AGGREGATES, CEMENT AND READY-MIX CONCRETE MARKET INVESTIGATION

GGBS/PFA working paper

Introduction

1. GGBS and PFA 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. GGBS and PFA can be used either:

   (a) by cement producers, to replace part of the 'clinker' element of cement to produce CEM II and CEMIII ('blended cements'); there are three main types of cement:

   (i) CEM I, which is made from ground cement clinker and a small percentage of gypsum to control the material's setting time when mixed with water;

   (ii) CEM II, which contains between 6 and 35 per cent PFA, limestone or GGBS; and

   (iii) CEM III, which contains between 36 and 95 per cent GGBS; or

   (b) directly by RMX or concrete block producers, to mix with CEM I in order to create customized mixes of concrete (which results in the production of concrete that is effectively identical to concrete made from pre-blended CEM II or CEM III).

2. Therefore, GGBS and PFA are both 'partial substitutes' to clinker in the manufacture of cement, though there are limits to the extent to which they can be used to substitute for clinker, and there are also differences between the extent of substitutability of GGBS and PFA.

3. In this working paper, we first present the production processes for PFA and GGBS. We then summarize views from cement producers and cement customers on the substitutability between PFA and GGBS. We then present some preliminary esti-

mates of production and shares of sales of both GGBS and PFA. The last section presents our current understanding of the contractual arrangements between Hanson and Tarmac for the supply of GBS and some internal documentary evidence on the supply of GGBS in Great Britain.

Production processes

PFA

4. PFA is a by-product produced by coal-fired power stations. It is the residue of the combustion of pulverized coal collected from the flue gases in electrostatic precipitators. Lafarge told us that in 2010 over 4 million tonnes of raw PFA was produced at the various coal-fired power stations in operation across Great Britain. However, Lafarge told us that only some of this material was suitable for use as a cementitious product and most PFA required further processing to be suitable for cementitious applications. This was because PFA must have a 'loss of ignition' of less than 7 per cent (indicator of low carbon content) to be used in cementitious applications. Therefore a considerable volume of PFA went into low-grade non-cementitious applications (effectively as a secondary aggregate), and Lafarge told us that only 960,000 tonnes of PFA produced in Great Britain was used as a cementitious material.

5. The raw ash produced by one of the power stations in Great Britain (Drax power station) is of cementitious quality and does not require further processing to make it suitable for use in cementitious applications. However, in other cases, the loss of ignition of the ash has to be reduced to below 7 per cent and the technologies to process raw PFA into cementitious PFA are the following:

   (a) STI technology: Lafarge told us that it had an exclusive agreement with Separation Technologies LLC (ultimately owned by Titan Cement) for installation of equipment using its technology to produce PFA suitable for cementitious applications in the UK. Lafarge told us that the licence was due to expire in 2012 and

that [✂]. The STI technology has been installed at a number of Great Britain power stations.

(b) Another ash beneficiation technology is the Rocktron technology, which has been recently installed at Fiddlers Ferry power station in Cheshire belonging to Scottish and Southern Energy. Lafarge told us that the total investment was £30 million according to press reports. Press releases on the SSE website[1] say that the plant is designed to remove and process all fresh ash produced by the power station and much of the ash currently stored in lagoons at the site, turning it into industrial minerals which will become marketable products, with the largest volume being used as cement substitutes. Press releases from late 2008 say that the plant was expected to become operational late 2009 and would be capable of processing around 800,000 tonnes of ash a year. SSE announced in February 2012 that it had decided to mothball its plant at Fiddler's Ferry because of adverse market conditions and a difficult outlook. It went on to say that the plant would be mothballed until conditions improved sufficiently to support the business.[2]

GGBS

6. GGBS is produced as a by-product of the iron manufacturing industry. The process is the following:

(a) The slag that comes out of the iron blast furnace can be air-cooled (in which case it has no cementitious properties and can just be used as an aggregate).

(b) The slag can (with considerable investment in equipment) also be water-cooled, which makes a cementitious granulate material (granulated blast furnace slag or GBS).

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[1] www.sse.com/News/PressReleases.
[2] SSE press release of 8 February 2012.

(c) It is this water-cooled cementitious granulate material which can be ground to make GGBS. Grinding equipment is expensive, although cement producers have grinders already to grind the clinker that comes out of cement kilns.

