarring or GA reducing best-corrected VA in each eye to below 20/400 (5% of normal vision[2]). For instance, the Prima 2 system can enable the recognition of symbols, letters and objects in patients who have lost the capacity to recognise those forms due to the severity of their disease; this can provide quality-of-life improvements for such patients. In the 18-month data of patients employing the second-generation AR glasses and pocket computer, effective device-assisted prosthetic VA was between LogMAR 0.5 (approximately 20/60, or c 33% of normal VA expected in healthy subjects) and LogMAR 0.69 (approximately 20/100, or c 20% of normal VA). This level of visual improvement, in our view, is considerably superior to that offered by the epi-retinal devices cited above, which generally only provide very crude vision (such as recognition of basic movements and illumination), with the theoretical limit of the Argus II being only four degrees (corresponding to about 0.4% of the resolution seen by healthy individuals). This restrained resolution generally limits that device's applicability to candidates with more profound (or near-total) central and peripheral vision loss, such as advanced stages of rare retinal dystrophies (such as RP).

Preclinical studies demonstrated safety and stimulation

Animal model thermal[3] and electrical safety studies completed in 2016 successfully showed that the system meets the safety thresholds for thermal and electrical safety requirements for the eye. Pixium also presented data[4] in autumn 2017 where it had implanted a Prima prototype in 11 cat eyes, six pig eyes and 19 monkey eyes. Visual evoked potentials in the cortex (brain) of the animals demonstrated that they perceived a visual stimulus when the Prima was illuminated with pulsed near infrared light. After three months in vivo, the implant showed no degradation and after euthanasia, histology analysis showed no degradation or damage to bipolar or ganglion cells in treated animals compared to the control group.

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[2] Patients with such severe visual impairment would generally not be capable of working in their prior occupations at comparable levels of productivity. They generally cannot read or write easily, even with the use specialised magnification devices. In many cases, patients with this level of central vision loss may also require living assistance for day-to-day tasks.

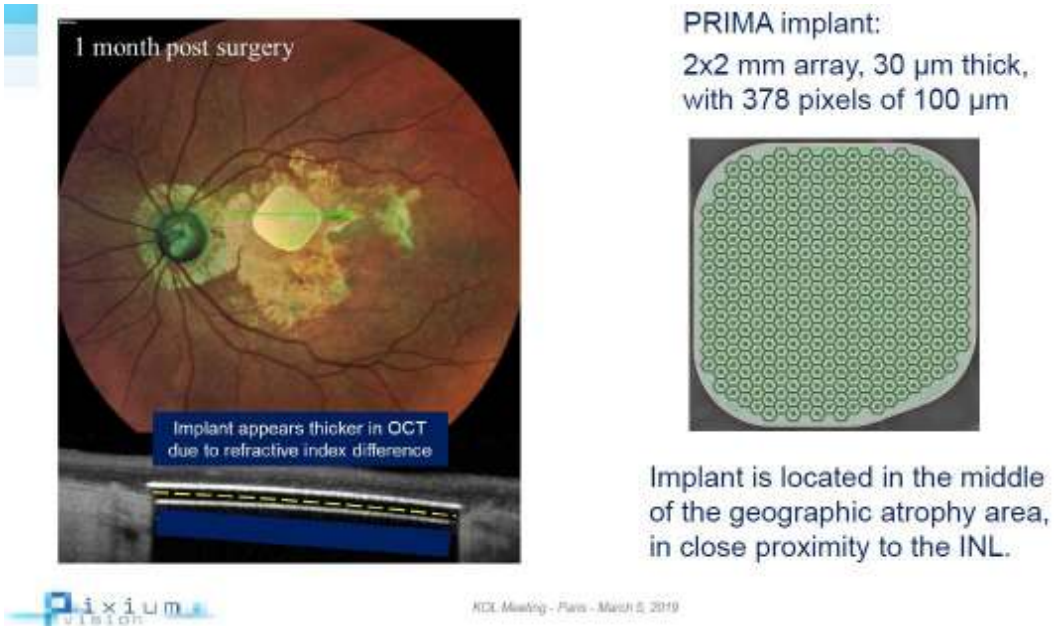
[3] Lorach H, Wang J, Lee DY, et al. *Biomed Opt Express*. 2015 Dec 4;7(1):13–21. doi: 10.1364/BOE.7.000013.

[4] Le Mer Y, Picaud S, Hubschman J, et al. Surgical and First Behavioral Test Results from the Sub-Retinal PRIMA Wireless chip implantations. Presented at TEATC conference 2017.

EU feasibility data shows safety and vision improvements

In late 2017, Pixium started the five-patient, single-site,[5] 36-month European feasibility study (PRIMA-FS) for the initial clinical-stage iteration of the Prima system in patients with advanced dry-AMD whereby none of the patients had remaining central visual activity at the time of enrolment in the study eye. In Q318, Pixium completed the fifth implantation, and then reported that all five implantations in the EU study resulted in successful consecutive activations and light perception, including the perception of white-yellow patterns with adjustable brightness, in areas where no central vision remained prior to implantation. Following activation, all patients proceeded to the visual re-education stage of the study, implemented as per study protocol, which is intended to assist patients in interpreting the new light perception patterns emitted by Prima.

Exhibit 3: Schematic of 378-pixel Prima and implantation into retina, at one-month post surgery



Source: Pixium Vision presentation

In January 2019, Pixium announced that Prima successfully met the endpoints of the five-patient EU feasibility study at interim six months follow-up after implantation, as all five implantations resulted in successful activations and light perception in areas where no central vision remained prior to implantation. Most patients were able to identify different visual patterns, symbols or letter sequences, and recognition speed improved throughout the post-implantation rehabilitation phase. The data showed that the Prima device can interface with retinal cells to restore some visual perception in an area where vision had been lost due to prolonged degenerative disease.

Pixium reported in July 2019 positive 12-month data from the study, which was consistent with the interim six-month results reported in January. Safety measures suggested the implant is stable and well-tolerated, as there were no device-related serious adverse events.

Prima 2 system improvements confirmed with 18-month data

Following the first Prima implantations, Pixium had worked on refining the system to improve functionality/usability and enable it to allow patients to combine both prosthetic and natural residual (ie peripheral) vision, as the initial-generation glasses were opaque. The Prima 2 system employs the same (current-generation) 378-electrode implant chip, but employs an enhanced second-

[5] All surgical implantations at the EU feasibility study took place at the Fondation Ophtalmologique A de Rothschild/Hopital des Quinze Vingts, based in Paris, France.

generation and transparent version of the AR glasses, and a new pocket computer employing improved algorithms, designed to incorporate more advanced image processing, magnification and artificial intelligence features to enhance the functional visual experience of patients.

