

***Case No COMP/M.4751 -
STM / INTEL / JV***

Only the English text is available and authentic.

**REGULATION (EC) No 139/2004
MERGER PROCEDURE**

Article 6(1)(b) NON-OPPOSITION
Date: 10/08/2007

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COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 10/08/2007
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In the published version of this decision, some information has been omitted pursuant to Article 17(2) of Council Regulation (EC) No 139/2004 concerning non-disclosure of business secrets and other confidential information. The omissions are shown thus [...]. Where possible the information omitted has been replaced by ranges of figures or a general description.

PUBLIC VERSION

MERGER PROCEDURE
ARTICLE 6(1)(b) DECISION

To the notifying parties:

Dear Sir/Madam,

Subject: Case No COMP/M.4751 – STM/Intel/JV
Notification of 10 July 2007 pursuant to Article 4 of Council Regulation
No 139/2004¹

1. On 10 July 2007, the Commission received a notification of a proposed concentration pursuant to Article 4 of Council Regulation (EC) No 139/2004 by which the undertakings ST Microelectronics (“STM”, Italy/France) and Intel (“Intel”, US) acquire within the meaning of Article 3(1)(b) of the Council Regulation joint control by way of purchase of shares in a newly formed joint venture company incorporated under the laws of the Netherlands.

I. THE PARTIES

2. **STM** is an Italian-French group active in the semiconductor industry. In particular, STM produces one of the industry’s broadest ranges of semiconductor products, from discrete diodes and transistors through complex System-on-Chip devices, to complete platform solutions.

¹ OJ L 24, 29.1.2004 p. 1.

3. **Intel** is a US-based company that designs, develops, manufactures, and markets microprocessors, chipsets, and other semiconductor components, as well as platform solutions for data processing and communications devices.
4. **Newco** will operate worldwide in the research and development, manufacture, marketing, and sale of flash memory.

II. THE CONCENTRATION

5. The joint venture will be created through a newly constituted company under the laws of the Netherlands ("Newco"). Intel will contribute to Newco all of its NOR² flash memory assets as well as a significant portion of its phase change memory ("PCM") assets and business whilst STM will contribute to Newco all of its flash memory types, i.e. both NOR and NAND³, and most of its phase change memory ("PCM") assets and business. Furthermore, a financial partner, Francisco Partners ("FP") will invest cash. On completion, Intel will own 45.1% of the stock of Newco, STM will own 48.6% and with FP owning the remaining 6.3%. STM and Intel will each nominate three out of eight members of Newco's Supervisory Board, while FP will nominate two members. A "Super Majority" of six members of the Supervisory Board is required in respect of the strategic decisions of Newco, therefore each of Intel and STM will have the ability to veto decisions relating to the approval of the annual business and financial plans (including the annual operating budget, R&D, budget, and capital expenditure budget) and any expenditure, or any other action inconsistent with an approved annual plan. FP will not receive any veto rights.
6. Newco will perform on a lasting basis all the functions of an autonomous economic entity and will receive assets and be staffed accordingly. It will be a full-function joint venture. Hence, the proposed operation constitutes a concentration pursuant to Article 3(1)(b) of the Merger Regulation.

III. COMMUNITY DIMENSION

7. The undertakings concerned have a combined aggregate world-wide turnover of more than EUR 5 billion⁴ ([...] for Intel, EUR 7.8 billion for STM; all figures relate to turnover achieved in 2006). Each of Intel and STM have a Community-wide turnover in excess of EUR 250 million (Intel: [...], STM: [...]), but they do not achieve more than two-thirds of their aggregate Community-wide turnover within one and the same Member State. The notified operation therefore has a Community dimension pursuant to Article 1(2) of the Merger Regulation.

IV. RELEVANT MARKETS

Newco's business

- 2 NOR-type flash memory provides fast access or "read" capabilities and it has traditionally been used to store executable code, e.g. in cellular phones with respect to the programming code of the mobile phone.
- 3 NAND-type flash memory is slower in reading data but faster in writing data and hence typically used in memory products, e.g. memory cards, digital audio players and cellular phones.
- 4 Turnover calculated in accordance with Article 5(1) of the Merger Regulation and the Commission Notice on the calculation of turnover (OJ C66, 2.3.1998, p 25).