7. In the UK, Tarmac and the Great Britain steel producers (Tata Steel and SSI) have entered [✂] contracts [✂]. Tarmac then sells GBS to Civil & Marine (Hanson) under [✂] contract, and Hanson undertakes the grinding to transform the GBS into GGBS. [✂]

Substitutability PFA/GGBS

8. We were told that blending PFA or GGBS into CEM I was cheaper for an RMX producer than using just CEM I. We understand that in many cases, RMX will be produced using some PFA or GGBS, or pre-blended CEM II/ III. Most estimates we received from RMX producers (including the Majors) suggest that GGBS or PFA is used in around 80 per cent of all RMX that is sold to customers.[3]

9. Views on the substitutability between PFA and GGBS, and on their relative merits, varied. We were told by some parties that PFA tended to be of more variable quality, but that it was in larger supply and generally cheaper, whereas the supply of GGBS was more restricted. Some parties told us that GGBS had superior cementitious properties. We were also told that there were pros and cons for both GGBS and PFA, and that each had its own strengths depending on the particular application.

10. Hanson told us that concrete producers could generally switch to cementitious products other than GGBS within a short period of time and with little additional cost and, hence, a European Commission investigation had concluded that the relevant market

[3] Hanson told us that PFA or GGBS was used in about 80 per cent of RMX produced. Newark Concrete told us that 95 per cent of its customers purchased CEM II and did so because of the cost saving (see: www.competition-commission.org.uk/assets/competitioncommission/docs/2011/anglo-american-lafarge/summary_of_hearing_with_newark_concrete.pdf).

included at least all cement additives, ie GGBS and fly ash. Hanson told us that whilst GGBS could generally be used as a substitute to CEM I for up to a maximum of approximately 80 per cent of the blended cement's volume,[4] the GGBS proportion in the blend could not be 100 per cent because the rate of hydration was too slow for practical application. Hanson also told us that GGBS, when used as a substitute for CEM I, modified some characteristics of concrete, such as heat generated during hydration, and the durability of the final product and the setting time of the mix was also modified. Hanson told us that fly ash could generally be used as a substitute for CEM I up to approximately 35 per cent, as, beyond this, it became a different cement type not widely used in the UK.

11. Hanson told us that the addition rate of GGBS or fly ash was varied to produce different properties in concrete depending on the customer's end-use. Cost and environmental benefits were also considered when deciding on addition rates.

12. The British Aggregates Association (BAA) told us that its members used GGBS or PFA in almost all the RMX they produced, because it was cheaper than just using CEM 1.

13. Breedon (an intermediate aggregates and RMX producer) told us that it purchased both GGBS and PFA to blend with cement at its RMX plants, and that there was a degree of substitutability between PFA and slag as a cementitious alternative. It told us that the quality of PFA was highly variable, but that it was more easily available than GGBS. Breedon also told us that it bought GGBS from Hanson, and it believed that it got a competitive price for GGBS from Hanson. An indicator of this was that the price of GGBS had come down recently, and that the difference between the price of GGBS and cement was reasonable in Breedon's view. If there were any

[4] However, the percentage of substitution currently varies between 50 and 75 per cent and is typically about 50 per cent, depending on the specification given by the customer.

problems of availability of supply for GGBS, Breedon told us that cement blended with PFA was a suitable substitute for blended cement produced using GGBS.

14. A cement importer told us that PFA had lower cementitious properties than GGBS, but was more widely available, particularly in winter.[5]

15. [✂], an RMX producer in [✂], told us that it did not consider PFA to be a suitable substitute for GGBS due to quality concerns about concrete made from PFA.

16. Lafarge told us that it had [✂] its use of GGBS in the production of cement. It said that one of the key benefits of increasing the use of extenders such as PFA and GGBS in blended cements was that it reduced the proportion of clinker required to produce cement to the required standard. It told us that while it also used PFA to produce cement, GGBS offered a higher clinker replacement rate and therefore could provide more cost and environmental benefits than using PFA or limestone.