In mid-2019 Pixium amended the PRIMA-FS study to enable the patients (already enrolled and implanted with the 378-electrode chip) to transition towards use of the second-generation Prima 2 glasses and pocket computer instead of the initial-generation components. On 31 March 2020, the company reported 18-month data on four of the five EU patients implanted in PRIMA-FS (one of the five patients implanted has passed away due to health reasons completely unrelated to Prima implantation or usage), showing several promising aspects from this transition. There were no indications of any ocular health or tolerability issues. More importantly, use of the new Prima 2 visual system components has led to some measurable improvements in VA, in part due to some of the features of the external device components, which include improved magnification capabilities.

With the Prima 2 system activated, they reported between three and seven lines of improvement on the VA scale using the Landolt C optotype (the type of figures or symbols used to measure VA), compared to baseline. Effective device-assisted prosthetic VA for the four subjects was between LogMAR 0.5 (approximately 20/60, or c 33% of normal VA expected in healthy subjects) and LogMAR 0.69 (approximately 20/100, or c 20% of normal VA). Each 0.1 increment on the LogMAR scale represents the next lower VA line of the VA chart (ie the higher the LogMAR value, the lower the effective VA). Altogether, these measures are markedly superior to the baseline results, even given that they were assisted to a degree by the device's magnification features.

Exhibit 4: Landolt C optotype

Source: Wikimedia commons; attribution to Visuoloog/CC BY-SA

Baseline VA was measured on the implanted eye shortly after surgery but without activation of the Prima system's glasses or pocket computer (and hence, the Prima system was inactive); baseline VA is expected to be very comparable to pre-implantation VA. We note that the study's inclusion criteria required entry VA in the implanted eye to be no better than LogMAR 1.3 (20/400 on Snellen scale, or 5% of normal VA). Baseline VA among the four subjects was between LogMAR 1.3 and LogMAR 1.4 (approximately 20/500, or c 4% of normal VA).

Even if part of the improvement in VA versus baseline is due to the Prima 2 external devices' magnification capabilities, these results nonetheless represent significant improvements in the ability of the patients to resolve visual details. Further, we are reassured that there is no degradation in Prima prosthetic visual performance between months 12 and 18 (and management indicates that this remains the case in some early 24-month data), as there had been some speculation that advanced dry-AMD (which attacks and damages photoreceptor cells in the retina) could eventually provoke atrophic damage to the RGCs (that the Prima system relies upon for providing the patient's prosthetic vision).

We note that assessments of the device's ability to provide improvements in functional tasks (ie whether the device assists patients in accomplishing day-to-day activities such as locating items,

identifying details or maintaining independence) will be very useful for both regulators and potential insurers, and we believe the company hopes to provide some functional use or quality-of-life (QoL) measures in the 36-month data, anticipated by early 2021).

US feasibility study underway but paused due to COVID-19

In parallel with this EU feasibility study, Pixium started a five-patient US feasibility study (PRIMA-FS-US) using the Prima 2 system in patients with advanced dry-AMD with geographic atrophy, conducted at the University of Pittsburgh Medical Center and at Bascom Palmer Eye Institute (Miami, Florida). The study's primary endpoint will be the elicitation of visual perception of the Prima device, while secondary endpoints will include VA, measured by methods such as the Early Treatment Diabetic Retinopathy Study and Freiburg Visual Acuity & Contrast Test scales. In January 2020, Pixium Vision announced the first implantation of the Prima system in the US, which is also the first procedure to use Pixium's new proprietary surgical delivery system (described above) designed to greatly improve the ease of implantation and result in a safer and less invasive procedure. To date, two US patients have been implanted but in light of the COVID-19 pandemic stretching healthcare resources globally and the need for organisations to protect workers and patients, Pixium decided to postpone further implantations until the risks associated with the pandemic have sufficiently abated.

PRIMAvera pivotal study filing expected in H220

Pixium intends to file a regulatory submission in H220 at least with European regulators for approval to start a pivotal study (PRIMAvera). While this is dependent on variables and factors such as sample size, in general, we anticipate that to demonstrate statistical significance in the pivotal trial and obtain regulatory approval, the Prima 2 system should show at least two lines of VA improvement versus baseline (assuming a study size of over 30–35) in addition to showing safety. We are encouraged that in PRIMA-FS, where patients were required to have a very advanced degree of geographic atrophy to be admissible[6], the 18-month data have shown three to seven lines of improvement versus baseline. We believe this level of VA amelioration can potentially allow the company to propose somewhat less restrictive inclusion criteria in terms of dry-AMD disease severity at baseline for the upcoming PRIMAvera pivotal study, while maintaining a sufficient buffer to allow it to demonstrate statistical significance. Relaxing the dry-AMD baseline severity criteria should facilitate patient recruitment and may lead to earlier study data.

The timing for initial implantations will depend on the progress, resolution or mitigation of the COVID-19 pandemic. It is unclear whether regulatory agencies' administrative resources will be positioned to respond and process the PRIMAvera dossier in a timely fashion and whether individual study centres' institutional review boards would promptly provide clearance (given COVID-19 effects and these organisations' other prioritisations). Hence, we do not expect initial implantations to begin until 2021.

Considerations on a harmonised US and EU registration trial

The regulatory pathway for a European CE mark approval is typically shorter than in the US, as CE mark registration typically has less onerous requirements for the demonstration of clinical efficacy or effectiveness than the premarket approval (PMA) process required by the FDA for Class III medical devices (what Prima would be classified as). Nonetheless, Pixium's preferred objective would be to harmonise study design requirements between the FDA and European regulators so it can potentially combine data and facilities from Europe and the US into a single unified pivotal trial that would satisfy registration requirements in both territories. Discussions with both the FDA and

[6] The inclusion criteria for PRIMA-FS required LogMAR 1.3 or worse VA, along with no foveal visual perception in the study eye.

European regulatory authorities are ongoing for this objective. In a scenario where a single pivotal study would be accepted by both regulators, we expect the initial implantations would occur in Europe (with US implantations starting several months later), leading to an earlier market approval in the region. European sites are expected to include centres in France, the UK, Italy and Spain.

However, given the PRIMA-FS-US study is on hold (due to COVID-19) and the FDA may prefer to have more clinical data before approving a PMA registration-enabling study pathway, our base case continues to assume European and US pivotal studies will be separate and European market registration and launch will occur earlier than US approval. We await further clarity on the US registration process over the coming months before revising our assumptions.

Our base case assumes the EU pivotal study (PRIMAvera) will start in H121, may require 40–50 patients and will require 12 months of follow-up safety and efficacy data for European regulators to provide CE mark approval. We continue to estimate that 12-month data from the EU pivotal study will be available in H222 or early 2023, leading to potential EU commercialisation (CE mark approval) in H223. We model that a separate US pivotal study will start implantations in H122. We expect that CE mark clearance (and EU launch) would occur approximately 18–24 months earlier than US PMA and launch, which we forecast will in H225.