8. Both parties are suppliers of flash memory. The joint venture will operate worldwide in the research and development, manufacture, marketing, and sale of flash memory, i.e. NOR and NAND. As regards PCM, it will continue with the current research and development activities in the field of PCM, a future new type of non-volatile memory⁵.

Relevant product markets: Flash memory, i.e. NOR, NAND, code-intensive, code&data, data-intensive

9. Flash memory is a form of non-volatile memory (“NVM”). NVM is a semiconductor memory that retains its contents when power to a device is turned off. NVM memory is distinguishable from volatile memory, such as dynamic random access memory (“DRAM”) or static random access memory (“SRAM”), which can only retain its contents when powered. Flash memory is integrated into a broad range of electronic products, including mobile phones, consumer electronics, automotive electronics, networking and telecommunications equipment, personal computers, and PC peripherals, to store and access software code and digital content such as photos, music, and video and text files.
10. There are currently two major architectures of flash memory in the market: NOR and NAND. Contents of NOR memory can be read more rapidly than the contents of NAND, while data can be written to NAND more rapidly than to NOR. Historically, NOR was used primarily in applications that require flash memory for software code storage, while NAND is traditionally used in applications that require flash memory for data storage. There is a difference therefore between code-intensive applications of flash memory for devices which most require code storage, e.g. the code of the operating system that runs the mobile device and data-intensive applications of flash memory for devices which most require data storage, e.g. memory cards which store digital images in a digital camera⁶.
11. The notifying parties contend that there is now increasing inter-architectural competition between NOR and NAND. Today, many devices would no longer predominantly require flash memory solely for code storage or solely for data storage. Instead, these devices would require storage for both code-intensive and data-intensive applications. The notifying parties state that the traditional bifurcation in usage of NOR and NAND flash would have been overtaken by evolution in the use of flash memory. The competition between NAND and NOR would be largely driven by the relative memory "bill of materials" for NAND-based and NOR-based solutions. This would be because both NOR and NAND would be ordinarily combined with some form of RAM volatile memory, but would have different requirements for RAM volatile memory: NAND would require to be combined with more RAM memory than NOR. Therefore the parties contend that the total "bill of materials" of a NOR-based solution would be constrained and would have to be competitive with the "bill of materials" for a comparable NAND based solution.
12. The Commission's market investigation revealed that the patterns of substitutability between various flash memory products are still limited, specifically as regards NOR and NAND. It may

⁵ In particular, PCM has a number of features that make it functionally attractive, when compared to flash memory. It does not suffer from the scaling limitations of flash memory types (and could be manufactured cost-effectively beyond the 32-nm lithography generation, which is instead uncertain for flash memory products). It has also superior read and write speeds as compared to flash memory.

⁶ In code storage, the data are typically written once or only few times onto the flash memory but many times executed or read from there, while in data storage the data are frequently written onto the flash memory.

indeed exist instances where customers consider the total cost of ownership of the products, based on the combination of NOR, NAND relative to the volatile memory component (RAM), but whether or not NOR or NAND is to be used is most of the time determined by the design of the application-specific integrated circuit. This, in turn, is dependent on the size of the products for which the memory is needed, its functionality, its complexity and its target customer base. In this connection, NOR is generally used for "lower densities" products and code storage requirements (e.g. inkjet printers), whereas NAND is required for more complex products which require data storage and higher densities (e.g. laserjet printers). Once the application-specific integrated circuit is designed to use NOR or NAND, it cannot be re-designed for the alternative flash memory without entailing very significant re-designing costs for customers, with long-term repercussions in terms of choice of flash memory.

