ANNEX A: PREPARATORY STUDY SELECTED EXCERPTS – STOCK & SALES DATA OF FURNACES AND OVENS

Task 2, Table 1. Estimated current and future EU sales of furnaces and ovens and current stocks by sector

Type of oven or furnace	Estimated EU annual Sales c. 2008	Current estimated stocks	Expected future trends in sales	Estimated EU Sales 2020
Laboratory				
Laboratory ovens	25 000	400 000	25 000	27 000
Laboratory furnaces	9 000	140 000	9 000	9 000
Laboratory incubators	15 000	225 000	16 000	19 000
Analytical instruments that include ovens or furnaces	17 000 (2007 sales)	170 000	20 000	27 000
Medical sterilizers – steam	Estimated at 7 000	100 000	7 000	7 000
Small- and medium– sized industrial				
Agricultural driers	2 000	20 000	No change	2 000
Metals heat treatment	c.1 500 (500 each of induction, vacuum and thermal)	30 000	No significant changes	1 500
Small / medium foundry melting furnaces	600 (40 rotary melting, c.500 small crucible, c.60 other types)	6 000	No significant changes	600
Medium industrial ovens & furnaces ***	500	50 000	No significant changes	500
Hazardous waste incinerators	100	1 000	Could increase as a result of higher landfill prices	
Mainly small size industrial	15 000	225 000	No significant change	15 000
Batch bakery ovens	50 000	500 000	Lot 22 study predicts increase of 1 – 1.5% p.a.	c.54 000

Type of oven or furnace	Estimated EU annual Sales c. 2008	Current estimated stocks	Expected future trends in sales	Estimated EU Sales 2020
Printed circuit board reflow ovens	286	20 000	No significant change	286
Continuous electric furnaces for electronics, solar panels, etc.	90	10 000	Uncertain, probably no change	90
Large				
Steel production	Steel smelting = 0, (c.10 refurbished/yr)	538	No new blast furnaces but some new Electric Arc Furnaces	No change likely
Cement and lime kilns	Cement kilns = c. 2/ yr + c. 2/ yr refurbished New lime kilns = 1.2/yr Refurbished lime kilns = 1 /yr	377 cement c.600 lime	Cement kilns = c. 2/ yr + c. 2/ yr refurbished New lime kilns = 1.2/year Refurbished lime kilns = 1 / year	No change likely
Glass production	>60 large plus many more smaller furnaces 25 new container glass melting but no new flat glass	628 (of >20t/day 2005) Total >787 (58 flat and c.300 container glass melting)	No change	No change likely
Ceramic production	Brick and roof tile kilns & ovens = 20 Ceramic tile and sanitary ware = c.20 Other ceramic = 4*	10 000	No change or small decrease	No change likely
Non-ferrous metal production (smelting and melting)	50	750	No change or small decrease	No change likely
Large ferrous and non-ferrous metals heat treatment	60 **	1 200	No change or small decrease	No change likely
Steel reheating	50	1 000	No change or small decrease	No change likely

Type of oven or furnace	Estimated EU annual Sales c. 2008	Current estimated stocks	Expected future trends in sales	Estimated EU Sales 2020
Oil refinery furnaces	45 (replaced / yr assuming 40 year life)	1 800	No data available	Not known
Waste to energy incinerators	10	903	8 (2012) – 10 (2020)	10
Bakery ovens	40	1 200	No change	40

* - tableware, mineral wool, HTIW, refractories, technical ceramics etc.

** - includes continuous annealing lines (3 p.a.), batch bell type furnaces bright annealing lines for stainless steel and for copper, hardening lines for steel, pusher type furnaces for aluminium and batch furnaces for aluminium

*** - One manufacturer of medium size furnaces and ovens with a moderately significant EU market share has provided data on all of their products sold since 2000. Of these, 65% were for metals heat treatment, 20% were for curing of coatings and 4.4% were for drying.

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Task 2, Table 1 above includes all available data and **will include some duplication**. For example, "mainly small size industrial" will include solder reflow and electric continuous furnaces. Sources of data are summarised below.