Exhibit 5: Projected registration pathways for EU and US

	EU registration pathway	US registration pathway
Registration category	CE mark	PMA
Pivotal study size	40–50 patients	60–80 patients
Estimated initial enrolment	H121	H122
Projected minimum duration needed for approval	12 months of follow-up data	18–24 months of follow-up data
Estimated study completion	H222 or H123	H224 or H125
Projected market launch	H223	H225

Source: Edison Investment Research

Follow-on implants could have higher pixel densities

The current Prima chip iteration in clinical trials (378 electrodes) uses electrodes (or pixels) that are each approximately 100 microns (0.1mm) long, but the company and its research partners at Stanford University have been researching higher-density chips that use smaller individual electrodes, can hold higher electrode/pixel densities and can theoretically provide higher visual resolution when implanted in patients. While the second-generation AR glasses and pocket computer analytics appear to provide functional improvements compared to their predecessors (based on the 18-month data described above), more substantive or pronounced improvements in VA may require an implant chip with (much) higher electrode densities. A higher level of VA could potentially extend the market reach of Prima technology to patients with less severe forms of atrophic AMD, as the current 378-electrode iteration appears to be only appropriate for those who already have severe forms of geographic atrophy (and incoming VA of under 5% or 20/400).

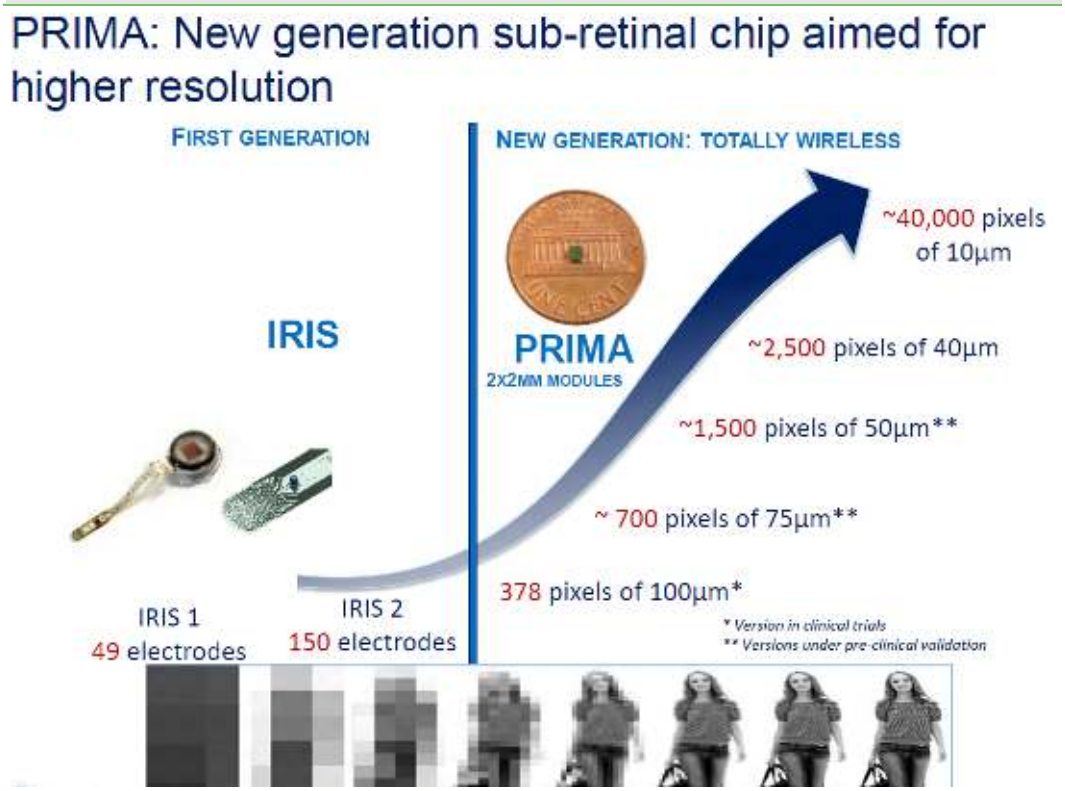
Using the manufacturing process used for Prima, it may be possible to reduce the individual electrode size down to 50 or 70 microns, whereas using even smaller electrode sizes (such as 10 microns, which would result in up to 40,000 pixels for a 2mm × 2mm chip) would require a different manufacturing process (what the company refers to as honeycomb arrays). Pixium's strategy is to bring the current 378-pixel Prima to market then work on a follow-on iteration carrying much higher pixel densities. Using 20-micron honeycomb pixels, approximately 10,000 pixels can theoretically exist in a 2mm × 2mm chip array, which can theoretically provide raw (unassisted by magnification) VA of 20/100 or even superior (greater than 20% of normal VA).

However, using higher-density Prima chips may entail some added risk, as the activation energy thresholds required to the device to function (as emitted through the pulsed near-IR light projected by the specialised AR glasses worn by the patient) will increase, given the need to stimulate a

significantly increased amount of electrodes in the implant. Furthermore, even if a Prima device can theoretically emit signals corresponding to a higher level of resolution, the ability of the patient to resolve such fine details will depend on many factors, including the precision in the communication between the Prima chip and the external projection transmitted by the glasses worn by the patient; and the efficacy and precision of communication and interfacing between retinal cells and the electrical signals emitted by the Prima chip. Hence, it is not assured that a higher-density Prima chip would necessarily provide meaningfully improved vision to the patient. At this point, our models and forecasts only consider the implications and market opportunities for the current (initial-generation) 378-electrode Prima device.

We expect the current iteration of the Prima implant chip (378-electrode count) to remain unchanged until the firm receives an initial market approval. Once the Prima system receives market approval or clearance, we expect the company will then investigate human trials using higher-density Prima chips, which can theoretically provide higher visual resolution when implanted in patients and potentially expand the target market.