13. It appears from the market investigation that the use of NOR versus NAND flash memory is dictated by the different end-application (telecom networking, telecom infrastructure, mobile communication, consumer electronics application, embedded systems, automotive, industrial applications, etc.), which at the outset is designed with the chosen component of flash memory (be it NOR or NAND, etc.). It furthermore appears that customers of NOR-based products cannot easily switch to NAND-based products without incurring significant costs, in terms of re-engineering with respect to the configuration of the flash memory that is used in the end-application. However, no major divergences in the flash memory products appear to exist across the various possible end-applications. It therefore appears that they would rather switch within NOR suppliers (or within NAND suppliers).
14. The initial choice by customers of flash memory is also largely based, as the notifying parties have submitted, on the intensity/density factors, often (in)directly linked to the end-application, whereby NOR is required for code-intensive applications (lower densities), while NAND is selected when data-intensive applications (higher densities) are at stake. Hybrid solutions and/or a combination of NOR/NAND in stack with RAM (volatile memory) in lieu of NOR solutions, etc. attempt to combine the functionalities of NOR and NAND and represent types of "bridge" solutions. These solutions could provide some performance advantages depending of the platform used and on the software architecture, but appear to be somewhat sporadic devices and are not necessarily cost-effective solutions. Although these hybrid solutions may be adopted by some customers to respond to requirements of low to midrange densities applications, they do not appear to be such as to create for customers either significant switching possibility between NOR and NAND, or a stand alone market on its own.
15. On the supply-side, there are flash memory suppliers who are not active across the board of the flash memory spectrum and would incur significant costs and risks, should they determine to switch production (e.g. from NOR to NAND), even if compelled to do so by market conditions. Therefore, also from the supply-side substitutability, there appear to exist certain resistances to the possibility of considering NOR and NAND as interchangeable from a market definition standpoint.
16. Therefore, based on the market investigation, while, for the time being, an (i) overall flash memory market does not appear to be concretely established in the way in which the market functions, separate markets could be considered for (ii) standalone NOR, (iii) standalone NAND. As an alternative to this definition, still based on the market investigation (and also following the contention of the parties) separate markets could be considered based on flash memory intensity/densities factors (i.e. depending also on the end-use application of flash memory): (iv) code-intensive applications of flash memory: mostly lower density NOR solutions (densities between 0 to 128 Mb), e.g. as of today for video-tapes, DVD players, set-top-boxes, digital TVs, automotive systems, etc. (v) code and data applications of flash Memory: NOR plus NAND

coupled with volatile memory (RAM), or Hybrid flash memory chipsets (densities between 256 Mb to 2 Gb), e.g. as of today for handset mobile telephones which deliver multimedia features and web browsing (besides telephony services), routers and switches, POS devices, etc. (vi) data-intensive applications of flash memory: mostly larger density NAND solutions (densities from 4 Gb up), e.g. as of today for MP3 devices, digital cameras, newer set-top-boxes, USB devices, etc.

17. In this last respect, it appears that such density segments are subject to evolution (as it has been the case in the past) along with technology changes over time. It is to be noted that the above segmentations according to intensity/density reflect the market conditions in 2006 as presented by the notifying parties and may shift upward as technology evolves.⁷ Progress in the node process generation may allow increased scalability (due to shrinking of the die size in the manufacturing process nodes)⁸ thereby achieving higher densities for flash memory products. Therefore in the foreseeable future end-applications may start using densities of increasingly higher scale even when similar applications were using lower densities beforehand⁹.
18. This evolutionary trend is expected to continue as long as suppliers invest in the reduction of the node process generation for flash memory and customers require more complex flash memory chipsets to allow greater complexity of the end-applications products (e.g. evolution of digital television from barely code-intensive applications to applications with increasing code and data storage capability). The market investigation confirmed the existence of this trend towards increased density requirements, recurring approximately every twelve to twenty-four months (sometimes even in a shorter timeframe). Customers appear in particular ready to monitor technology changes and to check whether any such change implies a shift in their purchasing strategy in terms of densities required.
19. At the same time, the investigation revealed that, regardless of the evolutionary trend occurring in respect of densities, NOR and NAND flash memory will still be required on a standalone basis by customers in the foreseeable future and that NOR and NAND will hardly be replaced by new generation products before a quite significant time span, i.e. approximately five years at least. This is because, despite the awareness existing in the market about the new generation products, such as PCM, as well as about "evolutionary" flash products, which are other floating gates

⁷ The notifying parties indicated that, for example, in 2004 the three density segments could have been outlined along the following boundaries: (i) code-intensive applications (0 to 64 Mb), (ii) code and data (128 to 512 Mb) and (iii) data-intensive applications (1Gb and above). In 2005, the three segments would have been still different compared to 2004, in order to reflect the increased scalability of flash memory having taken place meanwhile: (i) code-intensive applications (0 to 64 Mb), (ii) code and data (128Mb to 1Gb), (iii) data intensive applications (2 Gb and greater).

