Case ME/6795/18

ANTICIPATED ACQUISITION BY ILLUMINA, INC. OF PACIFIC BIOSCIENCES OF CALIFORNIA, INC.

Response to the Provisional Findings Report

14 November 2019

CONFIDENTIAL – BUSINESS SECRETS

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I. Introduction - Summary

1. The Provisional Findings do not discharge the CMA's burden to establish an SLC. The evidence – including the customer call notes – directly contradict its factual findings. The case-law is at odds with the CMA's efforts to avoid the "hypothetical monopolist test" and to rely on unsupported speculation about potential future competition among sequencing technologies. And the CMA fails to counter the extensive analyses and evidence the Parties have provided. In short, the CMA's conclusions are not supported and do not (and will not) withstand scrutiny.

2. The CMA has failed to establish that Illumina's short read systems and PacBio's native long read systems compete. It did not carry out a "hypothetical monopolist test" to define the relevant product market, and in turn did not carry out a SSNIP test (or any other form of diversion analysis) to assess the degree of interchangeability between the Parties' systems. Given the evidence in the record showing that the costs of operating Illumina's systems are an order of magnitude lower than those of operating PacBio's systems, this is a fatal error in the CMA's reasoning. In addition, having accepted that the Parties' systems are, at most, partial substitutes, the CMA erred by ignoring the case-law that makes it clear that products that are not close substitutes do not fall into the same product market.

3. Crucially, the CMA has failed to understand what it has been told by customers. That customer feedback confirms that short read and native long read systems are not interchangeable. More than 70% of the customers that it interviewed stated that the Parties' systems are not interchangeable, with the remaining 30 percent providing no evidence of interchangeability. Rather, those remaining customers described either one-way migration following improvements in native long read systems, or complementary use of short read and native long read systems within a particular application (in different use cases).

4. Similarly, customers confirmed that they do not simply "trade-off" characteristics of the systems when making purchases. Instead, their choices are determined by the sequencing requirements of the research or clinical question being asked. The feedback, properly understood, confirms that the current differences between short read and native long read technologies determine the system(s) that customers use.

5. Further, the CMA has misconstrued the evidence of a limited amount of migration by customers performing native long read use cases, following PacBio's accuracy improvements. The CMA has produced no evidence that such movement is extensive, and it is not. To the extent that any such movement is occurring, it is not competitively relevant because no reaction from Illumina would prevent or stem the movement of native long read use cases to native long read systems. The CMA's suggestion that the dynamic nature of the sequencing industry compels a different conclusion is not supported by the case-law or the facts. More seriously, the CMA failed to ask customers the crucial question: *would they have considered switching back to Illumina?* Without answers to that question, the customer feedback provides no support for the CMA's conclusions. And because the answers would have been "no", the CMA's failure to ask the question is at best surprising.

6. Rather extraordinarily, the CMA has taken the position that "competing for customer spend" is enough to make the Parties' systems substitutable, such that they are current competitors. The CMA is wrong that evidence of companies competing for shares of customers' budgets is relevant to a competitive effects analysis. Nor is such evidence sufficient to establish that the Parties' systems are close substitutes – which is determined by the degree of interchangeability between the products, not whether a customer devotes a portion of its budget to the one or the other product in a given year. The CMA's position on this issue is unsustainable, and flies in the face of established precedent.

7. The CMA has failed to provide analysis or evidence sufficient to support its "potential competition theory" – its conclusion that Illumina's short read and PacBio's native long read technologies will compete in the future as their technological differences and cost differentials reduce is incorrect. There are inherent limitations in PacBio's technology that will prevent it from ever converging with short read technologies. There are also factors that constrain PacBio's development for the foreseeable future that are entirely dependent on third parties. There is no evidence in the record to support the CMA's speculation that improvements of the orders of magnitude necessary to transform PacBio into a competitive threat to Illumina can be made in a relevant timeframe.

8. Importantly in this context, the CMA has chosen to ignore that under relevant UK law, a loss of potential competition can support a finding of an SLC only if it is both likely to, and could, become actual competition in a timely fashion and without incurring any substantial sunk costs. It is inconceivable that PacBio's technology could impose a competitive constraint on Illumina in the next decade. To cite just one hurdle among many – to match Illumina's throughput, PacBio's SMRT Cells would need to integrate a 10 giga-pixel sensor, *i.e.*, a 1,000-fold plus improvement on what PacBio has today that simply cannot be achieved in the foreseeable future. Obviously, the CMA has not presented (and cannot present) any such evidence.

9. As with its assessment of current competition, in evaluating potential competition the CMA has failed to recognise the relevant feedback from customers. A material proportion of customers were categorical that they do not see PacBio "closing the gap" with Illumina. Further, contrary to the CMA's assertion that certain customers suggested that growth of native long read sequencing would be "at the expense" of short read sequencing, those customers actually indicated that they believed that native long read and short read sequencing would remain suited to different uses.

II. The Parties do not currently compete

A. Introduction

10. The CMA has failed to establish that Illumina's short read systems and PacBio's native long read systems currently compete. It did not carry out a SSNIP test or any other economic analysis, despite the fact that the costs of Illumina's systems are an order of magnitude lower. Further, it does not explain why it is appropriate to ignore the body of case law that makes it clear, given the CMA's acceptance that the Parties' systems are, at most, partial substitutes on the margin, that the products are not substitutes that fall into a single product market.

11. Further, the CMA has misconstrued the evidence of a limited amount of customer migration by customers performing native long read use cases, following PacBio's accuracy improvements. The dynamic nature of a market is no basis for concluding without evidence that migration is substitution. The CMA did not ask migrating customers the crucial question: would you "switch back"? Given the fundamental differences between the systems, the answer to this question would have been "no". In fact, the customer feedback that the CMA did solicit confirmed that short read and native long read systems are not interchangeable. The CMA appears to have chosen not to take this feedback into account.

12. The CMA erroneously asserts that Illumina has the ability to price discriminate to discourage or slow the rate of customer migration. This is simply not true. Illumina's sequencing reagents are use case agnostic, making it impossible to price by reference to the use case(s) a given customer is performing. Also, as Illumina has explained, [redacted] percent of library preparation kits used with its sequencers are supplied by third parties (which offer various types of kits for different applications).

13. The CMA also appears to have, rather extraordinarily, taken the position that "competing for customer spend" is enough to make the Parties' systems substitutable. That position is contrary to law.

14. Further, the CMA also arbitrarily and without justification dismisses the relevance of certain evidence. Indeed, the CMA refers to the SSNIP test as a "*static test*" which may "*not accurately reflect the features of a dynamic market*"[1] and only places "*limited weight*" on the quantitative evidence provided by the Parties because it "*does not capture the future competitive constraints different suppliers will exert on each other*".[2] However, at the same time, the CMA places substantial weight on market shares,[3] an indisputably static metric which even old EC case law considered to be unsatisfactory in dynamic markets.[4]

15. Finally, and at the most fundamental level, the CMA appears to have ignored the inherent technological differences that mean that the Parties' systems simply cannot be used to do the same things.

16. Illumina's short read systems and PacBio's native long read systems are technologically distinct with unique characteristics and costs, such that they are not interchangeable.[5] Illumina's short read systems sequence only up to hundreds of base pairs per read, have high throughput (and run output), and are scalable and economical. PacBio's native long read systems sequence thousands to tens of thousands of base pairs per read, have lower throughput (by at least an order of magnitude), and only scale at a rate that is orders of

[1] See Provisional Findings Report, paragraph 7.44.
[2] See Provisional Findings Report, paragraphs 8.116 and 8.269 (d).
[3] See Provisional Findings Report, paragraph 8.269 (d).
[4] See, *e.g.*, case COMP/M.2609 - HP/Compaq (2002), paragraph 39 ("*not a proxy for market power in [a] technologically rapidly evolving ... market*") and case COMP/M.4747 – IBM/Telelogic (2008), paragraph 151 ("*industry standards today may become a legacy product within less than five years*"). See also paragraph 156 of the Merger Notice for references to further case law of the EC and General Court.
[5] See Merger Notice, Section 13.

magnitude below that of short read systems (an enduring characteristic), such that they are (and will remain) materially more expensive.

17. While the vast majority of variants are SNVs (more than 99%) that can be discovered and detected by short read systems, such as Illumina's, there are classes of structural variants where native long read systems, such as PacBio's, are required. However, once native long read systems have been used to discover these longer variants, in most instances short read systems may be used to identify them in subsequent resequencing. [6] Further, native long read systems are also used for phasing haplotypes and *de novo* genome assembly.[7]

Table 1: Comparison of Illumina's and PacBio's systems' characteristics

System attribute (at best)	Illumina	PacBio	Difference
Length of read	~300 bp	5,000 - 50,000+ bp	>10x, and often >100x
Number of reads per run	up to Billions	up to Millions	1000x
Output per run (Q20+)	up to Tb	up to Gb	1000x
Max throughput (Q20+)	>6,500 human genomes/year	50 human genomes/year	>100x

18. In addition, the costs of sequencing with Illumina's systems are materially lower than those of PacBio's systems. Accordingly, since all UK customers who own a PacBio system also own an Illumina system, customers use PacBio's systems only when their Illumina system cannot answer the biological question. As a result of the enduring cost differential between the systems, this will not change in the foreseeable future.

19. The fact that Sequel II has not created competition between the Parties is borne out by its [redacted].

B. <u>The Provisional Findings do not establish that the Parties' products are close substitutes</u>

i. Legal principles

20. According to the CMA's guidelines, "*the relevant product market is a set of products that customers consider to be <u>close substitutes</u>, for example in terms of utility, brand or*

[6] See Response to the Issues Paper, paragraphs 38 and 39.
[7] See Merger Notice, paragraphs 75, 76, 90 and 114 regarding phasing haplotypes, and paragraph 67 regarding *de novo* sequencing.

quality".[8] European and UK case-law make it clear that the CMA must assess the degree of interchangeability between the products to determine whether they are close substitutes, such that they belong to the same product market. Only products that are sufficiently interchangeable fall within the same product market. As the European Court of Justice held in *Hoffman-La Roche*:

> "*The concept of the relevant market in fact implies that there can be effective competition between the products which form part of it and this presupposes that there is a sufficient degree of interchangeability between all the products forming part of the same market in so far as a specific use of such products is concerned*".[9]

21. Further, the courts have made clear that a realistic possibility (*i.e.*, economic viability) of interchangeability is required. A mere theoretical possibility is not enough. The test of "sufficient interchangeability" is met only when there is an element of sustainability in customers' choices, not rare instances of substitution of products.[10] For example, in *Atlantic Container Line*, the European Court of First Instance noted with respect to different modes of transport that "*the fact that other modes of transport, whether maritime or air, may engage in marginal competition on the market in containerised liner shipping services in respect of a limited number of products [...] does not mean that, for that reason, they can be regarded as forming part of the same market*".[11]

22. Products that are only "partial" or "imperfect" substitutes do not fall into the same product market.[12] The Competition Appeal Tribunal ("CAT") has adopted the "sufficient interchangeability" test.[13]

ii. The CMA did not carry out a SSNIP test to determine whether the Parties' systems are sufficiently interchangeable to be considered close substitutes

23. The CMA has presented no economic evidence supporting its conclusion that the Parties' systems are sufficiently interchangeable to be included in the same product market. For example, insofar as the Parties are aware, the CMA did not carry out a "hypothetical monopolist test" to define the relevant product market, and in turn did not carry out a SSNIP test (or any other recognised diversion analysis) to assess the degree of interchangeability between the Parties' systems.[14] This is surprising, given the evidence in the record of inherent and enduring differences between the Parties' systems in a number of crucial, cost-determinative performance parameters (including reads per run, output per run, genomes per year and cost per Gb).[15] As a result of these differences, customers do not and will not substitute the use of native long read systems for short read systems on the basis of cost.