Exhibit 6: Scalable nature of Prima technology



Source: Pixium Vision presentation

Competitive analysis

Although we are hopeful that one or more drug or biological treatments for dry-AMD or GA-AMD will show efficacy and reach commercialisation (promising late-stage candidates include Allegro Ophthalmics' risuteganib, Iveric Bio's avacincaptad pegol, and Apellis Pharmaceuticals' pegcetacoplan) and potentially decelerate the progression of the disease in many patients, we believe such therapies will not materially impact the market potential for Prima 2, as the device is aimed at restoring vision in patients who have already had experienced severe vision loss from GA-AMD related photoreceptor damage whereas drug/biological treatments generally aim to prevent such damage (and even in the best scenarios, would not be expected to prevent all treated patients

from reaching 20/400 or worse vision levels). Hence, Prima 2's primary competition will be with other implants or restorative devices on the market or in development

Second Sight

Second Sight's Argus II is the only FDA-approved retinal implant, although it was approved only for the RP indication. Uptake to date has been limited, as despite its presence on the market since 2011 in Europe (with US approval occurring in 2013), only 28 implants ($3.4m in revenue was recognised) were sold worldwide in 2019 (vs 69 in 2018 and 75 in 2017). We believe the limited level of vision provided by the 60-electrode epi-retinal implant device (patients may still require mobility assistance) could help explain the limited uptake and Second Sight has transitioned its emphasis away from the Argus II and had since been prioritising its Orion Visual Cortical Prosthesis system (Orion), described below. In March 2020 it announced a plan to wind down operations, but other options and/or partnerships to develop the technology have subsequently been explored, given a recent $7.5m financing.

Retina Implant

Retina Implant was a private German company developing a sub-retinal implant limited for the RP indication. Alpha IMS earned a CE mark in 2013 and a follow-on product, Alpha AMS, received CE mark clearance in 2016. Alpha AMS intended to replace the functionality of degenerated photoreceptors by stimulating other retinal cells and its core chip measured 3.2mm × 4 mm and was equipped with 1,600 photodiodes (which convert the incident light into an electrical signal). Unlike Prima, the Alpha AMS relied on external cabling to provide power to the device and patients were required to have a conducting cable implanted through a section of the ocular globe, as well as a receptor implanted behind the ear in the cranial bone. These steps resulted in the need for two separate surgeries to implant the device, which is considerably more involved and time consuming than that required for Prima. At an extraordinary meeting on 19 March 2019, the shareholders of Retina Implant resolved to dissolve the company.

Nano Retina

Nano Retina is an Israel-based firm developing a miniature chip retinal implant, NR600, which is in preclinical development. The company claims the product can be implanted using a minimally invasive surgical procedure in under one hour. Like Prima, the product would be self-powered, as its energy needs are met by photovoltaic elements generating operating voltage from infrared laser light delivered by the Nano Retina eyeglasses worn by the patient. The device candidate may support implantations at the epi-retinal and/or sub-retinal level and we believe it is being designed to stimulate bipolar cells (similar to Prima).

Bionic Vision Technologies

Bionic Vision Technologies (BVT) is an Australia-based firm developing a visual implant (the Bionic Eye System) and has prioritised its initial emphasis on RP. The Bionic Eye System consists of a wearable device and a visual implant that translates images from a camera mounted on an eyeglass frame into electrical signals designed to stimulate the optic nerve via electrodes. Rather than sit in the epiretinal or subretinal space, this implant is positioned in the suprachoroidal space (between the choroid and the sclera), which the firm believes would reduce the risk of damage to the retina. Since 2012, seven RP patients have received the BVT Bionic Eye suprachoroidal implant in Australia, with four implanted with a second-generation fully implantable version of the device (ie not reliant on non-implantable percutaneous connectors) in a two-year pilot study. In early 2020, the firm reported interim 44-week results showing improvements in functional measures such as obstacle avoidance and object localisation and no device-related serious adverse events were reported. BVT is now developing a third-generation system designed to incorporate new

software algorithms and use a more portable and lighter external wearable device and it intends to initiate a worldwide clinical trial for this third-generation system.

iBionics

Based in Ottawa and founded in 2015, iBionics is designing an epi-retinal implant that stimulates the retina via diamond electrodes. The current iteration has 256 electrodes, with the possibility of increasing up to 1,024. The firm believes a 1,024-pixel version could enable patients to recognise faces, read and navigate their environment freely. Human trials could potentially start in 2021 or 2022.

Other competing technologies

Alternate therapies (beyond electronic implants) are being developed to restore sight in patients with retinal diseases that, if successful, could compete with Prima 2. These include:

- **Retinal transplantation or cell therapy** (ie transplantation of retinal cells or of immature retinal stem cells). This line of development is very premature and speculative with limited human data so far, but there have been reports of vision loss in some experimental treatments on AMD patients.[7] Reneuron is undertaking a US Phase I/IIa clinical trial of its proprietary human retinal progenitor stem cell therapy (delivered via a single, subretinal injection) in advanced RP, with the aim of potentially preserving existing photoreceptors, potentially halting further vision loss. In February 2020, the company reported interim data, discussed further here, showing mean improvements in VA of 15.7 letters (n=6) at six months, 16.5 letters at nine months (n=4), and 14.3 letters at 12 months (n=3), with a positive safety profile. The study is ongoing, the company expects to report further data this year and plans to seek approval in H221 to start a pivotal study. If successful in RP, it could be possible for a form of this technology to be considered for treating AMD.
- **Optic nerve implantation.** Moving further along the visual pathway, some research groups are developing electrode arrays designed to directly stimulate RGCs at the optic nerve level. The developments are still at early/preclinical stages, but notably, researchers from Ecole Polytechnique Fédérale de Lausanne in Switzerland and Scuola Superiore Sant'Anna in Italy in 2019 developed an intraneural 12-electrode array (OpticSELINE) that it applied to deliver electrical current to the optic nerves of anaesthetised rabbits. The researchers were able to detect visual cortex responses in response to stimulation of the electrodes. The group estimates a human electrode array could potentially consist of up to 60 electrodes, which would not appear to provide the same resolution potential as the current Prima 2 system but we believe the potential use would be more directed towards optic nerve diseases and thus not a direct competitor to Prima 2.
- **Neurological visual cortex stimulation**. Second Sight is developing a follow-on product (Orion) that stimulates the visual cortex of the brain rather than the retina. By bypassing the optic nerve, Orion could help patients with diseased optic nerves (eg glaucoma, optic neuropathy etc). The firm began a six-subject Orion human feasibility study in January 2018 under the FDA's Breakthrough Devices Program and reported 12-month data on all subjects in 2019, which showed that for five of six subjects the device provided functional benefit using the firm's Functional Low-Vision Observer Rated Assessment measure. It is also evaluating the design of a pivotal trial and plans to reach consensus with the FDA on design specifics during 2020. In addition to Orion, the Monash Vision Group (based in Australia) is developing a cortical vision prosthesis (Gennaris) with up to 473 electrodes that is in preclinical development. Neurosurgery is more invasive than retinal surgery, so we estimate unless these systems (eg Orion or Gennaris) can provide better VA than Prima for retinal diseases, its

[7] Kuriyan AE, Albini TA, Townsend JH, et al. *N Engl J Med*. 2017 Mar 16;376(11):1047–1053.

potential use would likely be concentrated towards optic nerve diseases and thus it may not directly compete with Prima.