⁸ Die size is calculated in nanometres (nm). To shrink the die size (transistor's size) to smaller nm process nodes implies achieving greater densities and also accelerates cost reductions for suppliers. Each new generation of semiconductors is capable of producing double the number of transistors on a give surface area (therefore effectively reducing the transistor's size and thereby increasing scalability of the product), which enables producers to manufacture products with greater capabilities and, normally, reduce prices. These manufacturing process generations are typically referred to as lithography nodes or process nodes. In this context, lithography refers to the process of transferring the design of an integrated circuit onto the surface of a wafer.

⁹ Each of the three density segments includes a broad range of applications. The applications in each segment are not static. Apart from the introduction of recent standalone applications which require more density (e.g. MP3 players in 1999/2000), the flash memory requirements for existing applications can also change over time: for example digital televisions were historically code-intensive applications, but began to require more and more data storage capabilities.

technologies similar to flash memory, timing and release to market of such pipeline products are still uncertain as well as the perspectives for mass production of those products¹⁰.

20. The ultimate market definition can, however, be left open in this case since the merger would not lead to competition concerns under either alternative market definition according to (i) overall flash memory, (ii) NOR, (iii) NAND and/or by intensity/density factors of the flash memory end-applications: (iv) code-intensive, (v) code and data, (vi) data-intensive.

Relevant Geographic market

21. The notifying parties contend that the geographic market for flash memory (whatever its segmentation) is world-wide. This would be borne out by the fact that clients have plants located all around the world, there would be no quotas, tariffs or technical specifications operating as barriers to shipping, there would be no significant price difference between countries and transport costs would be very low. Moreover, suppliers in those markets are international firms established worldwide. In addition, the costs of establishing a local presence would not be significant, since there is no need to produce or sell such products locally. Furthermore, customers, such as the Original Equipment Manufacturers ("OEM") and system makers, mobile telephony and consumer electronics designer and manufacturers, are big companies that buy their semiconductors on a worldwide scale. According to the notifying parties, their view would be supported by previous Commission's decisions with respect to other categories of micro-components or semiconductors¹¹, where these markets were found to be worldwide in scope. The flash memory market presents the same characteristics as those relating to other semiconductors.
22. The market investigation gave strong indications that the geographic scope of the flash memory markets is indeed world-wide. Supply patterns are global, while also demand follows dynamics which do not seem to be linked or dictated by regional patterns of customer behaviour. No significant price differences across regions or countries were reported. Therefore, it can be concluded that the relevant geographic market for the purpose of the present case can be considered to be at least EEA-wide or wider but its precise delineation can be left open since the analysis of this case does not alter be there world-wide or EEA-wide markets. World-wide market shares also reflect the market picture at the EEA level.

V. COMPETITIVE ASSESSMENT

Introduction

23. According to the notifying parties, the market for flash memory would be of a competitive nature, characterised by steadily declining prices, high degree of product innovation, rapid

¹⁰ In this respect, the notifying parties submitted that their plans regarding PCM are being delayed because of problems incurred in bringing forward product development with respect to technological feasibility of a cost-effective production and of risks associated to the investment in PCM as such. Therefore, samples of PCM are not expected to be available before 2009-2010. It is noteworthy that as regards PCM the parties are already collaborating pre-merger in the context of a three-party joint development agreement among STM, Intel and Ovonyx (as from March 2003). Ovonyx is described by the notifying parties as the most important patent holder as regards PCM, who would have broadly licensed its technology to a number of flash memory suppliers and other industry participants including Samsung. Pursuant to that agreement, the three entities agreed to use reasonable efforts to collaborate to achieve specified PCM development objectives.

¹¹ Cases COMP/M.2820 - STM/Alcatel, COMP/M.2439 - Hitachi/STM/JV

introduction of new products, overcapacity, volatile market shares, lumpy demand, and low switching costs for customers. Flash memory customers would have the option of designing their products around a variety of different architectural approaches. These would include a NOR-based architecture, a NOR and NAND architecture, a NAND-based architecture, and hybrid flash architectures. These characteristics of the flash memory market(s) would be valid across the board of all possible segmentations and would dispel any possible competition concerns be it in terms of non-coordinated or of coordinated effects¹².