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[8] See Merger Assessment Guidelines, paragraph 5.2.5.
[9] See Case C-85/76 - Hoffmann-La Roche v Commission (1979), paragraph 28. Reaffirmed, *e.g.*, case C-179/16 - F. Hoffmann-La Roche and Others (2018), paragraph 51.
[10] See *e.g.*, Case T-169/08 RENV - DEI v Commission (2016), paragraphs 87, 91-94 and 99.
[11] See Case T-395/94 - Atlantic Container Line and Others v Commission, paragraph 273.
[12] See paragraphs 26 to 37 below. See also case T-83/91 - Tetra Pak v Commission, paragraphs 71 and 75.
[13] See *e.g.*, Case 1005/1/1/01 - Aberdeen Journals Limited v Director General of Fair Trading, paragraphs 90-94.
[14] Pursuant to the CMA's guidelines, this is the tool that the CMA states that it uses in its merger assessment to define the relevant product market. See Merger Assessment Guidelines, paragraphs 5.2.9 to 5.2.16.
[15] See Response to the Issues Paper, paragraph 42.

24. Further, operating costs of Illumina's short read systems are an order of magnitude lower than those of PacBio's native long read systems.

25. As a result, where a customer could theoretically use either Illumina's short read or PacBio's native long read system, the customer will always use Illumina's system. This will not change in the foreseeable future.

26. If the CMA had carried out a SSNIP test pursuant to its guidelines, customers' responses would have been unequivocal that presented with a SSNIP of short read systems, none of them would have switched to native long read systems. Economic analysis, such as that provided by [redacted], further supports this conclusion. The CMA responded to that analysis with meritless objections, rather than by providing its own economic analysis.

iii. Case-law makes clear that the limited interchangeability identified by the CMA does not make Illumina's and PacBio's systems close substitutes

27. The CMA asserts that "*roughly half of the customers we spoke to said that short read and long read are currently substitutable for at least some projects [for some customers this was for a very small part of their workload however] (often with trade-offs, for example around cost or throughput)*".[16] However, the CMA did not identify the projects or quantify the volume of projects for which customers allegedly indicated that the Parties' systems are interchangeable, beyond conceding that "*for some customers this was for a very small part of their workload"*. In short, the only evidence provided undercuts the CMA's conclusion, in that it indicates that any interchangeability is only marginal, which the courts have made clear does not justify a conclusion that products are substitutable.[17]

28. The only reference to interchangeability between the Parties' systems comes from the CMA's assertion that a number (unspecified) of customers indicated that "*both short and long read instruments are used for almost 15% of applications*".[18] However, as the CMA has accepted,

- "*The fact that both short read and long read instruments are used for a given application doesn't necessarily imply they are substitutes – they may be used for different 'use cases' within a given application, or for the same 'use case' but in a complimentary fashion*";[19] and

- It is not clear whether the customers indicated an actual overlap between the Parties' systems, because they "*did not provide fully consistent lists of applications*" [20] and "*it is not clear that customers use the terminology of the Parties in relation to applications as against 'use cases'*".[21]

29. As a result, the CMA's assertion that both short read and native long read systems can be used for 15% of the sequencing applications sheds no light whatsoever on the actual

[16] See Provisional Findings Report, paragraph 8.219.
[17] See Provisional Findings Report, footnote 697.
[18] See Provisional Findings Report, paragraph 8.217.
[19] See Customer Calls Working Paper, note (2) on slide 3.
[20] See Provisional Findings Report, note in paragraph 8.216.
[21] See Provisional Findings Report, note in paragraph 8.236.

interchangeability of the Parties' systems. Indeed, as explained in Section II.E below, the customers interviewed by the CMA in fact confirmed that short read and native long read systems are not even marginally interchangeable, and what customers actually described is that they are migrating or use short read and native long read systems for different use cases within a particular application.

30. Moreover, even if there were to be such a degree of substitutability between the Parties' systems (which the Parties contest), there is not a single European or UK precedent where an authority or the courts found that such a limited degree of interchangeability (*i.e.*, up to 15%) supports the conclusion that two products form part of the same product market and compete. To the contrary, applying the legal test set out by the European courts, including the CAT, both the CMA and the EC have consistently concluded that two products that are only "partial substitutes" are not sufficiently interchangeable, and as such, cannot be included in the same product market. Examples of relevant CMA and EC cases are provided in the following paragraphs and in **Annex 1** attached to this response.

31. In fact, in all instances where the evidence pointed to the fact that two products were only partial substitutes, they have been found not to fall into the same product market, on the basis of the "sufficient interchangeability" test. In cases with a very similar fact-pattern to the case at hand, such as *Johnson & Johnson/Synthes*, the EC's approach to market definition was fundamentally at odds with that taken by the CMA in its Provisional Findings Report.

32. In ***Aggregates, cement and ready-mix concrete market investigation***, the Competition Commission ("CC") found that GGBS (*i.e.*, ground granulated blast furnace slag) and PFA (*i.e.*, pulverised fly ash), which are materials that can be added to cement made from clinker to produce different types of grey cement, or to replace a proportion of cement made from clinker when making concrete, do not belong to the same product market, because they are only partial substitutes.[22] The CC concluded that "*a monopolist supplier of GGBS would be able profitably and sustainably to raise prices of GGBS above competitive levels*" and that there "*is a distinct relevant product market for GGBS, which is closely related to cement and PFA, given that GGBS is both a partial substitute to cement and PFA, as well as an input into the production of CEM III and of downstream cement products (such as RMX [i.e., ready-mix concrete] and other concrete products)*".[23] The CC found that GGBS and PFA were not in the same product market although there was evidence suggesting that 60% of ready-mix concrete producers had identified PFA as an alternative to GGBS.[24]

33. In ***NTL Incorporated/Virgin Mobile Holdings (UK) Ltd***, the OFT did not include fixed and mobile telecommunications services in the same product market, although there was evidence "*that there is some scope for demand-side substitution between fixed and mobile telecommunications services, although this is partial rather than total*". The OFT cited a previous finding from OFCOM, where the latter concluded that "*while it is likely that there will be increasing convergence between fixed and mobile telecommunications services, at*

[22] See Aggregates, cement and ready-mix concrete market investigation - Final report (2014), paragraph 5.47.
[23] See Aggregates, cement and ready-mix concrete market investigation - Final report (2014), paragraph 5.78.
[24] See Aggregates, cement and ready-mix concrete market investigation - Final report (2014), paragraph 5.69.

present they are insufficiently close substitutes for them to fall within the same economic market".[25]

34. In ***Johnson & Johnson/Synthes***, the EC found that the non-anatomic and the different anatomically shaped plates, which are both internal fixation trauma devices,[26] "*do not belong in the same product market, but to neighbouring markets with a certain degree of marginal substitution*",[27] although the EC's market test had shown that they were to a certain degree mutually substitutable. The EC noted that "*various standard (straight) and anatomically shaped plates cannot or can only to a certain degree be substituted for each other. Non-anatomic plates can be substituted by a specific anatomic plate. An anatomically shaped plate could only partially be substituted by a straight plate as it would never fit as well as an anatomically shaped plate, resulting in a sub-optimal result*".[28]

35. In the same case, the EC found that the evidence "*pointed to the existence of separate markets*" for vertebroplasty and kyphoplasty procedures, which are both procedures that treat vertebral compression fractures ("VCF"), although the EC's market test had revealed that there was some demand-side substitutability between the two procedures.[29] Further, the EC suggested that the two procedures fall into different product markets "*despite a degree of migration from vertebroplasty users to kyphoplasty and a degree of (especially future) convergence in prices and in the marketing of VCF procedures*".[30] The EC reached this conclusion – *inter alia* – based on the following evidence:

    - There were significant differences between the two procedures with respect to the complexity and the technical expertise required;[31]

    - There were significant price differences between the two procedures, *i.e.*, kyphoplasty is significantly more expensive than standard vertebroplasty;[32] and

    - There was evidence that the introduction of kyphoplasty did not halt the growth of vertebroplasty, "*so that kyphoplasty cannot simply be considered as a new generation of vertebroplasty that has or would in the foreseeable future replace traditional vertebroplasty*".[33]

36. In ***Zimmer/Biomet***, the EC found that unicondylar and total knee implants belong to distinct product markets, although "*the in-depth market investigation [...] provided indications that sometimes surgeons may still use a total - most likely a primary - knee implant, despite a patient's condition being in principle suitable for the less intrusive unicondylar knee implant. For example, according to J&J/DePuy* [*i.e.*, one of the

[25] See NTL Incorporated/Virgin Mobile Holdings (UK) Ltd (2006).
[26] Internal fixation is the surgical application of devices/implants that physically hold a broken bone together.
[27] See case COMP/M.6266 - Johnson & Johnson/Synthes (2012), paragraph 28.
[28] See case COMP/M.6266 - Johnson & Johnson/Synthes (2012), paragraph 27.
[29] See case COMP/M.6266 - Johnson & Johnson/Synthes (2012), paragraphs 74 and 82. Note that eventually the EC left the product market definition open.
[30] See case COMP/M.6266 - Johnson & Johnson/Synthes (2012), paragraph 73.
[31] See case COMP/M.6266 - Johnson & Johnson/Synthes (2012), paragraph 75.
[32] See case COMP/M.6266 - Johnson & Johnson/Synthes (2012), paragraphs 76 and 77.
[33] See case COMP/M.6266 - Johnson & Johnson/Synthes (2012), paragraph 79.

competitors interviewed by the EC] *the proportion of cases that could be treated with either of the two type of implants could go up to approximately 10% of all primary surgery*".[34] Importantly, the EC noted that "*such an overlap does not however call into question the clear existence of market delineation between unicondylar knee implants as opposed to total knee implants*".[35]

37. Further, the EC found that primary and revision knee implants fall into distinct product markets, although it had previously noted that "*in rare cases revision implants may be used in primary surgery instead of primary implants*" and "*primary knee implants may be used in revision surgery*".[36] However, because customers and competitors confirmed that the overlap between the two products was limited (*i.e.*, only in 5-10% of cases the two implants could be used interchangeably),[37] and the majority of competitors confirmed that customers would not switch between these two implants in response to a SSNIP,[38] the EC concluded that "*the limited, potential overlap between primary and revision knee implants does not justify the finding of a single product market. […] The Commission takes the view that, from a demand-side perspective, primary and revision knee implants constitute distinct product markets*".[39]

38. The Provisional Findings do not square with these precedents. That is especially true given that the CMA essentially accepted that the Parties' systems are, at most, only partial substitutes on the margin,[40] but went on to conclude that the Parties' systems are close substitutes that fall within the same product market.