- **Optogenetics.** Optogenetics involves the transfer of a gene (gene therapy) encoding for a light-sensitive protein be applied to provoke neuronal cells to respond to light stimulation. GenSight Biologics's GS030 candidate uses this process to encode a photoactivatable channelrhodopsin protein, delivered via a modified AAV2 vector into the eye (through intravitreal injection). The intent is to confer a photoreceptive function to target functioning RGCs by enabling them to respond to light stimulation. A companion medical device is used (specialised biomimetic goggles) to deliver light at the proper intensity and wavelength to stimulate the transduced RGCs so they can transmit the visual signals to the brain. The firm started in October 2018 a Phase I/II study of GS030 at Moorfields Eye Hospital in London, UK, in 18 patients with RP. The firm provided a positive data safety monitoring board update in April 2020 but indicated that new patient recruitment was being delayed due to the COVID-19 pandemic (as the use of corticosteroids during the gene therapy injection could potentially increase COVID-19 susceptibility). Six patients treated to date were being monitored remotely and GenSight expects to complete enrolment in H220 and possibly provide some interim data before YE20. The company believes this technology can be applicable to RP and GA-AMD, or other diseases in which photoreceptors are lost while functioning RGCs remain.
- **Implantable telescope**. VisionCare Ophthalmic Technologies offers an FDA-approved implantable miniature telescope for AMD, providing 2.2–2.7 times magnification, but it does not improve the ability of the damaged retina to resolve details.
- **Alternate sensory reproduction**. Wicab's BrainPort Vision Pro is an oral electronic vision aid that provides electro-tactile stimulation by projecting an image recorded by a video camera mounted on a pair of sunglasses, on to a tongue array containing about 400 electrodes. White pixels from the camera provide a strong stimulation sense of feeling on the tongue, whereas black pixels provide no stimulation and grey levels provide moderate levels of stimulation. This device can offer functionality in profoundly blind patients with severely damaged optic nerve transmission.

Market opportunity for dry-AMD

AMD is the leading cause of blindness in adults over the age of 55 in western countries and is characterised by damage to the macular[8] region of the retina, leading to central vision loss. Prevalence increases with age, as about 2% of the population have the condition at age 40, rising to c 25% by age 80.[9] AMD patients generally maintain their peripheral vision but the damage to central vision can be so severe in advanced cases that it restricts a patient's ability to work, read, recognise faces or independently perform other habitual tasks.

Although the exact pathophysiology is not fully understood, AMD is believed to be caused by oxidative stress, mitochondrial dysfunction, inflammatory processes and/or cardiovascular (lipid-cholesterol pathway) factors. Genetic and environmental factors (such as smoking history or prolonged exposure to ultraviolet light) may also play a role in pathogenesis. There are two forms of AMD: dry (non-exudative) and wet (exudative).

[8] The macula is the central region of the retina, containing the highest density of photoreceptors compared to other regions, thus accounting for the high level of resolution and colour perception associated with the central vision. Photoreceptor cells in the retina absorb light photons, resulting in a biochemical reaction that leads to the generation of an electrical signal that stimulates downstream neurons (retinal ganglion cells) which then travel through the optic nerve and into the visual pathway leading to the occipital cortex of the brain.

[9] Friedman DS, O'Colmain BJ, Muñoz B, Tomany SC, McCarty C, de Jong PT, Nemesure B, Mitchell P, Kempen J, Eye Diseases Prevalence Research Group. *Arch Ophthalmol*. 2004 Apr; 122(4):564–72

- The dry form of AMD accounts for about 80–90% of cases (all AMD cases start as dry-AMD) and cellular atrophy is the primary cause of vision loss and photoreceptor damage in this form. This condition often evolves relatively slowly but has no proven treatment, although lifestyle factors and dietary or nutritional supplement changes may help decelerate progression. As the dry form of the condition advances, it can lead to GA, where there is irreversible scattered or confluent areas of degeneration of the retinal pigment epithelium (RPE) cells, damaging the overlying photoreceptors and resulting in a loss of visual function. Although some patients with GA may have near-normal VA levels, most will have reductions in contrast sensitivity at the least and in many cases, GA patients will have sharp reductions in VA (20/80, or 25% of normal vision, or lower). The 378-electrode Prima is intended for instances of dry-AMD where there is significant GA and VA below 5% acuity (20/400).
- The wet form (also called neovascular AMD, or NVAMD) is characterised by exudative and neovascular changes, such as the formation of choroidal neovascularisation (CNV). CNV refers to newly immature blood vessels from the eye's choroid layer growing into the overlying retina, which often leaks fluid, compromising the function of photoreceptors and connecting neurons, leading to central vision loss. The loss can be reversible if the excess fluid is eliminated in a timely manner, such as through the use of injection treatments to suppress vascular endothelial growth factor (VEGF), the current standard of care. However, without timely treatment, excess fluid can lead to macular scarring/fibrosis, damaging photoreceptors and resulting in more permanent central vision loss. NVAMD accounts for about 10–20% of AMD cases and is always preceded by the dry form. Prior to the usage of anti-VEGF injection treatments, NVAMD accounted for over 80% of AMD patients with legal blindness.[10]

Early-stage AMD is mostly asymptomatic and characterised by drusen (deposits below the RPE level), reticular pseudodrusen (deposits above the RPE) and pigmentary changes. Late-stage AMD is often defined as patients who develop NVAMD and/or GA. In general, RPE dysfunction and atrophy precedes the late stages of AMD (GA or CNV).

Globally, the prevalence of all stages of AMD in adults above age 45 is estimated at 8.0%,[11] affecting about 13 million people across Western Europe, and the US prevalence of all-stage AMD has been estimated at ranges between 7.2 million[12] and up to about 11 million.[13] Individuals with Caucasian or European ancestry are believed to be more prone to developing AMD. The prevalence of Caucasians in the US with NVAMD, GA, and late-AMD has been estimated at 1.1 million, 1.0 million and 2.0 million,[14] respectively. Based on US National Institutes of Health data[15] estimating that Caucasians account for 89% of all US AMD cases, we estimate the US prevalence of NVAMD, GA and late-AMD would be approximately 1.2 million, 1.1 million and 2.2 million, respectively. In Europe, it has been estimated the number of people with late-AMD was 2.7 million in 2013, which and that it will rise to 3.9m by 2040 (1.4% CAGR).[16] Given this, we estimate the prevalence of GA in Europe is approximately 1.4 million people.

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[10] Legal blindness refers to patients with a central VA of 20/200 (10%) or worse in the better eye when a patient is wearing their best-corrected prescription lenses, or those with a visual field of less than 20 degrees.