Table 2. Sources of sales and stock data

Type of oven or furnace	Sources of sales and stock data
Large	
Steel production	One new steel production plant installed in the last 10 years in EU and no new plant likely in EU. There are c.90 blast furnace / BOS facilities which are refurbished every 10 – 25 years so c. 9 blast furnace rebuilds per year plus other types of furnace/oven assuming numbers remain stable within the EU. Industry information is that there are c.10 refurbishment projects for steel production furnaces annually in EU.
Cement and lime kilns	Data from Cembureau shows that there was an increase of 14 cement installations between 2005 and 2008 in the EU, and all were dry kilns with pre-heaters and pre-calciners. There was a decrease of 7 installations of other types indicating that these older kiln types were replaced by new energy efficient kilns. This means that there were 7 new and 7 refurbished kilns assuming 1 kiln per installation (which will not always be correct). On average there are 1.6 kilns / installation and so actual numbers may be more than 7 + 7 over 3 years. New lime kiln data from trade association EuLA

Type of oven or furnace	Sources of sales and stock data
Glass production	There are 787 installations covered by IED but also there are many more of the smaller installations with medium-size and small furnaces and most installations have > 1 furnace so the actual total number is not known. However, the biggest producers and energy consumers are for container and flat glass. EU container glass production in 2007 was 22 million tonnes and a medium size container glass melting furnace would produce 87,500 tonnes / year so there are about 250 container glass melting furnaces in EU. Time between refurbishment is c.15 years so 250/15 = 17 per year. New sales data provided by stakeholders. 9.37 million tonnes flat glass produced annually in the EU. Sales and stock data supplied by a flat glass manufacturer. It was calculated that there are 3 – 4 flat glass melter rebuilds per year, assuming a stock of 58 having a life of c.15 years between rebuilds. New plant are less common. (There are also lehrs, and other furnaces used).
Ceramic production	Data for bricks, tiles and sanitary ware furnaces supplied by trade association ACIMAC.
Non-ferrous metal production (smelting and melting)	Sales and stock data are estimates based on stock data from 2009 draft IPPC BREF and some data from stakeholders. BREF data: Cu 20 sites, Al 130 sites, Zn 27 sites & Lead 39 sites (c.400 furnaces in total). For copper each site will have at least one primary smelter and one fire refining furnace. Most aluminium sites are secondary furnaces and may be more than one furnace per site. Zinc each of 15 primary sites has one roaster and there are 12 secondary sites with at least one furnace. 9 primary lead smelting furnaces and about 30 sites with at least one secondary refining furnace. There will also be many more of the smaller furnaces (sales estimated from stocks assuming 15 year lifetime).
Large ferrous and non-ferrous metals heat treatment	Data provided by several stakeholders
Steel reheating	Data provided by stakeholders
Oil refinery furnaces	From ref[1]
Waste to energy incinerators	Published data[2]
Bakery ovens	Data provided by stakeholders
Small and medium – size industrial	
Agricultural driers	Data from stakeholder
Metals heat treatment	Data provided by several stakeholders
Small / medium foundry melting furnaces	Data provided by stakeholder
Medium industrial ovens & furnaces	Data from manufacturer of medium sized ovens and furnaces

[1] "Description and Characterisation of the Ceramic Fibres Industry of the EU", Environmental Resource Management 1995

[2] ISWA report "Energy-from-Waste Statistics - State-of-the-Art-Report" 5th Edition August 2006, data for 2005 including Norway and Switzerland. 903 line at 427 installations

Type of oven or furnace	Sources of sales and stock data
Hazardous waste incinerators	Data from manufacturer
Mainly small size industrial	Data from manufacturer
Batch bakery ovens	Data from Lot 22 Eco-design preparatory study
Printed circuit board reflow ovens	Data from manufacturers
Continuous electric furnaces.	Estimates from manufacturer
Laboratory	
Laboratory ovens	EU sales estimated by one manufacturer, confirmed by data from other manufacturers
Laboratory furnaces	EU sales estimated by one manufacturer, confirmed by data from other manufacturers
Laboratory incubators	EU sales estimated by one manufacturer, confirmed by data from other manufacturers
Analytical instruments that include ovens or furnaces	Data from manufacturer
Medical sterilizers – steam	Data from several manufacturers

Total annual sales and stocks for large industrial, medium industrial and lab sectors are listed in Table 3.