C. Migration is not substitution

39. As explained in paragraphs 50 and following of the Parties' Response to the Annotated Issues Statement, some customers have historically used Illumina's short read systems to attempt to perform what are in fact native long read use cases because the project did not warrant investing in native long read systems. As native long read systems have improved (*e.g.,* PacBio's accuracy improvements and its increased throughput), these customers are "migrating" that limited sequencing activity to native long read systems.

40. Based on the CMA's reasoning in *Ladbrokes/Coral*,[41] such migration does not mean that customers are substituting competing products. Customers who choose to pay more to sequence fewer genomes in order to get longer reads do so because the question that they are trying to answer was not suited for short read sequencing. Illumina is not in a position to slow or stop such migration by further reducing its prices or by influencing other parameters of competition.

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[34] See case COMP/M.7265 - Zimmer/Biomet (2015), paragraph 61.
[35] See case COMP/M.7265 - Zimmer/Biomet (2015), paragraph 62.
[36] See case COMP/M.7265 - Zimmer/Biomet (2015), paragraphs 88 and 101.
[37] See case COMP/M.7265 - Zimmer/Biomet (2015), paragraphs 105 and 107.
[38] See case COMP/M.7265 - Zimmer/Biomet (2015), paragraph 97.
[39] See case COMP/M.7265 - Zimmer/Biomet (2015), paragraph 112.
[40] See *e.g.*, Provisional Findings Report, paragraph 8.33 where the CMA asserts that "*while in some circumstances [customers] may have a clear preference for which system to use for a particular project (eg a short read or a long read system), in other circumstances there may be some degree of substitution between sequencers*".
[41] See case ME/6556-15, Ladbrokes/Coral (2016).

41. The CMA's conclusions on migration are manifestly unfounded. The CMA is both misconstruing the relevant law and asserting with no evidence that Illumina has the ability to influence the rate of migration.

    i. The approach followed by the CMA in previous decisions regarding migration fully applies in the case at hand

42. The CMA is incorrect that the dynamic nature of the sequencing industry renders the approach followed in *Ladbrokes/Coral* inapplicable.[42] In the recent *PayPal/iZettle* decision, the CMA explicitly applied the SSNIP test to a dynamic market.

43. In *PayPal/iZettle,* PayPal argued that the market for offline payment services provided to small merchants should not be limited to mPOS and POS systems but should also include cash payments, as those customers were migrating from cash to mPOS and POS systems.[43] They pointed to the fact that a large proportion of mPOS customers only used cash before starting to use mPOS systems and that their internal documents referred to small merchants who only used cash as an "addressable market". The CMA rejected this argument because "*migration from cash to card payments by merchants is to be expected, and it is unlikely that a small increase in the price of offline payment services would result in a significant reduction in new customer acquisition*".[44] The CMA therefore used a SSNIP test to delineate the market, despite the fact that it found that "*the payment services industry is a fast-moving and dynamic market*".[45]

44. This approach is also dictated by the CMA's Merger Assessment Guidelines. These guidelines state that the relevant product market "*is a set of products that customers consider to be close substitutes*"[46] and that the CMA "*will ensure that the relevant market they identify satisfies the hypothetical monopolist test*".[47] The guidelines do not provide that the CMA may depart from these principles when defining dynamic markets.

45. The CMA is also incorrect that the *Ladbrokes/Coral* approach does not apply because the *Ladbrokes/Coral* customers were migrating from offline to online gambling independent of any changes in the relative offerings, whereas in the case at hand customers are migrating from short read to native long read systems due to improvements in native long read systems. This view reflects a fundamental misinterpretation of the concept of migration.

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[42] The CMA states that the approach followed in *Ladbrokes/Coral* does not apply in this case because:
- "*Betting shops are not a dynamic industry, with there being limited innovation, in contrast to the rapid developments seen in genome sequencing*".
- "*In Ladbrokes/Coral many customers were moving from offline to online gambling independent of any changes in the relative offerings. In contrast,[...], the evidence suggests that in this case customers appear to be switching to long read due to improvements in long read systems*."

The CMA goes on to assert that the SSNIP test is not appropriate in the case at hand because it is a static test that does not accurately reflect the features of a dynamic market, and because the Parties do not necessarily compete on pricing but with increased R&D. See Provisional Findings Report, paragraphs 7.44 and 8.44.

[43] See PayPal/iZettle (2019), Final Report, paragraphs 6.41 and following.

[44] See PayPal/iZettle (2019), Final Report, paragraph 6.43.

[45] See PayPal/iZettle (2019), Final Report, paragraph 10.

[46] See Merger Assessment Guidelines, paragraph 5.2.5.

[47] See Merger Assessment Guidelines, paragraph 5.2.1.

46. Migration occurs, by definition, as a result of a change in product offerings. Both in *Ladbrokes/Coral* and *PayPal/iZettle*, customers were moving to a new product that better satisfied their specific needs. Similarly, in the case at hand, customers are migrating a limited amount of sequencing from short read to native long read systems because PacBio's native long read systems have developed to the point that they are suited for those native long read use cases, whereas Illumina's systems are not.

47. In short, the CMA simply cannot explain why the precedents provided by *Ladbrokes/Coral* and *PayPal/iZettle* should be ignored in this case. That is because the relevant question is whether the incumbent can adapt to the competition or not, and that question applies equally in a dynamic industry. Indeed, migration may be *more* likely in a dynamic industry, where frequent technology changes are common.

48. The only relevant question to determine whether such limited shift in customer demand constitutes competitive "switching", as the CMA claims,[48] rather than migration, is whether Illumina would have the incentive and the ability to influence customers to switch back to short read systems by decreasing its prices by 5 to 10% or by improving its short read functionality. As explained below, there is no evidence that Illumina would have the ability to do so.

ii. There is no evidence that Illumina can influence the rate of migration

49. According to settled case-law, it is for the CMA to define the relevant market and to prove that its market definition is correct.[49] It is, therefore, for the CMA to prove that Illumina would have the incentive and ability to impede or slow down the rate of migration from short read to native long read systems by adjusting its pricing by 5 to 10% or by improving its short read functionality.[50]

50. The CMA has failed to discharge that burden. It has not carried out a diversion analysis of any type. Nor did it even ask the customers who indicated that they are migrating or may migrate particular workloads whether they would consider switching back.

51. The CMA's speculative theory is entirely based on a handful of Illumina's internal documents which the CMA misconstrues as describing threats of loss of sales to PacBio and mitigation strategies.[51] Not one of the documents cited by the CMA shows that

[48] The CMA takes the position that "*even if customers are indeed migrating from short read sequencing to long read sequencing, this is still competition*" as "*customers may consider switching back to short read in the future*". However, it offers no evidence to support this speculation, nor to rebut the evidence the Parties have provided that explains why there is nothing Illumina could do that would slow or prevent such migration. According to the CMA, "*in the short term, firms will have an incentive to influence the rate of migration. In the longer term, firms will have an incentive to innovate, such that they can better compete for migrating (or migrated) customers*". See Provisional Findings Report, paragraph 7.42. However, such general statements are inapplicable here because Illumina has no ability "*to influence the rate of migration*" and its systems will not ever be able to provide the read lengths that might prompt a customer to move native long read projects to a PacBio or ONT instrument.

[49] See case T-120/04 - Peroxydos Organicos, paragraph 120.

[50] And not for Illumina to prove otherwise, as asserted by the CMA in paragraph 7.44 of the Provisional Findings Report.

[51] See Provisional Findings Report, paragraph 8.43.

customers who migrated to native long read systems would switch back to Illumina's short read systems.

52. In particular, the CMA's reference to emails discussing [redacted][52] the emails referenced by the CMA do not show that these customers would ever switch back to Illumina. Quite the contrary.

53. As explained in paragraphs 77 and following of the Response to the Internal Documents Working Paper, [redacted].

Figure 1: [redacted]

54. In order to show that Illumina could influence the rate of migration, the CMA should have conducted a diversion analysis to assess migrating customers' responses to a change in Illumina's offering. Any such analysis would have shown that migrating customers would not switch back to Illumina's systems even if it decreased its prices by 5 to 10%, given that migrating customers are already accepting to pay much more to sequence samples using PacBio's systems than Illumina's systems.

55. The CMA has argued that a SSNIP test was not appropriate because it is a static test that does not accurately reflect the features of a dynamic market, and the Parties do not necessarily compete on pricing but with increased R&D. This is clearly irrelevant, as the CMA's use of the SSNIP test to distinguish migration from substitution in other cases concerning dynamic industries, such as in *PayPal/iZettle,* makes clear.

[52] See Provisional Findings Report, paragraph 8.137 (b) and (c).

56. Further, the CMA could have conducted another type of diversion analysis based on the other parameters on which, according to the CMA, the Parties compete. For example, the CMA could have asked migrating customers whether they would switch back to Illumina, if it further improved its systems on metrics such as throughput or accuracy. Those customers would also have replied in the negative, as they are migrating to PacBio because the sequencing that they perform requires long read lengths, a metric that no amount of innovation by Illumina will materially improve in its short read systems.