[11] Wong WL, Su X, Li X et al. *Lancet Glob Health*. 2014 Feb;2(2):e106–16.

[12] Klein R, Chou CF, Klein BEK, et al. *Arch Ophthalmol*. 2011;129(1):75–80. doi:10.1001/archophthalmol.2010.318

[13] Pennington KL, DeAngelis MM. *Eye Vis (Lond)*. 2016 Dec 22;3:34.

[14] Rudnicka AR, Kapetanakis VV, Jarrar Z et al. *Am J Ophthalmol*. 2015 Jul;160(1):85–93.e3. doi: 10.1016/j.ajo.2015.04.003. Epub 2015 Apr 6.

[15] US National Institutes of Health. https://nei.nih.gov/eyedata/amd Accessed 13 June 2020.

[16] Colijn JM, Buitendijk GHS, Prokofyeva E, et al. *Ophthalmology*. 2017 Dec;124(12):1753–1763. doi: 10.1016/j.ophtha.2017.05.035. Epub 2017 Jul 14.

Prima financial forecasts

As stated above, we estimate the prevalence of GA associated with dry-AMD would be approximately 1.1 million people in the US and approximately 1.4 million in Europe.

We continue to estimate the target population will be those GA patients with below 20/400 (5%) VA and we believe this would represent about 15% of GA patients. In other words, we estimate 15% of patients with GA would have sufficiently poor central vision to warrant potential consideration for Prima. Of these, we estimate that 30% would meet all remaining inclusion criteria and/or be suitable as potential responders (ie this assumes that many of the AMD patients are in poor general health and/or have concomitant eye diseases, such as glaucoma or poor optical media transparency, which would render them ineligible for Prima). Given the above, we now estimate the target eligible GA-AMD treatment population for the current Prima 2 system (with 378-electrode chip) to be currently about 64,000 in Europe and 50,500 in the US. Our peak market share forecasts (of the eligible treatment population) remain unchanged at 7% (peak share forecast in 2028 in Europe and 2030 in US). We continue to assume initial net per-implant EU Prima 2 pricing of €95,000, and initial US net pricing of c $157,000. Our financial forecasts are unchanged in local currency terms and are shown below.

Exhibit 7: Financial forecasts for Prima 2 system in dry-AMD

	2023e	2024e	2025e	2026e	2027e	2028e
Europe						
EU patients with dry AMD with GA (000)	1,471	1,486	1,501	1,516	1,531	1,546
Percentage with 20/400 or worse visual acuity	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Percentage meeting all Prima eligibility criteria	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
GA-AMD patients meeting all Prima eligibility criteria (000)	66.2	66.9	67.5	68.2	68.9	69.6
Prima unit sales in EU	93	1,004	1,814	3,070	4,278	4,853
Average revenue per treatment (€)	96,243	97,889	99,680	101,630	103,651	105,673
Total EU revenue (€000) for PRIMA-AMD	8,913	98,290	180,869	311,961	443,386	512,857
United States						
US patients with dry AMD with GA (000)	1,156	1,168	1,179	1,191	1,203	1,215
Percentage with 20/400 or worse visual acuity	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Percentage meeting all Prima eligibility criteria	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
GA-AMD patients meeting all Prima eligibility criteria (000)	52.0	52.5	53.1	53.6	54.1	54.7
Prima unit sales in US	-	-	74	730	1,756	2,813
Average revenue per treatment ($)	N/A	N/A	157,069	159,668	162,662	165,846
Total US revenue ($000) for PRIMA-AMD	-	-	11,659	116,514	285,706	466,527
Assumed $/€ rate	1.12	1.12	1.12	1.12	1.12	1.12
Worldwide total revenue (€000)	8,913	98,290	191,279	415,992	698,481	929,399

Source: Edison Investment Research

As stated earlier, we expect the implant chip iteration to be launched will be the current 378 electrode version. The firm's activities on substantially smaller electrode sizes (eg around 10 microns) carrying 10s of thousands of total electrodes are more likely to be explored for a potential follow-on product and are not included in our forecasts. In an ideal and optimal scenario, once the first Prima 2 commercial product iteration reaches the market, a next-generation implant chip carrying 10s of thousands of electrodes could theoretically deliver VA levels (without requiring additional magnification from the software/pocket computer) in the 25–50% range (20/80 to 20/40), which could make it potentially useable in a substantially larger segment of the dry-AMD population (than we expect for the current Prima 2 iteration).

Effects of COVID-19 on the operational outlook

With the COVID-19 pandemic stretching healthcare resources globally and the need for organisations to protect workers and patients, Pixium started to make operational changes in Q120 to contain expenditures while keeping the long-term investment thesis intact during this turbulent time. Many R&D activities involving lab work have been suspended and most Pixium employees are generally working through virtual means or from home. It has delayed payments of social charges, rents and temporary unemployment for its employees unable to work from home. In total we expect there will be effective cost savings of slightly above €1m for 2020 from these measures.

As stated above, Pixium postponed further implantations in its PRIMA-FS-US study as the target patient population is generally aged over 65 years old and is particularly susceptible to adverse health effects from COVID-19. Further mitigation or resolution of the pandemic is needed before US implantations will resume. On the European front, PRIMA-FS had a temporary hold in March to reduce demand on healthcare workers and institutions and avoid putting patients at risk. On 8 June 2018, Pixium announced that following the ease of the strain of COVID-19 on healthcare resources in France, the PRIMA-FS trial and further visual rehabilitation of implanted patients has resumed. Pixium expects to report 36-month data by early 2021.

Financials

Pixium finished 2019 with a net cash position (excluding €1.3m of lease liabilities) of €1.0m (€6.8m gross cash offset by €2.6m in refundable advances and €3.2m in long-term debt). The firm announced its 31 March 2020 gross cash position was €4.8m, with a Q1 operating cash burn rate of €2.48m.

In addition to the measures described above to curtail operating costs, in May 2020 Pixium announced a pre-agreement for a €2.5m loan, guaranteed by the French state, from its commercial bank and Bpifrance, and the funds are expected to be received before the end of June 2020. Pixium also has an agreement (from November 2019) with US-based investor, European Select Growth Opportunities Fund (ESGO), for the issue of up to €10m in 12-month bonds repayable in cash and/or new shares, over a period of up to 30 months. Three tranches of €1.25m have been issued (in November 2019, February 2020 and May 2020); the first two of these tranches have been completely converted to equity and about €0.09m of the third tranche has been converted (as of 29 May 2020). In total, €2.59m in ESGO tranches has been converted to equity.