24. As regards patterns of demand, the notifying parties pointed out that customers would make their decisions based on a variety of factors, including (i) price, (ii) product functionality, (iii) reliability, (iv) supplier's ability to provide the volume required, with little brand loyalty. Procurement of flash memory products would be based on infrequent informal tenders for important portions of the customers' flash memory requirements, which would put pressure mainly on the supplier's side and would justify the claimed volatility of market shares in this industry. According to the parties, the flash memory market is therefore characterised by excess capacity which would defeat any attempt to constrain output.

Market shares

25. The table below summarizes the global market shares of the parties and of their competitors in the various flash memory segments considered, based on 2006 share of sales (revenue-based). The parties were only able to provide market share figures including captive sales as well as merchant sales. The market investigation indeed indicated that in this industry vertically integrated suppliers (who have internal production of flash memory as an intermediate product to be integrated in other end-products they also supply) procure flash memory from third parties alongside to procuring flash memory from their group's entity active in flash memory (captive sales). This can occur in particular due to customer requirements, demand for flash memory in excess of captive supply, and to the desire of diversifying the risk of having a single source for a component. Vertically integrated producers therefore may also choose to sell more flash memory products as merchant sales.

2006	Intel	STM	Combined Intel/STM	Samsung	Toshiba	Spansion	Hynix	Renesas	Micron	SST	Sharp	Macronix	Others
Overall Flash memory	[10-20]	[0-10]	[10-20]	[30-40]	[10-20]	[10-20]	[10-20]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]
NOR	[20-30]	[10-20]	[40-50]	[0-10]	[0-10]	[30-40]	//	[0-10]	//	[0-10]	[0-10]	[0-10]	[0-10]
NAND	[0-10]	[0-10]	[0-10]	[40-50]	[20-30]	//	[10-20]	[0-10]	[0-10]	//	//	//	[0-10]
Code Intensive	[10-20]	[10-20]	[20-30]	[10-20]	[0-10]	[20-30]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]
Code & Data	[10-20]	[0-10]	[20-30]	[20-30]	[0-10]	[10-20]	[10-20]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]
Data Intensive	[0-10]	[0-10]	[0-10]	[50-60]	[20-30]	[0-10]	[20-30]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]	[0-10]

¹² Vertically integrated suppliers of microprocessors that produce both the flash and volatile memory (RAM) components appear to have a greater flexibility to adjust their costs and margins. Differences in the cost structures of different producers, and large differences in margins, would also create differences in incentives and strategies.

26. In overall flash memory, Samsung enjoys a market share of approximately [30-40]% worldwide. Newco would become a distant number two player, with a world-wide market share of approximately [10-20]%, followed by Toshiba (around [10-20]%), Spansion ([10-20]%), and Hynix ([10-20]), and other smaller players.
27. As regards code-intensive applications (essentially NOR-based applications with densities from 0 to 128 Mb, on the basis of the 2006 density's state of play), Newco's market share would be approximately [20-30]%, followed by Spansion with around [20-30]%, while other players enjoy lower market shares, e.g. Samsung (approximately [10-20]%), Toshiba (approximately [0-10]%), SST (approximately [0-10]%), Sharp (approximately [0-10]).
28. In respect of flash memories for code and data applications (consisting of NOR and NAND and hybrid flash memory with densities ranging from of 256 Mb to 2 Gb, on the basis of the 2006 density's state of play), Newco's share would be approximately [20-30]%. In this segment, other strong competitors are present, including Samsung (approximately [20-30]%), Hynix (approximately [10-20]%), Spansion (approximately [10-20]%), Toshiba/SanDisk (approximately [0-10]).
29. As regards data-intensive applications (essentially NAND-based applications with densities ranging from 4 Gb and greater, on the basis of the 2006 density's state of play), the transaction would not give rise to overlaps as Intel is not contributing its NAND business to Newco. Even if Intel's market shares in NAND were to be attributed to Newco, it would represent a market share below [0-10]% in this segment.
30. Considering the market shares along the lines of the bare flash memory architecture (NOR and NAND), the overlap would amount to approximately [40-50]% as regards standalone NOR flash memory, with Spansion enjoying a market share around [30-40]% and other players with lower market shares such as Samsung (approximately [0-10]%), SST (approximately [0-10]%), Sharp (approximately [0-10]%), Toshiba (approximately [0-10]%), Macronix (approximately [0-10]%), Renesas (approximately [0-10]) and others (all together accounting for approximately [0-10]).
31. As regards standalone NAND, the proposed merger would result in a combined market share of approximately [0-10]%. It is to be noted that the notifying parties participate independently of one another in some (production) non-full function joint ventures with competitors (Intel with Micron as regards NAND and STM with Hynix as regards NAND). In particular, Intel will retain some activities in the relevant markets as it does not contribute its NAND business to Newco. In any event, these joint ventures do not provide for sales to third parties (i.e. to the market) and for revenue sharing between the parent companies, but only supply the parent companies. Therefore, their existence does not alter the assessment about the effects of the proposed transaction.