17. Lafarge also told us that PFA was generally produced at times which were counter-cyclical to the demand for cement. PFA was produced from coal-fired power generation, which in turn was driven by the demand for electricity which was higher in winter months than in summer months. In contrast, the demand for cement peaked in summer when the weather was more conducive to construction activities. Lafarge told us that GGBS production was more constant throughout the seasons. It said that an even more important factor which influenced availability of PFA was the long-term outlook for gas as a lower-cost source of power compared with coal-fired plants in the UK, as a result of which coal-fired power stations were used much less. We also understand that there are plans to phase out coal-fired power generation in the UK

[5] Summary of hearing with a cement importer during the Anglo-Lafarge joint venture inquiry; see: www.competition-commission.org.uk/assets/competitioncommission/docs/2011/anglo-american-lafarge/summary_of_hearing_with_a_cement_importer.pdf.

as part of the UK's climate change commitments. This would clearly have a strong impact on the availability of UK-produced PFA in the longer term, though Cemex told us that whilst some coal plants were closing, others were investing in order to meet the new IED emissions legislation that would allow them to continue in operation for the next 10 to 15 years.

18. We also find this concern regarding the counter-cyclicality of PFA and lack of availability in a [✂].

19. Internal documents from Lafarge [✂].

20. Aggregate Industries told us that [✂].

Availability and shares of production/sales

GGBS: production, sales and market shares

21. As set out above, Hanson has [✂] contract for the production of GGBS in Great Britain. All other GGBS supplied in Great Britain is imported. Our understanding is that Lafarge, Aggregate Industries, [✂] and [an importer] are currently importing GGBS into Great Britain (we do not have estimates for [an importer's] imports of GGBS, but these are likely to be low). Cemex also used to import GGBS, but ceased in 2009:

(a) Lafarge told us that it imported [✂].

(b) Cemex told us that it purchased quantities of GGBS from Germany until 2009. [✂]

(c) Aggregate Industries imports GGBS [✂] from Holcim in Germany.

(d) [✂] told us that it imported about [✂] kt of GGBS per year through an import terminal located in [✂]. The GGBS is sourced from [✂], and [✂] told us that it consumed all the GGBS it imported internally.

(e) [An importer] also told us that it imported some GGBS into Great Britain. [✂]

22. Our best estimates of total production and imports of GGBS are presented in Table 1 below, and, using this data, we also computed estimated market shares for the supply of GGBS in Great Britain in Table 2. Total sales of GGBS were around 1.4 mt in 2011, and have reduced between 2007 and 2011 by about 1 mt.

TABLE 1 **Estimated production and sales of GGBS in Great Britain, 2007 to 2011**

	2007	*2008*	*2009*	*2010*	*2011*
Hanson GGBS production	[✂]	[✂]	[✂]	[✂]	[✂]
Lafarge GGBS imports	[✂]	[✂]	[✂]	[✂]	[✂]
Cemex GGBS imports	[✂]	[✂]	[✂]	[✂]	[✂]
AI GGBS imports	[✂]	[✂]	[✂]	[✂]	[✂]
[An independent]	[✂]	[✂]	[✂]	[✂]	[✂]
Others ([✂])*	Unknown	Unknown	Unknown	Unknown	Unknown
Total known	2,496,615	2,104,973	1,382,930	1,291,595	1,418,039

Source: Hanson, Lafarge, Cemex, Aggregate Industries, [✂].

*We understand this amount to be very small and it will have no substantial impact on the Total.

TABLE 2 **Estimated shares of supply of known GGBS volumes, 2007 to 2011**

	2007	*2008*	*2009*	*2010*	*2011*
Hanson	[✂]	[✂]	[✂]	[✂]	[✂]
Lafarge	[✂]	[✂]	[✂]	[✂]	[✂]
Cemex	[✂]	[✂]	[✂]	[✂]	[✂]
Aggregate Industries	[✂]	[✂]	[✂]	[✂]	[✂]
[An independent]	[✂]	[✂]	[✂]	[✂]	[✂]
Total	100.0	100.0	100.0	100.0	100.0

Source: CC calculations based on Table 1.

23. The estimates above show that Hanson has increased its market share between 2007 and 2011, largely as a result of [✂] having gradually ceased to import GGBS in 2009 and 2010. Although there is an increase in the share of supply of GGBS by [✂] and [✂] in 2011 through increased imports, their shares in absolute terms are very small. Overall, the share of Great-Britain-supplied GGBS held by Hanson is very high—of the order of [✂] per cent depending on the year. These estimates are in line with the estimates of GGBS market shares that we see in Hanson internal strategy documents where GGBS market shares are generally reported to be between [✂] and [✂] per cent depending on the year.

24. Our calculations suggest that Hanson has a large amount of spare capacity for grinding GBS to produce GGBS: total capacity for grinding GBS held by Hanson is around 2,920 kt per year.[6] Data provided by Hanson shows that production of GGBS fell from about [✂] mt in 2007 to about [✂] mt in 2011, therefore suggesting a reduction in capacity utilization from [✂] to [✂] per cent.