Given these actions and the offerings described above, we estimate Pixium's gross cash at mid-2020 at €8.2m (net cash estimated at 0.8m, assuming €7.4m H120 gross debt excluding lease liabilities). We continue to estimate the firm's 2020 operating cash burn rate (excluding net interest) will be €6.8m (including an H220 burn rate of €4.4m) and that the 2021 operating cash burn rate will be €9.9m.

Hence, with current funds on hand (ie prior to the rights offering described below), we expect Pixium to have sufficient funds to continue its operations into Q221. In total, assuming continued relaxation of the COVID-19 pandemic-control measures in H220, we believe Pixium has sufficient current liquidity to resume Prima 2 implantations and any currently suspended R&D activities, and that it will start the PRIMAvera pivotal study (expected in H121).

Rights offering underway should extend runway into Q421

Including the remaining (or unused) €6.25m in tranches from ESGO funding facility, we now assume that Pixium will need to raise €45m in funds between 30 June 2020 and year end 2023, modelled as illustrative debt, to bring Prima to commercial launch (anticipated in H223). We are

spreading out our funding assumptions compared to our prior estimates, as we now model that Pixium will raise €10m in H220, €12.5m in 2021, €12.5m in 2022 and €10m in 2023. Previously, our model assumed that it would raise €24.7m in net illustrative debt in 2020 and €25m in 2021.

We continue to assume that positive cash flows resulting from EU sales should enable the completion of the US pivotal study, and that Pixium will start to become cash flow positive on a sustainable basis in 2024.

On 12 June 2020, Pixium announced a rights offering initiative, whereby existing shareholders will receive rights to purchase 15 new shares for every 26 shares already held at €0.50/share (a 32.2% discount to the closing price on the prior trading day). The company will use the proceeds to prepare and start the PRIMAvera pivotal study. If fully subscribed, the transaction would provide maximum gross proceeds of €7.8m, fulfilling part of our estimated future funding need and thereby further extending our estimate of Pixium's operating cash runway into Q421.

A full subscription of the rights offering would increase shares outstanding by 15.6m (57.7%), thereby diluting the interests of non-participating investors. The subscription period is between 18 June and 1 July 2020 and Pixium indicated it has received subscription commitments representing 75% of existing shares outstanding, with Sofinnova Partners and Bpifrance Participations committing unconditionally to €2.6m and €3.3m in underwriting commitments from other qualified guarantor investors.

Our model does not include the proceeds and/or increases in shares outstanding from the rights offering (as stated above, our forecasts apply illustrative debt to meet funding needs) but we will revise our model and valuation accordingly once the subscription period has concluded.

Valuation

Our valuation for Pixium Vision is based on a rNPV approach, employing a 12.5% cost of capital, based on the Prima opportunity in dry-AMD. We continue to apply a 20% probability of success estimate for Prima-AMD in our model. After rolling forward our estimates and adjusting our FX rate for US sales to $1.12/€ (from $1.08/€ previously), we now obtain a pipeline rNPV (enterprise value, excluding net cash) of €105.9m versus €98.0m previously.

After including €0.8m in estimated H120 net cash (excluding lease liabilities), we obtain an equity valuation of €106.7m, or €3.95 per share (versus €3.85 previously).

Exhibit 8: Pixium Vision rNPV assumptions (prior to consideration of rights issue and/or possible dilution)

Product contribution	Indication	Status	NPV (€m)	Probability of success	rNPV (€m)	rNPV/ share (€)	Launch year	Peak WW sales (€m)
Prima (net of R&D and marketing and G&A costs)	Age-related macular degeneration with geographic atrophy	Human feasibility trials	944.4	20%	177.5	6.57	H223 in Europe and H225 in US	1,075 in 2029
Net capex, NWC & taxes			(354.4)		(71.5)	(2.65)		
Total			590.0		105.9	3.92		
Net cash (debt) (H120e)			0.8		0.8	0.03		
Total equity value			590.7		106.7	3.95		
FD shares outstanding (000s) (31 May 2020 data)			27,014					

Source: Edison Investment Research

If the rights offering is fully subscribed, total shares outstanding would increase by 57.7% and our total equity valuation would rise to €114.5m, but the equity value per share would decrease to €2.69.

Sensitivities

Development and regulatory risk. Much development risk remains with Prima as it has only been implanted in a small number of patients. Although there are favourable EU 18-month feasibility study data, it is unknown whether Prima can consistently provide superior central vision to epi-retinal implants and/or do so without additional safety risk. In addition, Prima is being advanced in patients with intact peripheral vision and it is uncertain how well the visual system in Prima-implanted patients will interpret natural intact peripheral vision with artificial central vision. Further, degradation of the inner retinal cells can reduce the VA offered by a retinal implant.

Commercial and competition risk. The visual improvements offered by Prima must be sufficient to persuade patients and insurers to cover the implant and be competitive versus alternative treatment options. Particular risk lies in the need for patients to properly undergo vision rehabilitation training to make full use of the Prima; if patients do not fully engage in this process, the level of vision improvement possible could be restrained, affecting the commercial value proposition and adoption level for the device. This risk is offset risk somewhat by the 18-month EU feasibility study data showing meaningful ameliorations in VA (aided by the device's magnification features); prior data show the device can enable recognition of shapes and symbols in patients who previously had no light perception in the treated eye. Further evidence of functional benefit may support discussions for obtaining reimbursement coverage upon approval.

Financing risk. Pixium's gross cash (pre-rights offering) should support its runway into Q221. We model Pixium will raise an additional €45m between mid-2020 and the end of 2023 to sustain its operations and maintain its Prima commercial development strategy, as we do not expect Pixium to be cash flow positive until 2024. While our model accounts for these financings as long-term debt, the firm may need to issue equity instead and there is a risk that pricing may not be favourable for current shareholders and leads to significant dilution. The June 2020 rights offering that is under way could potentially raise up to €7.8m of this anticipated need, but if fully subscribed, would increase shares outstanding by 57.7%, diluting the interests of non-participating investors.