57. The CMA could have also asked migrating customers what they would do in case Illumina limited improvements to PacBio's technology to slow down migration. Given that customers have uniformly identified ONT as PacBio's closest competitor, they would have replied that they would switch to ONT, not to Illumina.[53]

58. Given its extensive investigative powers, the CMA cannot base its market definition on unsupported assumptions that are themselves based on a misreading of a handful of internal documents, particularly since the Parties have provided econometric analysis which casts serious doubts on that market definition. In particular, [redacted] econometric analysis of the impact of PacBio on Illumina prices shows that Illumina did not offer lower prices to customers who purchased a PacBio system. This is undisputed evidence that, contrary to the CMA's speculation, Illumina does not have the incentive and has not tried to influence migration of workload to PacBio's systems.

59. The CMA argues that it can place only limited weight on this econometric analysis because it is based on historical data and does not capture the future competitive constraint that the Parties will exert on each other. This argument is flawed, as customers began to migrate workload a few years ago and the CMA asserts that the Parties currently compete. As a result, the analysis discredits the CMA's assertion that the Parties currently compete for migrating customers.

60. In light of the above, it is clear that the CMA has not discharged its burden of proof to establish that Illumina would be in a position to influence switching back of migrating workloads. In fact, the available evidence clearly shows that Illumina does not have the ability or incentive to either impede or slow down the rate of migration from short read to native long read systems or to influence switching back by adjusting its pricing by 5 to 10%, or by improving its short read functionality.

D. The Parties do not have the ability to price discriminate to discourage migration

61. The CMA asserts that "*the Parties are able to set prices individually for customers based on the sequencing they wish to conduct and the options that are likely to be available to them. This ability to price discriminate means the Parties have the ability (and would continue to have the ability post-merger) to worsen prices selectively for those customers whose options are more limited without increasing prices for others and can consequently avoid the risk that those other customers switch away as a result of the price increase*".[54] This assertion is not correct.

[53] See also Section IV.B.iii. below.
[54] See Provisional Findings Report, paragraph 8.66.

62. The Parties will not have the ability or incentive to price discriminate, because they cannot identify which use cases a customer performs. Customers do not buy a system to perform only one use case. Further, the Parties cannot identify which use cases a customer performs on the basis of its consumables purchases. As explained in response to question 9 d) of Annex C of the Phase 2 Merger Inquiry, the majority (*i.e.*, [redacted] percent) of library preparation kits purchased by Illumina's customers are supplied by third parties (which offer different types of kits for different applications). In addition, Illumina's sequencing reagents are use case agnostic, and are used in a variety of applications (and, as a result, use cases).

63. As explained in the Parties' response to question 20 of the CMA's RFI of 15 February 2019, the Parties do not price discriminate between customers on the basis of the use cases that they perform.

64. Moreover, if the CMA's theory that the Parties compete and have the ability to price discriminate was correct, the Parties would have already started to do so in order to mitigate (in the case of Illumina) or accelerate (in the case of PacBio) customer migration. However, [redacted] econometric analysis of the impact of PacBio on Illumina prices shows that Illumina has not offered lower prices to customers who purchased a PacBio system, even though these customers would be positioned to easily switch back workload.

65. The CMA asserts that [redacted][55] [56] .

E. Customers confirmed that short read and native long read systems are not close substitutes and do not currently compete

66. The CMA's Provisional Findings are also contradicted by customers' feedback. The customers interviewed by the CMA confirmed that short read and native long read systems are not even marginally interchangeable, neither at the project, application, nor use case level. The customer call notes alone are sufficient to overturn the CMA's Provisional Findings.

[55] See Provisional Findings Report, paragraph 8.58.
[56] See Provisional Findings Report, paragraph 8.137 (b) and (c).

i. Lack of interchangeability

67. The CMA states that "*roughly half of the customers we spoke to said that short read and long read are currently substitutable for at least some projects*".[57] This is simply not true. As shown in Table 2 below, out of the 21 customers interviewed by the CMA for whom call notes were provided to the Parties' counsels, 15, *i.e.*, more than 70%, clearly stated that short read and native long read systems are not interchangeable for any project, application, or use case.

Table 2: Customers confirmed that Illumina and PacBio are not interchangeable

Customer	Quote
[redacted]	[redacted][58]
[redacted]	[redacted][59]
[redacted]	[redacted][60]
[redacted]	[redacted][61]
[redacted]	[redacted][62]
[redacted]	[redacted][63]
[redacted]	[redacted][64]
[redacted]	[redacted][65]

[57] See Provisional Findings Report, paragraph 8.219.
[58] See note of call with [redacted].
[59] See note of call with [redacted].
[60] See note of call with [redacted].
[61] See note of call with [redacted].
[62] See note of call with [redacted].
[63] See note of call with [redacted].
[64] See note of call with [redacted].
[65] See note of call with [redacted].

[redacted]	[redacted][66]
[redacted]	[redacted][67]
[redacted]	[redacted][68]
[redacted]	[redacted][69]
[redacted]	[redacted][70]
[redacted]	[redacted][71]
[redacted]	[redacted][72]

68. The remaining customers describe two distinct types of behaviour, neither of which indicates that PacBio's systems and Illumina's systems are interchangeable or substitutes: (a) migration from short read to native long read following improvements in native long read systems that enable their use in native long read use cases or (b) the use of short read and native long read systems for different uses cases within a particular application.

ii. Migration following improvements in native long read systems

69. Customers provided the CMA with examples of migration. For example, the [redacted] described how [redacted][73] As the single-molecule accuracy of native long read systems continues to improve (which, in the case of PacBio's technology, includes the ability to produce even longer CCS (or HiFi) reads), the Parties expect that less polishing will be required. However,

[66] See note of call with [redacted].
[67] See note of call with [redacted].
[68] See note of call with [redacted].
[69] See note of call with [redacted].
[70] See note of call with [redacted].
[71] See note of call with [redacted].
[72] See note of call with [redacted].
[73] See note of call with [redacted].

this is not an instance of competition between the Parties, as no market response by Illumina could lead customers to perform additional polishing if it is no longer necessary.

70. The Parties – and their customers – understand that *de novo* sequencing and assembly of large genomes are suited to PacBio's technology, not Illumina's, and that customers will do as much of that assembly as possible using native long read sequencing. Further, the cost differential, which will persist (and may indeed increase), is such that any polishing that is required will continue to be done using short read systems.

71. It is also absurd to believe that Illumina would curtail improvements in PacBio's technology to protect Illumina's insignificant polishing revenue. That is especially true because an increase in the number of *de novo* reference genomes created (*i.e.*, by improving native long read sequencing) will drive significantly larger amounts of short read resequencing, in PopGen and other large scale projects. This is the complementary "virtuous cycle" use of the two types of sequencing systems described in paragraph 55 of the Parties' Response to the Annotated Issues Statement.

iii. Short and native long read systems are used for different use cases within the same application

72. The CMA has at best misunderstood or misinterpreted the views expressed by customers regarding the interchangeability of short read and native long read systems. For example, customers such as the [redacted] described that they use both Illumina's and PacBio's systems within the same application but to address different use cases. [redacted][74] As explained by the Parties in paragraph 13 of the Response to Customer Calls Working Paper, for RNA sequencing, native long read systems are necessary to discover and map entire (*i.e.*, full length) RNA transcripts, including splice junctions of isoforms, which short read systems cannot do. Short read systems are used for quantification of such transcripts. These are separate and distinct use cases, for which only one type of sequencing system is appropriate, respectively.

F. Competition for sequencing dollars is not substitution

73. The CMA has relied on [redacted][75] to assert that "*competition may take the form of competition in the purchasing decisions of customers over the acquisition of a sequencing system ("competition for sequencing dollars")*"[76] and that "*we consider that competing for sequencing dollars, [...], encompasses all the forms of competition ... . In our view, this vying for a share of the available sequencing budget is an example of rivalry playing out between firms over time*".[77] Essentially, the CMA's

[74] See note of call with [redacted].
[75] See Provisional Findings Report, paragraphs 8.136 and 8.186.
[76] See Provisional Findings Report, paragraph 8.5 (a).
[77] See Provisional Findings Report, paragraph 8.38.

view is that competing for a share of customers' research equipment budgets is a relevant form of competition for the purpose of defining markets.

74. This extraordinary view is directly at odds with the CMA's and the EC's decisional practice. Precedent makes it absolutely clear that the fact that a customer has a finite budget out of which it buys multiple products and services does not support a conclusion that those products and services fall into a single relevant product market, if these products are not close substitutes.

75. For example, the CMA and the EC have consistently taken the position that different forms of advertising (TV, newspaper, radio and internet) do not fall within the same product market, despite the fact that they compete for advertising budgets.

76. In *Google/DoubleClick*, the EC found that offline advertising and online advertising do not fall within the same product market because they are not close substitutes.[78] It explained that online advertising allows advertisers to reach a more targeted audience and has a different pricing structure than offline advertising. Similarly, in *News Corp/BSkyB*, the EC found that the sale of advertising inventory in newspapers and in television broadcasting fall into distinct product markets because they differ in pricing, reach and consumer patterns, such that they cannot be considered as direct substitutes.[79]

77. The CMA's predecessors adopted the same approach in *Sky/VMTV*[80] and *BSkyB/ITV*.[81] The OFT and the CC found that TV advertising and online advertising fall into distinct product markets, despite the fact that they compete for advertisers' budget. In a similar vein, the CMA also found, in several decisions, that online gaming (poker, bingo and casino games) and online betting constitute distinct product markets despite the fact that they compete for customers' gambling spend.[82] Finally, the CC found in *Cineworld/City Screen* that cinemas did not compete with other leisure venues (*e.g.*, sporting events and bowling), despite the fact that they compete for customers' leisure pounds and that the Parties broadly monitored developments in the leisure sector.[83]

78. As these cases make clear, products do not fall within the same product market simply because they compete for customers' budgets. Every customer has a finite budget and must make budgetary choices between distinct products that do not compete. The fact that products or services compete for spend does not mean that they are close substitutes that fall within the same relevant product market.[84]

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[78] See case COMP/M.4731 - Google/DoubleClick, paragraphs 45 and following. See also case COMP/M.5727 - Microsoft/Yahoo! Search business, paragraph 61 and case COMP/M.7217 - Facebook/WhatsApp, paragraph 74.
[79] See case COMP/M.5932 - News Corp/BSkyB, paragraph 267.
[80] See case Sky/VMTV, Final Report, paragraphs 21 and following.
[81] See case BSkyB/ITV, Final Report, paragraphs 4.138 and following.
[82] See case Stars UK/Sky Betting and Gaming, Phase 1 Decision, paragraph 26 and following. See also case Betfair Group/Paddy Power, Phase 1 Decision, paragraphs 30 and following.
[83] See case Cineworld/City Screen, Final Report, paragraph 5.9 and 5.10.
[84] See Merger Assessment Guidelines, paragraph 5.2.5.