25. Regarding the profitability of importing GGBS, Lafarge told us that it bought GGBS from Hanson, but also imported GGBS from Spain, and that this was cheaper than buying GGBS domestically. It said that the volumes it imported were small, and were only for its own use. It told us that the GGBS that it purchased from Spain already had limestone in it, so it could not receive 'CE' marking and therefore Lafarge could not sell it in the UK. However, it told us it was able to sell the RMX made from this GGBS in the UK as the RMX would have the 'CE' mark. It said that it would not be cost-effective for its Spanish GGBS supplier to make GGBS without limestone in it specifically for Lafarge. Lafarge told us that its ability to import GGBS from Spain was largely due to the economic downturn in Spain. It said that, at the moment, there was good availability of cementitious materials.

26. Lafarge also told us that the GGBS it imported was used to produce CEM II/III, but that its RMX businesses bought GGBS from Hanson.

PFA production, sales and market shares

27. The data available to the CC on production and sales of PFA is not as complete as the data on GGBS, and there are inconsistencies in some of the information submitted. We set out in Table 3 the coal-fired power plants at which we understand cementitious quality PFA is currently being produced,[7] an estimate of the annual

[6] Source: Hanson website www.heidelbergcement.com/uk/en/hanson/home.htm.
[7] We did not include Didcot in this table. We understand that Didcot, though it has capability to make cementitious PFA, is not currently in operation.

production where available, and the identity of the seller/contractual arrangements where known.

TABLE 3 **PFA sources and capacity**

Power plant	*Contract*	*Total PFA capacity*
Drax (North Yorkshire)	[✂], [✂] and [✂] each [✂]	Lafarge estimated that Drax could produce up to 1m tonnes of cementitious quality PFA per year
Longannet (Scotland)	Lafarge JV with Scottish Power for the processing and marketing of all PFA	[✂]
West Burton and Cottam (Nottinghamshire)	Lafarge and Cemex JV (ProAsh) for the production of PFA [✂]	[✂]
Aberthaw (South Wales)	Lafarge JV with RWE for processing and marketing of PFA	[✂]
Fiddler's Ferry	SSE contract with Rocktron	This facility is currently mothballed

Source: Lafarge, Internet research; Cemex, Aggregate Industries.

28. We note from a Lafarge internal document that [✂].

29. We also understand that Lafarge and Cemex have in some years [✂].

30. We were told by the BAA that quality assurance was important for PFA to be used as a cement substitute, and that there were some sales of PFA by merchants but this was not quality assured so could not be used to produce RMX. BAA told us that quality-assured PFA was only available to buy from the Majors.

31. The information we have at present does not enable us to estimate market shares for the production and sales of PFA in Great Britain with any accuracy. From Table 3 we think it is highly likely that most sales of PFA in Great Britain will be through the Majors, but we will try to get more accurate sales estimates. Table 4 presents the current information we have on production and imports of PFA, but we note that this table is incomplete as we do not have information on Drax and Rocktron sales.

TABLE 4 **Production and imports of PFA in Great Britain**

	2007	*2008*	*2009*	*2010*	*2011*
Lafarge	[✂]	[✂]	[✂]	[✂]	[✂]
Of which, imports of PFA	[✂]	[✂]	[✂]	[✂]	[✂]
Cemex	[✂]	[✂]	[✂]	[✂]	[✂]
Of which, imports of PFA	[✂]	[✂]	[✂]	[✂]	[✂]
Hanson	[✂]	[✂]	[✂]	[✂]	[✂]
Tarmac	[✂]	[✂]	[✂]	[✂]	[✂]
Aggregate Industries	[✂]	[✂]	[✂]	[✂]	[✂]
Drax	Unknown	Unknown	Unknown	Unknown	Unknown
Rocktron	Unknown	Unknown	Unknown	Unknown	Unknown

Source: Lafarge, Cemex, Hanson, Tarmac, Aggregate Industries.

Relative size of PFA/GGBS markets

32. The data above suggests that the total sales of PFA (around 500 kt a year based on the data we have at present) are small compared with GGBS (around 1.4 mt of total GGBS sales a year in Great Britain). Other estimates we have of the relative size of GGBS and PFA markets also confirm that PFA sales are lower than GGBS sales.