Horizontal overlap (NOR, code-intensive, code&data)

Non-coordinated effects

32. As mentioned earlier, the market investigation showed that while there might be some form of competitive interaction between the two architectures at the juncture (and along the somewhat "upward moving" break-point) between mid-range densities and high densities, standalone NOR and standalone NAND flash memory could, for the time being, be considered independently of one another in respect to distinct markets.
33. In particular, low density applications will almost only require NOR (e.g. in telecom infrastructure equipment), while high density applications will almost only require NAND. Low density storage requirements are not serviced by NAND and would require a larger device at increased price compared with a NOR device at the right size, which renders substitutability between the two architectures inapplicable even in case of compelling market conditions. Consequently, the price competition that the parties have highlighted between (higher-density) NAND over (lower-density) NOR through the concept of "bill of material", appear to be overstated, at least as regards the lower density end-applications (code intensive) and as regards the end-applications which only use NOR. Therefore, it can be concluded that NOR and code-intensive applications may be considered on a standalone basis for the purpose of the assessment.
34. The notifying parties will have significant market shares in some segments of the flash memory. In particular as regards: (i) code-intensive, (ii) code and data and (iii) standalone NOR markets, Newco would have a strong position. The market investigation had, however, not brought about any reasons for serious doubts as to the transaction's compatibility with the common market.
35. Even in the standalone NOR market, where Newco would enjoy a market share of approximately [40-50]% and where Newco would also be a strong supplier over Spansion (with a market share of approximately [30-40]%), the prevailing market conditions post-merger would not allow for an independent behaviour by the merged entity over customers and competitors. This is *a fortiori* the case in the other flash memory markets, where Newco would have a significant market share and a strong position, but lower share of sales (code-intensive and code and data).
36. Almost all respondents to the Commission's investigation confirmed that customers would continue to have sufficient choice to switch among alternative suppliers post merger, even in the standalone NOR market. Customers adopt multi-sourcing strategies as regards flash memory and appear to attribute very limited value to "brand loyalty". A multitude of criteria appear to be applied by customers when they award or conclude contracts for delivery of flash memory. The criteria mentioned most often were functionality, quality, prices, volumes and lead time apart from past performance, technology, technical support. Customers appear to practice mostly annually-negotiated framework agreements with flash memory suppliers providing for intra-annual reviews (mostly on a semi-annual or on a quarterly basis, with some agreements even providing monthly price reviews). Some respondents even described the flash memory market to be almost a "spot" market, while the product appears to be commoditised at the lower density applications.
37. With respect to switching for NOR, respondents to the market investigation expressed their view that such could be a costly exercise, in particular when done after end product design, since a switch would require changes to both the hardware and the software designs of the relevant end product, involving significant re-engineering costs. Some respondents, however, appear to have another approach by which they integrate their designs at the stage of the development process to allow for easy switching of flash memory types, both at hardware and software levels.