G. The choice of short read or native long read system is not a trade-off

i. Customers do not "*face a trade-off*" when purchasing a sequencing system

79. The CMA asserts that "*we have found that many customers make purchases with multiple projects in mind. Evidence we have seen from customers demonstrates that they may not simply purchase sequencers for individual projects, but rather the majority take into account the full range of different projects within their research portfolio. These customers therefore, rather than make a trade-off for a specific project, instead make trade-offs across projects. These customers may face a trade-off between the technology which is most applicable to the greatest number of projects and the extent to which a different sequencer can be used effectively for some projects, even if it is not the optimal choice*".[85]

80. The Parties agree that many customers purchase a sequencing system taking into account "*the full range of different projects within their research portfolio*".[86] However, because of the fundamental differences between short read and native long read technologies, customers do not "*face a trade-off*" between technologies when purchasing a sequencing system. Indeed, given the magnitude of the differential between Illumina's and PacBio's systems (described above in Section II.A.), the vast majority of customers purchase a short read system first. As explained in the Paper "Longer Read Lengths do not Inherently add Utility", the vast majority of use cases – including the highest volume use cases (*e.g.*, RNA-Seq, NIPT, liquid biopsy (cfDNA / ctDNA for Dx / Tx / monitoring), and population-scale resequencing projects (*e.g.*, Genomics England)) – do not require native long read systems, and are performed using short read systems because of their practicality, ability to scale and favourable economics. Customers purchase native long read systems only if they need to perform use cases that require long-range contiguity. For example, [redacted] told the CMA that they [redacted][87] [redacted].[88]

81. The above is confirmed by the fact that the vast majority of customers use short read systems, such that virtually all users of native long read systems also use short read systems. All customers interviewed by the CMA own both short read and native long read systems, and explained to the CMA that they need both short read and native long read systems to address their research questions. For example, [redacted].[89]

[85] See Provisional Findings Report, paragraphs 8.34 and 8.284.
[86] See also Merger Notice, paragraphs 220 et seq.
[87] See note of call with [redacted].
[88] See note of call with [redacted].
[89] See note of call with [redacted].

82. [redacted][90] [redacted][91]

Table 3: [redacted]

[redacted]

83. Customers confirmed to the CMA that they do not make a "trade-off" when purchasing a sequencing system. The differences between short read and native long read technologies are deterministic of the sequencing system customers purchase. For example:

- [redacted].[92]
- [redacted][93]
- [redacted].[94]
- [redacted]

[90] [redacted]
[91] [redacted].
[92] See note of call with [redacted].
[93] See note of call with [redacted].
[94] See note of call with [redacted].

[redacted][95];

- [redacted][96];
- [redacted];[97] and
- [redacted].[98]

ii. Sequencing requirements determine whether a short read or native long read system is used

84. The CMA asserts that "*competition may take the form of competition in the trade-off made by customers between the use of short read and long read technologies in certain projects*", that "*while in some circumstances they may have a clear preference for which system to use for a particular project (eg a short read or a long read system), in other circumstances there may be some degree of substitution between sequencers*", and that "*this substitution comes about because, although for some projects the differences in the characteristics of the two technologies may be significant, each may offer its own advantages and disadvantages such that there is no clear best choice. In these instances, each customer will face a trade-off between these different features and may be willing to shift a proportion of their workflow between them if the relative balance of their pros and cons were to change. For instance, the probability of success may be higher with one technology over another, but the differences in price make the overall choice closely matched*".[99]

85. The CMA has fundamentally misunderstood what customers told it about the choice of sequencing system. Properly understood, the CMA's customer feedback confirms that the

[95] See note of call with [redacted].
[96] See note of call with [redacted].
[97] See note of call with [redacted].
[98] See note of call with [redacted].
[99] See Provisional Findings Report, p. 90, 97 and 186-187.

differences between short read and native long read technologies are deterministic of the sequencing system customers use for a particular project, application, or use case. For example:

- [redacted][100];
- [redacted][101]
- [redacted][102]
- [redacted][103];
- [redacted][104]
- [redacted][105]
- [redacted][106]; and
- [redacted][107].

[100] See note of call with [redacted]. This was a response to the following question: [redacted]
[101] See note of call with [redacted].
[102] See note of call with [redacted].
[103] See note of call with [redacted].
[104] See note of call with [redacted].
[105] See note of call with [redacted].
[106] See note of call with [redacted].
[107] See note of call with [redacted].

86. The CMA asked some customers how they decide whether to use a short read or native long system when looking for SVs of an "*unknown size*". Many customers responded that they know which sequencing system to use in a particular situation and, when they do not, they first use a short read system because of its favourable economics. For example:

- [redacted].[108]
- [redacted][109]
- [redacted].[110]
- [redacted].[111] and
- [redacted][112]

87. The CMA also asked some customers a more general question (*i.e.*, not limited to SVs) about whether they make "trade-offs" between the use of short read and native long read technologies. Many customers explained that they do not make trade-offs, and that the requirements of a project, application, or use case determine whether a short read or native long read system is used. For example:

- [redacted]

[108] See note of call with [redacted].
[109] See note of call with [redacted].
[110] See note of call with [redacted].
[111] See note of call with [redacted].
[112] See note of call with [redacted].

[redacted][113]

- [redacted];[114]
- [redacted][115] and
- [redacted].[116]

88. Further, even where customers seem to indicate that they might be making "trade-offs" for a limited part of their workload, the CMA has misconstrued what customers mean by

[113] See note of call with [redacted]. This was a response to the following question: [redacted].

[114] See note of call with [redacted]. This was a response to the following question: [redacted].

[115] See note of call with [redacted]. This was a response to the following question: [redacted].

[116] See note of call with [redacted]. This was a response to the following question: [redacted].

that term. With respect to SVs, for example, customers explained that they "trade-off" (*i.e.*, sacrifice) cost and output in order to detect SVs, *i.e.*, in order to discover SVs they have to use a native long read system:

- [redacted][117] and
- [redacted][118].

89. Put simply, the "trade off" is that if a customer needs read length beyond what short read can – and will be able to – provide, the customer must give up cost-efficiency and other benefits. That provides no support for (and indeed contradicts) the CMA's conclusions on substitutability.

H. <u>Conclusion</u>

90. In short, the CMA has advanced no evidence that the Parties are current competitors. Instead, it ignored established precedent and extensive customer input (both provided directly to the CMA and through the DeciBio study commissioned by the Parties). More

[117] See note of call with [redacted].
[118] See note of call with [redacted]. This was a response to the following question: [redacted].

than 70% of the customers that the CMA interviewed were clear that the Parties' systems are not interchangeable, with the remainder describing use of short read and native long read systems that amounts to either migration (following improvements in native long read systems) or use of both short read and native long read systems within a particular application but in different use cases. Similarly, customers confirmed that they do not simply "trade-off" characteristics of the systems when making purchases – the differences are far more fundamental than that, and are determined by the sequencing requirements of the research or clinical question being asked.

III. The Parties will not compete in the future

A. Introduction - Framework of assessment of future competition

91. The CMA's Provisional Findings conflate the assessment of current and future competition and thus do not apply the legal principles applicable to the assessment of future competition. The CMA's reliance on the more lenient standards for assessing current competition in the context of alleged future competition is inappropriate, and it fails to meet (or even try to meet) its burden under the proper test for future competition.

92. The CMA takes the position that "*while there is currently a distinction between long read and short read sequencing technologies – which leads to differentiation within the NGS market – in our view, in the context of a dynamic assessment there is not, for the purposes of market definition, a clear-cut distinction between sequencing technologies on the basis of read length*".[119] As such, it is implicitly conceding that short read and native long read systems are currently not close substitutes but that it considers that they fall in the same product market because they may become close substitutes in the future. That is at odds with the CMA's existing practice on market definition, which assesses the current state of competition, even in dynamic industries.

93. For example, in *PayPal/iZettle*, the parties argued that new payment methods based on direct-to-bank payments such as quick response QR codes and in-app payment should be included in the same market as POS and mPOS payment systems. However, the CMA considered that these payment systems should not be included in the relevant product market because it had "*not seen evidence that noncard technologies (eg bank-to-bank transfer, QR codes and in-app payment) are currently being adopted at scale by consumers and by merchants as alternatives to card payments in the UK*".[120]

94. The CMA's Merger Assessment Guidelines confirm that the framework of assessment for the loss of potential competition[121] differs from the framework of assessment for the loss of existing competition.[122] Because potential competition is necessarily a less certain and direct competitive constraint than existing competition, the loss of potential competition is less likely to lead to an SLC, and the CMA's burden of proof is therefore higher.

[119] See Provisional Findings Report, paragraph 7.46.
[120] See case PayPal/iZettle, Final Report, paragraph 6.44.
[121] See Merger Assessment Guidelines, paragraphs 5.4.13 and following.
[122] See Merger Assessment Guidelines, paragraphs 5.4.4 and following.

95. The Merger Assessment Guidelines set out that higher burden explicitly: the loss of potential competition may lead to an SLC only if that potential competition is likely and could become actual competition in a timely fashion: "*[a] firm is more likely to provide a constraint as a perceived potential competitor if its entry can take place without incurring any substantial sunk costs, and if it can happen within a year*".[123] This reflects the fact that the further into the future an event is, the less certain and the more speculative it becomes.

96. Given that the relevant legal standard is the existence of an SLC, "on the balance of probabilities",[124] the CMA cannot base its assessment on speculative assumptions. But that is precisely what the CMA tries to do in the case at hand. Specifically, the CMA considers that technological improvements in PacBio's technology will lead to convergence of the Parties' technologies and increased competition for workflow for current use cases and projects, as well as for new use cases and projects.[125] However, it does not identify (i) when these technological improvements are expected, (ii) the likelihood that these improvements could be made, or (iii) the use cases for which the Parties would compete as a result of these improvements. In short, the CMA does not address the timing or level of convergence before it simply asserts that the Parties' technologies will converge and "*compete more closely in the future*".[126]

97. In contrast, while the CMA recognises that the sequencing industry is dynamic and rapidly growing in the context of its unjustified assertions regarding future competition between the Parties,[127] it completely discounts [redacted] presence as a competitive constraint any time "*in the foreseeable future*".[128] [redacted][129]

98. As explained below, evidence shows that the Parties' technologies will not converge and that their short read and native long read systems will not become substitutes either in the near future or the longer term. Further, even if there could be partial convergence of the Parties' technologies, *quod non*, they would only marginally overlap, such that they could not be considered as close substitutes. [redacted], PacBio's current share of sequencing spend is [redacted] and could grow to [redacted]. Even if that increase would result entirely from customers migrating from Illumina to PacBio, that would still only represent a loss of [redacted] of Illumina's revenues over the next 15 years. Even this grossly overstated overlap would be *de minimis*, and insufficient to justify a conclusion that the Parties would compete in the future.