33. The Mineral Products Association (MPA) produces an estimate of the total sales of cementitious products (PFA and GGBS) in Great Britain, on a quarterly basis. This data is summarized in Table 5. According to this data, total sales of PFA and GGBS in Great Britain were around 1.7 million tonnes in 2011, representing about 15.3 per cent of total sales of cement and cementitious products in Great Britain. The MPA data also suggests that sales of GGBS and PFA as a proportion of total cement sales have reduced between 2007 and 2011, from 17.5 to 15.3 per cent.

TABLE 5 **MPA estimates of sales of cementitious and cement**

	Sales of PFA and GGBS kt	*Total GB cement sales kt*	*Total cement + cementitious kt*	*Proportion of PFA and GGBS %*
2007	2,758	13,025	15,783	17.5
2008	2,433	11,228	13,661	17.8
2009	1,680	8,657	10,337	16.3
2010	1,534	8,980	10,514	14.6
2011	1,736	9,575	11,311	15.3

Source: MPA website www.mineralproducts.org/, CC calculations.

34. A Hanson strategic document provides some estimates which give an order of magnitude of the how the sales of GGBS and PFA compare with each other and with total sales of cement. The data is reproduced in Figure 1, which shows, for 2005 and 2010, the breakdown of total cementitious sales between PFA, GGBS, composite cements, blastfurnace cements (CEM II/III) and CEM I.

35. Hanson's estimates suggest that total sales of PFA are small in comparison with sales of GGBS (about a third). However, we note that sales of composite cement would include some PFA and GGBS as inputs, and therefore total production is likely to be higher (and, if PFA is used in greater volumes in producing blended cement, this could mean that the overall balance is different). Between 2005 and 2010, the GGBS share has reduced slightly, and PFA sales have increased slightly. The share of blended cements has increased, to the detriment of sales of CEM I. Hanson commented in this document that: 'UK market remains mainly separate CEM I/GGBS/Fly ash market. Growth in composite cements mainly within vertically integrated companies, esp Lafarge, Cemex (ie their own internal concrete production).'

FIGURE 1

Hanson estimates of sales of different types of cement, 2005 and 2010

[✂]

Source: Hanson.

Hanson/Tarmac GGBS contract

36. As set out above, in the UK, Tarmac and the Great Britain steel producers (Tata Steel and SSI) have entered [✂] contracts [✂]. Tarmac then sells GBS to Civil & Marine (Hanson) under [✂] contract [✂], and Hanson undertakes the grinding to transform the GBS into GGBS. [✂]

37. The Hanson/Tarmac contract [✂].

38. There are three steel plants in operation in Great Britain at present: Scunthorpe and Port Talbot (owned by Tata Steel) and Teesside (SSI Steel), which reopened in April 2012. Table 6 shows the plants and the contractual arrangements for GGBS, as well as the volumes of GGBS produced in 2010 and the price per tonne for the GBS purchased by Hanson in 2010.

TABLE 6 **Contractual arrangements for GGBS**

Plant	*Plant owner*	*Source contract owner*	*Expiration*	*Sub-agreements with source contract owner*	*Volume*	*Price per tonne in 2010*
Scunthorpe	TATA	Tarmac	[✂]	[✂]	[✂]	[✂]
Port Talbot/ Llanwern	TATA	Tarmac	[✂]	[✂]	[✂]	[✂]
Teesside	SSI Steel production	Tarmac	[✂]	[✂]	[✂]	[✂]

Source: Hanson.

39. Research from the Hanson/Heidelberg website reveals that Hanson does not grind the GBS in its existing cement works, but instead has a network of dedicated plants for the grinding of GBS, two of which are located within steelworks plants in Scunthorpe and Port Talbot, and one of which (Teesport) is located very close to the third steelworks plant. The Purfleet grinding plant is located on the River Thames and has a wharf to receive bulk deliveries of GBS. The Llanwern plant is located on the now closed Llanwern steel plant. The grinding plants are shown in Table 7.

TABLE 7 **Hanson GGBS grinding plants**

Hanson GGBS grinding plants	*Location*	*Capacity (kt grinding capacity per year)*	*Notes*
Purfleet	Essex	1,000kt	
Scunthorpe (in Scunthorpe steelworks)	N Lincolnshire	560kt	
Port Talbot (in Port Talbot steel plant)	South Wales	500kt	
Teesport (very close to Teesside steel plant)	North East	430kt	Plant is mothballed; so material from Teesside plant is granulated at Purfleet. Teesside steel-works only reopened in April 2012
Llanwern (in Llanwern steelworks)	South Wales	430kt	Plant is mothballed

Source: Hanson/Heidelberg website www.heidelbergcement.com.