Table 3. Estimated EU annual sales, stock levels and numbers refurbished of furnaces and ovens based on data from stakeholders, IPPC BREFs and other sources

Sector	Estimated EU annual sales	Estimated EU stock	Estimated numbers refurbished annually
Large industrial	c. 400	c.15 000	c.150
Small / medium size industrial	18 000 (plus 50 000 batch bakery ovens)	340,000 (plus 500 000 batch bakery ovens)	10 000
Laboratory*	50 000	800 000	Uncommon

* Totals depend on whether incubators and laboratory instruments containing ovens are included.

Small / Medium: The data for small and medium size is dominated by the large number of batch bakery ovens, and so the values including and excluding these have been calculated (industrial batch bakery ovens are the same designs as commercial bakery ovens assessed in the separate DG Energy Lot 22 eco-design preparatory study). The average power rating for gas ovens is affected very significantly by agricultural driers, as sales are c.2000 of a total of 3440 medium-size gas ovens and furnaces. Although agricultural driers are not typical ovens, they appear to be relatively energy efficient. They are used for only short periods each year.

Medium/ Large: Data for the main design classifications used by this study for large size and small/ medium size industrial furnaces and ovens have been determined using data provided by stakeholders and from published sources. This has used annual sales data with information on the ratios of batch/ continuous, electrically heated to fossil fuel, by temperature (i.e. ovens / furnaces) and the average power ratings of small / medium size industrial have also been calculated. (These data are given in Appendix B of the Preparatory Study (2012). The data is summarised here for small and medium size industrial and for large size industrial.)

Table 4. Average characteristics of small and medium size industrial furnaces and ovens

Classification	All small and medium size industrial	Small and medium size industrial excluding batch bakery ovens
Electric / gas	54% electric / 46% gas	92% electric / 8% gas
Batch / continuous	98% batch / 2 % continuous	91.1% batch / 8.9% continuous
Ovens (<450°C) / furnace (>450°C)	87.5% ovens / 12.5% furnaces	58% ovens / 42% furnaces
Average power rating electric	57.3 kW	66.2 kW
Average power rating gas	161 kW	688 kW or 254 kW excluding agricultural driers

For base case calculations BC2-5, we have used the values for power rating that exclude batch bakery ovens, because these types of ovens have already been assessed in the DG Energy Lot 22 Ecodesign Ovens/ Cookers study. Grain driers are also excluded because they have a high power rating, but are used only six weeks per year, and their inclusion would give an unrepresentative high average value.

Table 5: Sales and stock of small/ medium-sized industrial furnaces and ovens

Configuration	Type	Energy	Sales	Stock
Batch	Oven	Electric	8 758	164 986
Batch	Oven	Gas	762	14 347
Continuous	Oven	Electric	856	16 118
Continuous	Oven	Gas	74	1 402
Batch	Furnace	Electric	6 342	119 472
Batch	Furnace	Gas	551	10 389
Continuous	Furnace	Electric	620	11 672
Continuous	Furnace	Gas	54	1015
Total			**c.18 000**	**c.340 000**

Large: Most large-size industrial furnaces and ovens use fossil fuels (mostly natural gas, some liquid fuels [medium distillates: heavy fuel oil, or gasoil], plus coke/ coal). The only exceptions are electric arc furnaces for melting steel, some induction melting (electric) furnaces for metals and a few electric glass melting furnaces in countries where cheap electricity is available, such as Sweden. Many of these furnaces and ovens are continuous, but some are batch, such as: bell type heat treatment furnaces, several types of metal melting furnaces some large brick drying ovens, etc. At least 80% are >450°C (furnaces). Raw data are given in Appendix B (Preparatory Study [2012]).