38. The NOR market (and more in general the flash memory products) is a tight-margin business¹³, accompanied by declining prices over past years. It appears unlikely that the merger would stop or reverse that tendency, especially bearing in mind that Newco would continue to face strong competitors, such as Spansion (former market leader) and Samsung, which is a growing player also in NOR, having increased its market shares from [0-10]% in 2003 to [0-10]% in 2006 (with further growth perspectives).
39. In addition, STM and Intel cannot be regarded as the closest competitor to each other as regards standalone NOR (and a fortiori for code-intensive and code and data applications). Rather, the investigation provided indications that in respect of NOR the closest competitor for each of STM and Intel is another player.
40. NOR is growing at a lower rate compared to NAND's growth, and it is increasingly geared towards servicing the solution already in place for customers, rather than towards the outright expansion of the technology.

No capacity constraints

41. Furthermore, the investigation revealed no indications with respect to capacity constraints which would restrict the parties' competitors. While it is not clear cut that the market is overwhelmingly characterised by overcapacity¹⁴, nevertheless, the investigation gave no indication about capacity restrictions by which competitors would be hindered from satisfying additional demand also as regards NOR. Therefore, they appear to be able to offset potential attempts of Newco to adversely affect price or output conditions to customers in respect of NOR. In particular, some respondents to the market investigation included in their selection criteria the ability of a supplier to meet the volume requirements of the customer and furthermore the framework agreements appear to explicitly foresee shift in volumes at short notices.

No effects on innovation

42. The investigation showed that the notifying parties are indeed important innovators as regards NOR¹⁵, but at the same time the concrete further perspectives for Newco's NOR business and for NOR innovation are narrowed down by issues of scalability concerning NOR (as well as NAND) and by cost-efficient considerations concerning the best production process for these current floating gates technologies. These issues *inter alia* depend on the decision to be taken by the notifying parties as regards the destination of new manufacturing process generations along the 300 mm manufacturing facilities versus the 200 mm manufacturing facilities. These options are to be assessed against the backdrop of plans concerning new generation products, i.e. PCM, which are being carried out by the notifying parties and will be most likely be tackled also in the context of Newco.
43. At this juncture, the future of NOR (as well as of NAND) will highly depend on the development currently taking place in respect of PCM and of "evolutionary" floating gates products, which are

¹³ It is a loss-making business for many players.

¹⁴ The flash memory sector appears to be cyclical in terms of capacity utilisation within the same year. The way for suppliers to increase capacity is to build additional fabrication facilities and/or to introduce new technologies to produce more chips on a single silicon wafer.

¹⁵ Intel was a NOR producer in the past and a pioneer in flash memory.

supposed to overlap and replace NOR and/or NAND in the foreseeable future. In this respect the market investigation confirmed the market participants' full awareness of the promising features of the next generation technology and PCM in particular. At the same time, it is unclear at this stage whether the notifying parties would produce PCM (and/or other "evolutionary" floating gates technologies) in a cost-effective way. The same goes for other players who are deploying R&D efforts in respect of PCM, whether there will be mass-production of PCM, and whether PCM will be accepted as a replacement of the existing flash memory products or as newly featured products requiring a price premium over the current products. Moreover, the timeline of this to happen is likely to be beyond the typical (three) year time horizon applied in merger control. Therefore, it appears unlikely that Newco would successfully undertake any potential strategy aimed at transitioning its substantial customer base of NOR clients towards its foreseeable PCM products.

44. In addition, the position of innovator of STM and/or Intel in this respect is not considered as unique and/or irreplaceable in the current and foreseeable market conditions. In particular, while STM and Intel have deployed in the past and are currently deploying strong innovation efforts in the industry, respondents view the notifying parties on at most equal footing compared to their main competitors active in flash memory and also in respect of PCM. Indeed, the proposed merger would not appear to confer to Newco any competitive advantage in respect of innovation, be it for PCM and/or concerning the "evolutionary" floating gates technologies.

Conclusion for non-coordinated effects

45. In view of the above, due to these market dynamics and the presence of strong players, the proposed transaction would not give rise to competition concerns with respect to non-coordinated effects in any of the potential flash memory markets affected by the transaction, notably (i) code intensive, (ii) code and data (iii) and NOR.