40. In addition, Hanson also has a GGBS depot in Glasgow (Scotland) with a storage facility for 10 kt of GGBS, and which receives supplies from the Port Talbot works.[8]

41. To assess the effects of this [✂] contract, and whether there may be competitive concerns in relation to the supply of GGBS in Great Britain, we have considered:

(a) the efficiencies deriving from the contract; and

(b) the possible competition problems arising from the contract (and more generally regarding the supply of GGBS in Great Britain).

We deal with these issues in turn.

Efficiencies

42. Any efficiencies resulting from the [the nature of the contract] contract between Hanson and Tarmac are likely to be related to:

(a) Any large-scale investment necessary for Hanson in order to install GBS grinding facilities, and how specific this investment is to grinding GGBS (or whether it can also be used to grind cement, for example). Such large-scale investment may require some form of certainty of supplies of GBS over time to be justified.

(b) Number of steel plants: Hanson has entered into an [the nature of the contract] agreement for each of the three steel plants in Great Britain. This raises the question whether similar efficiencies could be realized with up to three different [the nature of the contract] contracts with different players.

(c) There may also be some efficiencies from Tarmac's point of view, because of the necessity for Tarmac to invest in slag-cooling technology, and therefore Tarmac may also require some form of certainty that the GBS it has produced will be purchased.

[8] Source: Hanson/ Heidelberg website: www.heidelbergcement.com/uk/en/hanson/products/cements/ggbs_and_related_products/glasgow_.htm.

43. In relation to possible efficiencies, it is notable that any efficiencies that might arise were not sufficient to prevent authorities elsewhere in Europe taking action to bring to an end similar [the nature of the contract] arrangements for GGBS in other jurisdictions, though we note that there may be some differences between GGBS arrangements in these other jurisdictions and in Great Britain.

44. Hanson told us that the [nature of the contract] agreement was logical and required, when it came to the very significant capital investments that the then-owner of the Civil and Marine business had needed to commit to when founding and scaling up the GGBS UK business, coupled with the unusually high levels of risk in pioneering, what was seen as a highly innovative business on such a scale. Hanson also told us that a [the nature of the contract] contract was also required because of the uncertainty in the production of steel and the likelihood that the associated availability of GBS from relevant plants would cease or be suspended in time. To illustrate the uncertainty in steel production, Hanson told us that the Redcar Teesside steel plant was closed and that, at that time, it did not think it was going to reopen, so Hanson was obligated to mothball its entire GGBS plant there (namely, the grinding plant at Teesport). Hanson also told us that there had been significant changes to and uncertainty regarding the strategy of steel producers in the UK, [✂].

45. Hanson told us that it did not have information on the exact level of investment in the GGBS plants. For an indication of a rough proxy for the cumulative level of investment in current terms, Hanson referred to the CC's updated issues statement, which stated that the approximate cost of building a new clinker grinding plant was £50 million. Hanson said that this level of capital investment and market risk would naturally require the security of an [the nature of the contract] arrangement for granulate supply to justify the cost of building and upgrading five new grinding plants,

in the context of it being a new and pioneering development, to be attempting such operations on this scale in the British construction market.

46. Hanson has separate facilities for grinding cement and for producing GGBS. It told us that with some technical modifications and additions such as limestone source and gypsum source and a method of integration, it would be possible to mill clinker to make cement from its GGBS grinding facilities. It told us that it had not used its GGBS facilities to grind cement and that it had no plans to do so in the future. Conversely, it told us that a clinker grinding plant could not produce GGBS without further modification since GGBS production involved the additional operating of drying (involving dryers/burners and associated conveyors, pipe works and filtration).

47. Hanson highlighted the clear need for efficiencies from the perspective of the steel industry, whose business was not the commercial trading of products used in the cement industry. In this respect, Hanson highlighted the need of the steel industry to ensure that it had in place the efficiency of a [the nature of the contract] solution to guarantee the offtake of what would otherwise constitute waste and represent a potential cost, were it not processed as a by-product. Hanson also told us that the [nature of the contract] was necessary to create a Great Britain GGBS supplier committed to GGBS production to facilitate the promotion of GGBS as an alternative to CEM 1 and PFA.