Exhibit 9: Financial summary

€'000s	2017	2018	2019	2020e	2021e	2022e
Year end 31 December	IFRS	IFRS	IFRS	IFRS	IFRS	IFRS
PROFIT & LOSS						
Revenue	2,535	1,598	1,782	1,700	1,600	1,600
Cost of Sales	(1,124)	(41)	0	0	0	0
General & Administrative	(5,324)	(2,019)	(3,815)	(2,900)	(2,973)	(3,847)
Research & Development	(7,817)	(5,297)	(6,320)	(6,000)	(8,000)	(10,400)
EBITDA	(11,731)	(5,758)	(8,352)	(7,200)	(9,373)	(12,647)
Depreciation	(936)	(677)	(448)	(449)	(531)	(639)
Amortization	0	0	0	0	0	0
Operating Profit (before exceptionals)	(12,666)	(6,435)	(8,801)	(7,649)	(9,903)	(13,286)
Exceptionals	0	(5,859)	(69)	0	0	0
Other	0	0	0	0	0	0
Operating Profit	(12,666)	(12,294)	(8,870)	(7,649)	(9,903)	(13,286)
Net Interest	(876)	(1,277)	(1,006)	(450)	(1,759)	(2,834)
Profit Before Tax (norm)	(13,542)	(7,712)	(9,806)	(8,099)	(11,662)	(16,120)
Profit Before Tax (FRS 3)	(13,542)	(13,571)	(9,876)	(8,099)	(11,662)	(16,120)
Tax	0	0	0	0	0	0
Profit After Tax and minority interests (norm)	(13,542)	(7,712)	(9,806)	(8,099)	(11,662)	(16,120)
Profit After Tax and minority interests (FRS 3)	(13,542)	(13,571)	(9,876)	(8,099)	(11,662)	(16,120)
Average Number of Shares Outstanding (m)	13.3	18.5	22.3	27.1	27.6	28.2
EPS - normalised (€)	(1.02)	(0.42)	(0.44)	(0.30)	(0.42)	(0.57)
EPS - normalised and fully diluted (€)	(1.02)	(0.42)	(0.44)	(0.30)	(0.42)	(0.57)
EPS - (IFRS) (€)	(1.02)	(0.73)	(0.44)	(0.30)	(0.42)	(0.57)
Dividend per share (€)	0.0	0.0	0.0	0.0	0.0	0.0
BALANCE SHEET						
Fixed Assets	9,649	3,666	4,507	4,457	4,151	3,555
Intangible Assets	7,680	2,623	2,361	2,361	2,361	2,361
Tangible Assets	1,970	1,042	2,145	2,096	1,789	1,194
Current Assets	14,241	17,756	9,107	15,685	16,373	13,742
Short-term investments	0	0	0	0	0	0
Cash	10,532	15,629	6,792	13,375	13,975	11,344
Other	3,710	2,126	2,316	2,310	2,398	2,398
Current Liabilities	(2,752)	(2,044)	(2,880)	(2,880)	(2,037)	(2,037)
Creditors	(2,752)	(2,044)	(2,880)	(2,880)	(2,037)	(2,037)
Short term borrowings	0	0	0	0	0	0
Long Term Liabilities	(9,302)	(8,023)	(7,033)	(18,693)	(31,193)	(43,693)
Long term borrowings	(9,130)	(7,870)	(5,787)	(17,447)	(29,947)	(42,447)
Other long-term liabilities	(172)	(153)	(1,246)	(1,246)	(1,246)	(1,246)
Net Assets	11,836	11,355	3,700	(1,431)	(12,707)	(28,434)
CASH FLOW						
Operating Cash Flow	(10,605)	(6,174)	(7,282)	(6,816)	(9,917)	(12,253)
Net Interest	(876)	(1,277)	(1,006)	(450)	(1,759)	(2,834)
Tax	0	0	0	0	0	0
Capex	(191)	(31)	(34)	(400)	(224)	(44)
Acquisitions/disposals	0	0	0	0	0	0
Financing	519	14,068	2,034	2,590	0	0
Net Cash Flow	(11,153)	6,587	(6,288)	(5,076)	(11,900)	(15,131)
Opening net debt/(cash)	(12,911)	(1,401)	(7,760)	(1,004)	4,072	15,972
HP finance leases initiated	0	0	0	0	0	0
Other	(357)	(228)	(468)	0	0	0
Closing net debt/(cash)	(1,401)	(7,760)	(1,004)	4,072	15,972	31,103
Lease debt	N/A	N/A	1,346	1,346	1,346	1,346
Closing net debt/(cash) including IFRS 16 lease debt			342	5,418	17,318	32,449

Source: Pixium Vision accounts, Edison Investment Research

Contact details	Revenue by geography
74 rue du Faubourg Saint-Antoin 75012 Paris, France +33 1 76 21 47 30 www.pixium-vision.com	N/A

Management team

Chairman: Bernard Gilly	Chief executive officer: Lloyd Diamond
Bernard Gilly has over 20 years' experience in the financial and pharmaceutical sectors and as an entrepreneur. He was VP of R&D for five years at Pasteur Mérieux Connaught (now Sanofi Pasteur). He subsequently served as CEO of Transgene from 1992 to 2000. He later joined Sofinnova Partners in Paris (2000–05). In 2005, he founded and became the CEO of Fovea Pharmaceuticals. After Fovea was acquired by Sanofi in 2009, he became executive VP of the Ophthalmology division of Sanofi. He founded Pixium Vision in 2011.	Lloyd Diamond is an experienced medtech executive and CEO with 25 years of disruptive technology commercialization experience in the life science industry. He most recently served as the CEO of Precise Light Surgical, a commercially ready medical device company in Silicon Valley. Prior to that, he was the CEO of Bonesupport, a European orthobiologic company that underwent rapid market penetration in Europe and the US during his tenure, leading to a successful IPO on the NASDAQ OMX in Stockholm. Lloyd has first-hand experience in the ophthalmology segment as he was responsible for managing Lumenis's global surgical and vision franchises. He has commercialised many other disruptive technology platforms including at Kyphon and Laserscope. Lloyd received a dual degree in Biochemistry and Marketing from Florida Atlantic University and an MBA from the Thunderbird School of Global Management at Arizona State University.
Chief financial officer: Guillaume Renondin	**Chief technology officer: Guillaume Buc**
Guillaume Renondin graduated from Institut Supérieur de Gestion (ISG) and also received an MBA from HEC in Paris. He has experience as a CFO in the aeronautical sector (Daher) and as a financing consultant. He led an OEM in the automotive sector before founding the first auto parts comparison company. Since 2016 he has been senior advisor at Grant Thornton Executive in France and has participated in numerous restructuring operations and financings of start-ups.	Guillaume Buc has over 25 years' experience in technology development. Before joining Pixium Vision, Mr Buc held several management positions at GE Healthcare Europe. His latest role was CTO of the GE Healthcare interventional cardiology department. He received an engineering degree from the French Polytechnic Institute, in applied mathematics, and a degree from the Ecole Nationale Supérieure des Télécommunications / National Telecommunications School in Paris, in image processing and computer sciences.

Principal shareholders	(%)
Bpifrance Investissement	16.0
Sofinnovia Venture	13.4
Abingworth	9.4
FCPR InnoBio	7.2
Groupe BPI	4.7

Companies named in this report

Second Sight, Gensight Biologics, Reneuron, Retina Implant AG, Nano Retina, iBionics, Bionic Vision Technologies, VisionCare Ophthalmic Technologies, Wicab Inc.,

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United Kingdom

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