[123] See Merger Assessment Guidelines, paragraph 5.4.17.
[124] See Mergers: Guidance on the CMA's jurisdiction and procedure, paragraph 3.7.
[125] See Provisional Findings Report, paragraph 8.297.
[126] See Provisional Findings Report, paragraph 8.298.
[127] See Provisional Findings Report, paragraphs 8.39 and 8.287.
[128] See Provisional Findings Report, paragraph 8.335.
[129] [redacted]

B. <u>Illumina's and PacBio's technologies will never converge</u>

i. PacBio's technology will never converge with short read technologies due to its inherent limitations

99. PacBio's SMRT technology has inherent limitations which mean that (i) it will never converge with short read technologies in relation to raw accuracy and run output, and (ii) there are a significant number of use cases for which it is unsuited.

100. These technical limitations have been described in detail in the Parties' earlier submissions. At its simplest, to compete with Illumina's SBS technology in terms of run output, PacBio's SMRT Cells would have to integrate a 10 giga-pixel (10 billion) sensor. PacBio's SMRT Cells currently incorporate a 8 mega-pixel (8 million) sensor. This implies an improvement of more than 1,000-fold which, to the best of the Parties' knowledge, no-one is suggesting is possible in even the medium (or perhaps even long) term.

a. *PacBio's SMRT technology has inherent limitations which will prevent it from converging with short read technologies*

101. The CMA states that "*technological limitations will not impact PacBio's trajectory for at least the next few years (though throughput will remain significantly lower than that of high throughput instruments in Illumina's pipeline)*."[130] The first part of this statement is not correct.

1) Improvement of PacBio's SMRT technology rests on certain factors that **are** outside of PacBio's control, so that no convergence between PacBio's and Illumina's technologies is possible in even the long term

102. PacBio's run output and accuracy are limited by technological barriers that are inherent to its SMRT technology. The basic premise of SMRT sequencing involves anchoring a polymerase and DNA molecule at the bottom of a Zero Mode Waveguide ("ZMW") etched into a metal film on a consumable SMRT Cell. The ZMW's diameter is smaller than the wavelength of light. Due to its small diameter, light intensity decreases rapidly as light enters the ZMW and only the bottom of the ZMW is illuminated, creating an extremely powerful microscope. Each ZMW may contain a DNA polymerase and the target DNA fragment for sequencing. Free-floating nucleotides labeled with fluorescent molecules ("fluorophores") are added to the ZMW chamber.

103. The polymerase reads the template strand of the DNA fragment and adds the fluorescently labeled nucleotides into a new, complementary strand. As each florescent nucleotide is incorporated into the strand, the fluorescent molecule attached to the nucleotide is excited by a laser below the ZMW chamber and, before separating from the nucleotide, releases a light signal back through the bottom of the ZMW. The light signal is recorded by a Complementary Metal – Oxide-Semiconductor ("CMOS") image sensor located below the ZMW. This CMOS image sensor is one-time use (and is part of the consumable SMRT

[130] See Provisional Findings Report, paragraph 8.292.

Cell). The recording is subsequently processed by the system's computer to determine which base the polymerase added to the new DNA strand (referred to as "base calling").

104. PacBio's systems incorporate nucleotides in real time. This is why SMRT sequencing requires the use of a high-resolution, one-time use (because it is part of the consumable SMRT Cell) CMOS image sensor that can continuously record the sequencing process in each ZMW chamber simultaneously and is able to capture a DNA polymerase that moves across the template strand at approximately two to six base pairs per second. To capture this, PacBio's systems have to record movies running at 100 individual frames per second.

105. In contrast to Illumina's SBS technology, SMRT sequencing does not clone the DNA fragments within the flow cell, as a result of which the signals that are emitted during the sequencing process are not amplified. The CMOS sensors in SMRT Cells must, therefore, be extremely sensitive to detect the relatively few photons of light emitted from the incorporation of a single nucleotide into a single DNA fragment. Due to this comparatively weak light signal and need for real-time base calling, PacBio's systems historically have had a high error rate of about 13% (and thus lower raw read accuracy).

106. The error rate of SMRT sequencing can be reduced through the use of standard consensus sequencing (where multiple DNA fragments containing the same order of bases are sequenced) or through circular consensus sequencing or CCS (when the same DNA fragment is sequenced multiple times). However, DNA templates prepared for CCS are typically shorter and result in (i) a much lower throughout of unique base calls and (ii) a higher overall cost relative to standard continuous long reads: ~4x lower sample throughput at ~4x higher cost.

107. The extent to which SMRT sequencing can increase its raw output and raw accuracy, and reduce its cost, is limited by its rate of data recording, the power of the laser, and the detection capabilities of sensors and cameras.

2) Contrary to the CMA's claims, these factors **have limited** the development of the SMRT technology in the past

108. The CMA's assertion that these external factors (the rate of data recording and the detection capabilities of sensors and cameras) have not "*historically ... constrained PacBio development*"[131] is incorrect. PacBio has developed and brought to market RS, RS II, Sequel and most recently Sequel II. However, the fact that it has developed four systems does not mean that technology has not constrained it in the past.

109. In support of its claims, the CMA states that "*the Parties and some customers told us that PacBio has made bold claims in the past and has often failed to meet their performance targets. However,* [redacted]*, all customers told us that the Sequel II instrument met or exceeded their expectations*".[132] In these sentences, the CMA is conflating two distinct matters. It is a fact that Sequel II has been launched, that orders have been placed for Sequel II and that sales have been completed – and PacBio is pleased that customer feedback is on balance positive. This does not, however, allow the CMA to state that **therefore** PacBio has

[131] See Provisional Findings Report, paragraph 8.292.
[132] See Provisional Findings Report, paragraph 8.293.

overcome its technological challenges or to suggest that Sequel II is or is likely to be an inflection point for PacBio. The CMA again seems to be confusing PacBio's (objectively measurable) throughput limitations with the data quality and performance of Sequel II.

110. [redacted][133][redacted][134][redacted].

111. [redacted][135][redacted][136][redacted][137]

112. [redacted]

113. [redacted]

114. Finally, the CMA mischaracterises the customers' feedback on this issue in material ways. None of the customers characterised the Sequel II as the beginning of a reduction in the significant throughput differential with short read systems or in operating costs.[138] In fact, several customers noted that Sequel II did not close the output or price gap, and that its improved throughput has not changed the projects, applications or use cases that customers carry out using PacBio systems. For example:

- [redacted]

[133] See Illumina's Response to Internal Documents Working Paper, paragraph 99.
[134] See Illumina's Issues Meeting presentation, slide 9.
[135] See Illumina's Response to Internal Documents Working Paper, paragraphs 100-102.
[136] See Provisional Findings Report, paragraph 8.162 (b).
[137] See also Illumina's Response to Internal Documents Working Paper, paragraph 104 and 105.
[138] See also Section III.B.iii. below.

[redacted];[139] and

- [redacted][140]

3) Technological limitations **will continue to limit** PacBio's SMRT technology in even the long term, such that no convergence with short read technologies, in terms of accuracy, run output or cost, is possible

115. The flaws in the CMA's reasoning are reflected in its statement that whilst "*there is some uncertainty regarding the timing and level of convergence* [...] *the evidence demonstrates that the Parties will compete more closely in the future*" and that "*on balance, there will be sufficient convergence, and threat of convergence, such that the loss of future competition will be significant.*"[141]

116. The CMA's juxta-positioning of the words "*some uncertainty*" to describe the timing and level of convergence and "*will compete more closely in the future*" to describe competition between Illumina and PacBio is irregular. The uncertainty is considerable, and significantly more than "*some*"; and the suggestion that, at some unspecified point of time in the future, the Parties "*will compete more closely*" is so speculative and vague as to be both meaningless and highly prejudicial to the interests of the Parties.

117. The evidence that the Parties have submitted does not allow the CMA to conclude that there will be convergence in even the long term between PacBio's SMRT technology and short read technologies. The reasons have been explained at length, notably in:

- The submission of 16 May 2019;
- PacBio's response to the Internal Documents Working Paper submitted on 22 September 2019; and
- The response to the Annotated Issues Statement submitted on 24 September 2019.

These reasons seemingly have been dismissed by the CMA without justification.

118. In summary, for PacBio to be viewed by customers as competitive for uses that are best suited to short read sequencing today, PacBio would have to significantly increase its raw accuracy and run output. However, the limited raw accuracy and run output of PacBio's systems is inherent to the SMRT technology, and any significant improvement in these

[139] See note of call with [redacted].
[140] See note of call with [redacted].
[141] See Provisional Findings Report, paragraph 8.297.

metrics rests on factors outside of PacBio's control and is not expected in the foreseeable future. Two examples highlight these constraints.

119. First, to compete with Illumina's SBS technology in terms of run output, PacBio's SMRT Cells would have to integrate a 10 giga-pixel (10 billion) sensor instead of the current 8 mega-pixel (8 million) sensor – a more than 1,000-fold improvement in sensor technology. The most advanced sensor currently available on the market is limited to 48 mega-pixels [redacted] There is no realistic prospect of the necessary advances in sensor technology being available in the medium or perhaps even long term.

120. Second, PacBio is constrained by CMOS pricing. Whilst developments in third party CMOS sensors may make <u>incremental</u> improvements technically possible, the fact remains that PacBio is reliant on developments that make economic sense to incorporate into PacBio's disposable SMRT Cell. Before PacBio can incorporate a 48 million pixel sensor into a SMRT Cell, PacBio will have to wait for the cost to decrease.

121. [redacted].

122. Finally, even if PacBio were to significantly increase its run output and reduce its cost to match the run output and cost of short read sequencing providers today, that does not mean its systems would be competitive with short read systems, because the short read providers will continue to increase their run output/sample throughput and reduce their costs.

b. *Native long read sequencing does not always add value*

123. The CMA claims that there are a number of projects, applications or use cases for which native long read and short read might compete in the future. However, it has failed to (i) identify these, or (ii) state when such competition would happen.