48. Hanson also explained that [the nature of the contract] over all three steel plants was a necessity due to *(a)* uncertainty in the production of steel at individual plants (meaning that access to all three plants meant that mothballing or closure of one steel plant would not destroy its business) and *(b)* the fact that Hanson swapped supplies for GGBS around the three plants, which Hanson frequently did depending upon its needs; whether there was high demand from customers at a particular plant,

meaning that some customers might instead be supplied from an alternative plant; and the quality of the granulate produced at a particular plant, meaning that, for example, if the granulate was not of the correct quality, then supply to customers might be made from an alternative plant.

Competition problems

49. The main possible competitive problems linked to the [nature of the contract] is that Hanson has market power in the supply of GGBS in Great Britain, leading to higher prices and/or lower availability of GGBS than would otherwise be the case. Hanson market power in GGBS could also lead to concerns regarding foreclosure of competitors for the supply of GGBS.[9]

50. Figure 2 shows the trend in Hanson's sales of GGBS over the period 2007 to 2011, split into internal and external sales.

FIGURE 2

Hanson's GGBS sales, 2007 to 2011

[✂]

Source: CC calculations on data provided by Hanson.

51. Figure 3 shows the trend in Hanson's average selling prices of GGBS over the same period. [✂]

FIGURE 3

Hanson's average selling prices of GGBS, 2007 to 2001

[✂]

Source: CC calculations on data provided by Hanson.

[9] Due the large share held by Hanson [✂], we have analysed Hanson's prices, volumes and margins.

52. Figure 4 shows Hanson's GGBS sales to each of the Majors and to the Independents over the period 2009 to 2011. [✂]

FIGURE 4

Hanson sales of GGBS, 2009 to 2011

[✂]

Source: CC calculations on data provided by Hanson.

53. Figure 5 shows Hanson's average selling prices to each of the Majors and to Independents over the same period. [✂]

FIGURE 5

Hanson's average selling prices of GGBS, 2009 to 2011

[✂]

Source: CC calculations on data provided by Hanson.

54. Table 8 shows that independent RMX and concrete producers account for [✂] per cent of total GGBS sales by Hanson. This compares with our estimate of about [✂] per cent of all sales of bulk cement by majors being made to independents.[10]

TABLE 8 **Hanson sales of GGBS by type of customer, 2011**

	tonnes
Sales by Hanson	[✂]
Of which, sales to :	
Hanson	[✂]
Cemex	[✂]
Lafarge	[✂]
Tarmac	[✂]
Aggregate Industries	[✂]
Independent	[✂]
Total (%)	100

Source: CC calculations on data provided by Hanson.

55. Table 9 compares Hanson's average selling prices of GGBS with Hanson's average selling prices for bulk cement for the period 2008 to 2011. [✂]

[10] CC calculations based on Majors data.

TABLE 9 **Hanson's average selling prices for GGBS and bulk cement, 2008 to 2011**

		£
	GGBS	*Bulk*
2008	[✂]	[✂]
2009	[✂]	[✂]
2010	[✂]	[✂]
2011	[✂]	[✂]
Growth (%)	[✂]	[✂]

Source: CC calculations on data provided by Hanson. [✂]

[✂]

56. Table 10 shows data from Hanson's 2010 and 2011 business reviews on GGBS and cement profit margins.. Hanson told us that these were forecast margins (not actual margins). In addition, it told us that the bulk cement margins displayed were the forecasts for all of its cement activities (including bulk, bagged cement and white cement) and that the data excluded Hanson and Heidelberg overheads). Therefore Hanson argued that the margins shown below were not a true representation of Hanson's cement margins. Bearing in mind that the figures below should be interpreted with caution, we note that the table [✂].

TABLE 10 **Hanson's profit margins for GGBS and bulk cement, 2010 and 2011**

		per cent
	2010	*2011*
GGBS		
Gross variable margin	[✂]	[✂]
Gross variable and fixed margin	[✂]	[✂]
Bulk cement		
Gross variable margin	[✂]	[✂]
Gross variable and fixed margin	[✂]	[✂]

Source: CC calculations on data provided by Hanson.

Note: [✂].

57. Hanson [✂].[11]

58. [✂] Hanson's [✂].[12]

[11] [✂]

59. We have seen another piece of evidence [✂].

60. [✂]

61. This email [✂].

62. [✂]

63. [✂]

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[12] [✂]