Coordinated effects

46. Although in the NOR market, the combined position of Newco and of Spansion (player number two) would be around [70-80]% post merger, the results of the market investigation did not support that the proposed operation would be conducive to the emergence of coordinated effects. In particular, competitors (and in particular Samsung) appear to be able to constrain Newco and Spansion should they undertake such market behaviour also as regards NOR, where the market shares are more stable compared to other flash memory markets and where products are more commoditised. In any event, neither competitors nor customers voiced concerns of this nature.
47. In general terms as regards flash memory, it is likely that the heterogeneity of the portfolio of flash memory suppliers would create distinct incentives for the different producers. In particular, the investigation revealed that cost structures and gross margins may vary to a large extent between suppliers especially based on the current and future node manufacturing costs for each supplier of flash memory, be it NOR or NAND¹⁶, and depending on the major business focus,

¹⁶ The Parties submitted that costs vary greatly due to differences in the deployment of 300 mm manufacturing facilities and in the implementation of upgrades of existing manufacturing facilities to new manufacturing process generations (with each generation bringing about a 50% reduction in manufacturing cost for a given flash density). These cost differences are related to the wafer size and manufacturing lithography process, rather than the type of flash memory product produced. In other words, they can be achieved equally for NOR, NAND and hybrid products as a result of a shift to 300-mm facilities and migration to the next generation manufacturing process. In particular 300-mm manufacturing offers cost savings of about 25% in the fabrication of wafers containing flash memory die, or chips, as compared to the 200-mm manufacturing processes, which is used by both parties.

e.g. between NOR and NAND, of the supplier itself. Partly as a result of these cost differences, but also due to other factors affecting operating efficiency, it is likely that gross margins differ widely across the industry, with NAND producers generally enjoying significantly higher margins than NOR producers.

48. Regardless of the other elements which would be relevant for effective coordination to be implemented, at the outset, these factors appear to offset the possible rewards, if any, of a NOR-only coordination between Newco and Spansion, especially bearing in mind the tight-margin business involved with NOR.
49. In view of the above, due to the dynamics of these markets and the number of players remaining in the market after the merger, the proposed transaction would not give rise to competition concerns with respect to coordinated effects in any of the potential flash memory markets affected by the transaction, in particular not as regards NOR.

Other issues

50. Few customers (e.g. customers using NOR for telecom infrastructure equipment end-applications) expressed concerns that they might be confronted with the discontinuation of certain NOR flash support and upgrades should the parties so decide. In view of the fact that these end-applications only require NOR, these customers feared that the merger would increase the risk for them of being locked-in with the incumbent supplier, due to a limited interoperability of the interface design between flash memory products of different vendors. Therefore, these customers would not always be able to switch suppliers as regards upgrades and/or replacements of NOR products and would have to face a reduction of choice, if NOR products were to be phased out.
51. However, a number of factors appear to counterbalance this concern. According to the notifying parties, it is typical that flash memory customers design multiple memory solutions into their products and in particular such a statement appears true with respect to large customers which are the main customer base of Newco. As a result, they can switch easily and at low cost to alternative suppliers. Hence, it reduces their dependence from few suppliers while securing a multi-sourcing strategy. Furthermore, flash memory products appear to be typically used with a given design architecture. A change of flash memory by one from another vendor involves little costs and time, according to the notifying parties, to integrate into the other architecture. Even more would a switch be facilitated when changing to low density NOR, since it is a highly commoditised product.
52. In addition, one competitor raised the issue that Newco would sustain a loss-making NOR business, in a market setting of declining prices and extremely tight margins with the aim of squeezing competitors out of the market, through cross-subsidization from profits stemming from other (margin-positive) business in each of the parent's group.
53. In this respect, the notifying parties' business plan foresees positive results in the foreseeable future with respect to Newco's operations. It is also agreed among the parents that Newco will become independent after an initial start-up period in order to be able to raise capital from the market on its own. Since the relevant businesses of STM and Intel will be entirely transferred to Newco, it appears unlikely that the parent's shareholders would accept further losses of a business which is independently operating on the market and on its own accounts. Finally, the notifying parties' strong competitors have at least equal access to substantial financial resources to fund their operations in flash memory as Newco would have on its own or through its parents.

VI. CONCLUSION

54. For the above reasons, the Commission has decided not to oppose the notified operation and to declare it compatible with the common market and with the EEA Agreement. This decision is adopted in application of Article 6(1)(b) of Council Regulation (EC) No 139/2004.

For the Commission

signed
Janez POTOČNIK
Member of the Commission