124. Independent of accuracy, run output and cost, there are projects, applications, and use cases for which native long read sequencing does not add value. As explained in the Paper "Longer Read Lengths do not Inherently add Utility", these fall into the following categories:

- In many instances, the length of the DNA available for sequencing is no more than a few hundred bases long; and

- For many projects, applications and use cases, reads of only tens to hundreds of bases are sufficient to unambiguously identify the sequenced fragments, meaning that short read systems are sufficient to answer the underlying biological question. When long DNA is available, the biological questions can be divided into those for which long stretches of contiguity are *required* and

those for which contiguity beyond a few hundred bases *adds no utility*. If contiguity is required, native long read systems are used. Otherwise, short read systems can answer the question.

c. [redacted]

125. [redacted]:

- [redacted][142]. [143]. [redacted][144] and
- [redacted][145] [146].

126. [redacted][147]

ii. The cost of Illumina's and PacBio's systems will not converge

127. The CMA's assertions that the cost of Illumina's and PacBio's systems will converge in the future and that "*PacBio does appear to compete with Illumina on price to some extent currently and that this is likely to increase in future*" are purely speculative and not supported by any evidence.[148]

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142 [redacted].
143 [redacted].
144 [redacted]
145 [redacted].
146 [redacted].
147 [redacted].
148 See Provisional Findings Report, paragraph 8.291.

128. First, it is inappropriate and inaccurate for the CMA to credit its assumptions about PacBio's future price decreases while at the same time claiming ignorance about the likelihood of Illumina's future price decreases. While the cost of sequencing on PacBio's systems has decreased, the cost of sequencing on Illumina's systems has decreased materially further, as shown in Figure 2 below:

Figure 2: [redacted][149]

[redacted]

129. [redacted], operating costs of Illumina's short read systems are an order of magnitude lower than those of the Sequel II.

130. Further, the cost gap between Illumina's and PacBio's systems will not close in the future. As explained above in Section III.B.i., PacBio's ability to increase output and reduce cost is limited by technological barriers. In addition, Illumina will be launching new medium and high throughput systems, which will further reduce the cost of short read sequencing, before PacBio can release its next system [redacted]. Illumina has also publicly announced its intention to offer a $100 genome.[150]

131. In light of this evidence, the CMA's assertion that "*it is not clear to us the extent, nature or timings of Illumina's cost reductions*" is mistaken. And the CMA's speculation that "*even if a gap persists, we consider it is likely to narrow further*" is without support and at odds with the evidence on the file.

[149] [redacted].

[150] See also Merger Notice, paragraph 304.

iii. Customers do not expect native long read use will grow at the expense of short read use

132. The use of native long read technologies will increase in the future, as native long read technologies continue to improve and enable both the development of new use cases and the expansion of existing native long read use cases. However, this growth will not be at the expense of short read. On the contrary, the use of short read systems will grow concomitantly; native long read sequencing will not cannibalise short read sequencing.

133. This view is shared by customers, despite the CMA's unsubstantiated claim that "*the view that Illumina and PacBio would compete more closely in future was largely corroborated by evidence from customers*".[151] In fact, a large proportion of customers stated that the growth of native long read systems would not be at the expense of short read systems:

Table 4: Native long read systems will not grow at the expense of short read systems

Customer	Quote
[redacted]	[redacted][152]
[redacted]	[redacted][153]
[redacted]	[redacted][154]
[redacted]	[redacted][155]
[redacted]	[redacted][156]

[151] See Provisional Findings Report, paragraph 8.295.
[152] See note of call with [redacted].
[153] See note of call with [redacted].
[154] See note of call with [redacted].
[155] See note of call with [redacted].
[156] See note of call with [redacted].

134. The CMA asserts that "*some customers suggested this* [*i.e.*, the growth of native long read] *will be at the expense of short read technologies*" and listed five customer quotes allegedly supporting this view in paragraph 8.223 of the Provisional Findings Report. Several of these quotes have been misinterpreted. For example, the CMA included a partial quote of [redacted], which states that "*in a couple of years time, long read technologies will become more mainstream and it will become quite useful for a lot of the projects*".[160] However, it omitted the rest of that quote, which confirmed that native long read growth will be limited to native long read use cases: [redacted].[161]

135. In a similar vein, the CMA also included a quote from [redacted] "*[a]s it gets more affordable, it is thought that people will do more whole genome resequencing for variants analysis using long reads.*"[162] However, that customer has also explained that he would not use more native long read instead of short read in the future [redacted] because [redacted].[163] He also explained that the use of native long read systems would remain limited because [redacted].[164]

136. The CMA also included the following statement by [redacted]: "*there are certain applications where long read is expected to be increasingly used instead of short*

[157] See note of call with [redacted].
[158] See note of call with [redacted].
[159] See note of call with [redacted].
[160] See Provisional Findings Report, paragraph 8.223 (a).
[161] See note of call with [redacted].
[162] See Provisional Findings Report, paragraph 8.223 (d).
[163] See note of call with [redacted].
[164] See note of call with [redacted].

read such as for whole genome sequencing and RNA transcripts for splice variants".[165] WGS and RNA sequencing of splice variants (*i.e.*, full length isoforms) are application spaces that include multiple use cases, for which different technologies are suited. In these application spaces, native long read and short read are actually used in a complementary manner. Further, [redacted] went on to say that native long read technologies could be used instead of short read only if the former could close both the cost and the throughput gap: [redacted][166] As explained above, PacBio will not close this gap.

137. Other customers such as [redacted] a,[167] [redacted],[168] [redacted],[169] and [redacted][170] have confirmed that the use of native long read will remain limited by its need for long fragments and large amounts of DNA.

C. Conclusion

138. The CMA's conclusion that Illumina's and PacBio's technologies will compete in the future is incorrect. There are inherent technological limitations in PacBio's SMRT technology (including the CMOS image sensors that are built into the SMRT Cells) that will prevent it from ever converging with short read technologies in terms of throughput and cost. Both of these elements are entirely dependent on third party developments, and there is no evidence in the record to support the CMA's speculation that improvements of the order of magnitude necessary to transform PacBio into a competitive threat to Illumina can be made in a legally relevant timeframe.

139. Importantly, the CMA has chosen to ignore the fact that a loss of potential competition may lead to an SLC only if it is both likely and could become actual competition in a timely fashion and without incurring any substantial sunk costs. It is simply inconceivable that PacBio's technology could impose a competitive constraint on Illumina in the next decade. To match Illumina's throughput, PacBio's SMRT Cells would need to integrate a 10 giga-pixel sensor – a 1,000-fold improvement that simply cannot be achieved in the medium (or perhaps even long) term.

140. Finally, as with its assessment of current competition, the CMA has ignored the feedback from customers. A material proportion of customers were categorical that they do not see PacBio "closing the gap" with Illumina. Further, contrary to the CMA's assertion that certain customers suggested that growth of native long read sequencing would be "at the expense" of short read sequencing, those customers actually indicated that they believed that native long read and short read sequencing would remain best suited to different uses.

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[165] See Provisional Findings Report, paragraph 8.223 (c).
[166] See note of call with [redacted].
[167] See note of call with [redacted].
[168] See note of call with [redacted].
[169] See note of call with [redacted].
[170] See note of call with [redacted].

IV. The merged entity will continue to have strong incentives to innovate

A. Introduction

141. Less than 0.01% of species and less than 0.02% of human genomes have been sequenced, and less than 1% of variants in the human genome have been fully characterised. Sequencing is still a new and developing space whose potential is far from known, let alone realised. The merged entity will have strong incentives to continue developing PacBio's technology. Further, the merged entity will have strong incentives to continue Illumina's native long read development.

142. As with its assessment of both current and potential competition, the CMA has ignored customer feedback regarding Illumina's incentives to continue native long read development. Virtually all customers confirmed that they believed that Illumina will improve PacBio's technology, such that the Transaction will lead to a better SMRT offering.

B. The merged entity will have strong incentives to continue developing PacBio's systems

i. The CMA's assertions

143. The CMA claims, without any basis, that "*after the Proposed Merger, PacBio would be likely to choose to invest in developing its technology in a manner which complemented Illumina's portfolio rather than competing with it; such as focusing on longer read lengths. This would be likely to result in the level of competitive interaction with Illumina's instruments being lower than would have been the case if R&D had focused on reducing the cost or increasing the throughput of the PacBio instruments*".[171]

ii. PacBio is not a meaningful driver of Illumina's innovation

144. Sequencing is nascent and rapidly growing, implying that there is a great deal of growth opportunity remaining. For instance, less than 0.01% of species and less than 0.02% of human genomes have been sequenced, less than 1% of variants in the human genome have been fully characterised, and the understanding of complex structure features of the human genome is at its beginning. To drive demand, Illumina needs to innovate, to both increase demand for existing use cases and create demand for new use cases.

145. Further, innovation enables Illumina to both meet expectations of customers and drive down their sequencing costs. This is reflected in the frequent introduction of new technologies (and systems). Indeed, sequencing systems have a relatively short lifecycle due to the rapid pace of technological innovation. Illumina offered 13 different models between 2013 and 2018.[172] ONT and BGI also launched many new systems over the same period.[173]

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[171] See Provisional Findings Report, paragraph 9.117. See also paragraph 8.334.
[172] In 2010, Illumina launched the HiSeq 2000. Between 2010 and 2015, Illumina subsequently launched the HiSeq 1000, 1500, 2500, 3000, 4000 and X.
[173] See, *e.g.*, paragraphs 187 to 206, 380, and 384 to 389 of the Merger Notice.

146. Illumina's continued growth is heavily dependent on developing new technologies (and systems using those technologies) and enhancing existing technologies, systems and services. If Illumina fails to innovate or invest in new technologies, its systems may cease to be attractive in the light of evolving customer needs and competitive offerings.

147. With respect to native long read systems, Illumina expects that customers will want higher throughput, higher accuracy, and low capex native long read sequencing. [redacted]. The inherent limitations of PacBio's SMRT technology mean that it cannot provide systems with those characteristics.

148. Illumina's innovation is also driven by competition from a number of short read system providers and potential entrants. [redacted].

iii. The merged entity will have strong incentives to continue developing PacBio's systems

149. The CMA has failed to properly assess the merged entity's incentives to discontinue, delay, or reorient the development of PacBio's systems. Even assuming that there might be some potential competitive overlap between the Parties' technologies now or in the near future, the merged entity would not have the incentive to limit innovation of either Illumina's or PacBio's technology to prevent customers from migrating to PacBio for those projects for which its SMRT native long read technology is suited.

150. First, the expected gains from expanding the use of sequencing are orders of magnitude larger than any possible upside for Illumina from limiting migration. [redacted] PacBio's current share of sequencing spend is [redacted], and could grow to [redacted]. Even if that increase would result entirely from customers migrating from Illumina to PacBio (which it would not), that would still only represent [redacted] of Illumina's revenues over the next 15 years. The merged entity would have no incentive to let such a small volume of business drive its innovation strategy or its research and development plans. Therefore, it would make no sense to limit innovation for PacBio's technology in an effort to prevent putative migration of a small volume of sequencing.

151. Second, the merged entity will need to keep on developing PacBio's technology to prevent customers from switching to ONT and/or new entrants. The CMA has acknowledged that "*customers … often mentioned ONT as a competitor to PacBio and made comments suggesting that the choice between PacBio and ONT is closely balanced*".[174] As explained to the CMA, ONT has grown significantly in recent years, and demand for its systems has, in ONT's own words, "*increased exponentially*" in the last five years.[175] ONT is expected

[174] See Provisional Findings Report, paragraph 8.227.
[175] See, *e.g.*, Illumina's Response to ONT's submission, p. 14-16.

to continue to innovate. Further, as explained in Section IV.C.i. below, there are numerous companies developing native long read systems.

152. Third, the CMA has ignored the fact that improving the throughput of PacBio's native long read systems, and driving down PacBio's sequencing costs, will not only enable more native long read sequencing but also increase demand for short read sequencing. Indeed, improving the throughput of PacBio's systems will actually increase the complementary use of each of short read and native long read systems. Both Illumina's internal documents and customer feedback confirm that increased demand for, and use of, native long read systems will increase demand for short read sequencing.[176] As a result, it would make no sense to stop improving the throughput of PacBio's systems.

153. Finally, the CMA has produced no evidence to support its assertion that the merged entity would "*focus on longer read lengths*" for PacBio's systems. Nor has it explained how longer read lengths would increase the complementarity with Illumina's portfolio, or investigated whether PacBio's technology would enable longer read lengths. [redacted].[177]

iv. [redacted]

154. [redacted]

Figure 3: [redacted][178]

[redacted]

[176] See Illumina's Response to the Internal Documents Working Paper, p. 16-18. [redacted]. See note of call with [redacted].

[177] See note of call with [redacted].

[178] [redacted].

Figure 4: [redacted][179]

[redacted]

155. [redacted].

v. Customer feedback confirms their expectations that Illumina will improve PacBio's technology

156. Almost all customers expect Illumina to improve PacBio's technology, and that the Transaction will lead to a better product offering. For example:

- [redacted].[180]
- [redacted].[181]
- [redacted].[182]
- [redacted].[183]

[179] [redacted].
[180] See note of call with [redacted].
[181] See note of call with [redacted].
[182] See note of call with [redacted].
[183] See note of call with [redacted].

- [redacted][184]
- [redacted];[185] and
- [redacted].[186]

157. These customer views are completely at odds with the CMA's assertion that the Transaction could reduce innovation.

C. The merged entity will have strong incentives to continue Illumina's native long read development

i. The CMA's potential competition concerns are ill-founded and ignore fundamental legal principles

158. The CMA is wrong that the Transaction is likely to lead to "*a deterioration in the future competitiveness of the long read subsegment, through, for example, the Proposed Merger's impact on Illumina's incentives to develop technologies that compete directly with PacBio's long read systems and leading to the elimination of Illumina as a potential future, independent competitor in the long read sub-segment*".[187]

159. First, and as an initial matter, the CMA's conclusion necessarily recognises that short read and native long read technologies do not compete, and that the CMA's concern is about future competition between native long read systems. But, as a matter of law, for an undertaking to be a potential competitor, it needs to have real concrete possibilities to enter a relevant market, not a subsegment of a relevant market. There is, therefore, an inherent inconsistency between the CMA's claim that there is one NGS systems market, on the one hand, and the assertion that Illumina is a potential native long read competitor.

160. Second, the CMA has failed to assess the likelihood and timing of Illumina's potential entry as a provider of native long read systems. [redacted].

[184] See note of call with [redacted].
[185] See note of call with [redacted].
[186] See note of call with [redacted].
[187] See Provisional Findings Report, p. 90. See also Provisional Findings Report, p. 192 ("*absent the Proposed Merger, there is evidence that Illumina would be a potential competitor in the long read technology sub-segment of the market*").

[redacted][188]. [redacted][189]

The CMA has conceded the speculative nature of its concerns here by acknowledging that "*there is* ***uncertainty around when and if*** *Illumina would have launched a commercial long read system absent the Proposed Merger*".[190]

161. Third, the CMA has failed to give appropriate weight to the fact that there are numerous companies developing and planning to launch native long read systems. To the best of the Parties' knowledge, at least 14 companies are expected to launch native long read systems.[191] Many of these companies are expected to enter before Illumina [redacted]. For example:

- It is expected that [redacted] may launch its native long read sequencer in the next 12 to 18 months;
- **Roswell** stated in April 2019 that it "*aims to be on the market by the end of 2020 with a chip that can sequence targeted parts of the genome*" and that "*it is on track to make a chip that has up to 10 million biosensors and can sequence a full genome for less than $100 in the next three years*";[192]
- **Ontera** (formerly Two Pore Guys) stated that a working prototype of one of its two anticipated sequencing systems will be available in March 2020 and that it expects to commercialise its first device in 2021;[193]
- **Quantum Biosystems** is expected to start providing prototype sequencing systems in 2021 and has said it intends to commercialise its systems in 2022;[194] and
- On completion of a Series 3 financing round in July 2018, **Quantapore** stated that the "*funding will be used to advance Quantapore's technology to beta units for deployment [and] to select early-adopters in industry and academia*".[195] At

[188] [redacted]

[189] [redacted].

[190] See Provisional Findings Report, p. 191.

[191] These companies are [redacted] See the Merger Notice, paragraph 395.

[192] https://www.roswellbiotech.com/wp-content/uploads/2019/05/Roswell-Organovo-More-Xconomy-Awards-Innovation-at-the-Intersection-Finalists.pdf

[193] https://www.ontera.bio/press/ontera-welcomes-mark-rose-to-executive-team and https://www.ontera.bio/sam

[194] https://newswitch.jp/p/18460?lang=en and https://project.nikkeibp.co.jp/behealth/atcl/feature/00013/070400009/?P=3

[195] https://quantapore.com/2018/07/18/effective-product-promo-videos/.

the time, Quantapore's CEO also stated that pricing for the sequencer had not been determined yet and will depend "*on how the market evolves in the next 12 to 18 months*".[196]

162. [redacted] Indeed, a large number of other companies are expected to enter, imposing significant competitive pressure on existing suppliers of native long read systems before then.

163. [redacted]. The CMA has no evidence to conclude that an Illumina native long read system would compete closely with PacBio.

ii. Illumina will continue to have incentives to develop native long read technology

164. The CMA has referred to no evidence that supports its conclusion that Illumina's incentives to develop a native long read technology that meets the broader needs of customers needing to perform native long read sequencing would be reduced post-Transaction. To the contrary, it has ignored the evidence provided by the Parties, including in Illumina's Response to the Internal Documents Working Paper, [redacted][197] [redacted][198]

165. First, native long read technology will be crucial to creating new *de novo* references, and discovering the majority of the as yet undiscovered variants. [redacted]

166. [redacted][199].

167. [redacted]

[196] https://www.genomeweb.com/sequencing/quantapore-working-towards-commercialization-optical-nanopore-sequencing-tech#.XN1fR8gzbct.
[197] See Illumina's Response to the Internal Documents Working Paper, p. 26-29.
[198] See Illumina's Response to the Internal Documents Working Paper, p. 28-29.
[199] See Illumina's Hearing Transcript, p. 7, lines 15-21.

[redacted].

Annex 1 – Further examples of cases where the EC concluded that two products that are only "partial substitutes" are not sufficiently interchangeable, and as such, cannot be included in the same product market

1. In ***Anglo American/Tarmac***, the EC found that asphalt and other types of surfacing (notably concrete and block paving) do not fall within the same product market, although there was evidence that "*all these alternatives [i.e., all other types of surfacing] together make up only some 37% of the total surfacing market, against 63% for asphalt*" and that asphalt could *"only be partially substituted (maximum 30% of the total surface)*" by the other types of surfacing. The EC concluded that, due to the significant differences in the characteristics of the two products, "*there is only limited substitutability between asphalt and the other materials, suggesting that asphalt should, as in the request, be regarded as a distinct product market*".[200]

2. In the same case, the parties argued that concrete blocks and other walling materials should be included in the same product market, because concrete blocks can be used as walling materials and can thus be substituted by bricks and similar products. However, the EC concluded that "*other walling materials would appear to be, at best, only partial substitutes for concrete blocks, and accordingly, [...] concrete blocks can, as in the request, be considered as a distinct product market*".[201]

3. In ***Bertelsmann/Springer/JV***, the EC found that rotogravure printing of high volume printing orders is distinct from offset printing, although it recognised that "*this does not rule out the possibility that in exceptional cases higher volumes may be printed in offset*".[202] In other words, the EC confirmed that a few "*exceptional cases*" in which customers might consider two products to be interchangeable do not support a conclusion that the products are sufficiently interchangeable and fall in the same product market.

4. In ***Travelport/Worldspan***, the EC found that travel service providers' own websites, through which end-consumers book travel services directly) do not fall into the market in which global distribution system providers are active, although the EC's market test had shown that "*for the vast majority of airlines, supplier.coms function as partial substitutes to GDS services*".[203]

5. In ***Danisco/Abitec***, the EC found that Distilled Monoglycerides ("DISMO") and Diacetyl Tartaric Esters of Monoglycerides ("DATEM") emulsifiers do not fall into the same market as other synthetic emulsifiers, although the EC's market test had shown that for certain food applications customers could replace DISMO and DATEM with other synthetic emulsifiers, or that customers could partially (from 20% to 50%) substitute DATEM with other synthetic emulsifiers for certain bakery applications. The EC concluded that "*it appears that from demand-side perspective, the possibility to substitute DISMO or DATEM by other emulsifiers depends very much on the specific application, the production process of the customer and the specifications of the final product.* [...] *All*

[200] See case COMP/M.1779 - Anglo American/Tarmac (2000), paragraph 16.
[201] See case COMP/M.1779 - Anglo American/Tarmac (2000), paragraph 19.
[202] See case COMP/M.3178 - Bertelsmann/Springer/JV (2005), paragraphs 40-44.
[203] See case COMP/M.4523 - Travelport/Worldspan (2007), paragraphs 41-57.

these elements, although making difficult the adoption of a clear cut distinction between the various emulsifiers, tend to confirm that each emulsifier constitutes a separate relevant product market".[204]

[204] See case COMP/M.5109 - Danisco/Abitec (2008), paragraphs 17 to 25. Note that the EC left the product market definition open.