ANNEX E: INITIAL INDICATIVE DRAFT IMPACT ASSESSMENT ENERGY SAVINGS ACCORDING TO MODELLED POLICY OPTIONS AND FURNACE/ OVEN BASE CASES

1. OVERALL SCOPE

The overall scope of products covered in ENTR Lot 4 includes industrial and laboratory furnaces and ovens. These products are extremely variable in size, complexity, uses, cost and energy consumption. As such, they need to be represented by 11 sub-categories, or Base Cases, shown in Table 1. The ENTR Lot 4 Ecodesign Preparatory Study[1] reviewed many types of classification that are used by industry, and the most robust classification for ecodesign purposes is suggested as follows:

- Laboratory ovens and furnaces (Base Case 1)
- Small and medium-sized industrial furnaces and ovens (Base Cases 2-5)
- Large-sized industrial furnaces and ovens (Base Cases 6-7)

This classification is further described below.

Base Case 1 – Comprises mostly standard designs sold in relatively large numbers. Reliable, objectively and transparently comparable energy consumption information is usually not available to end-users, as there is as yet no agreed standard measurement method.

Base-Cases 2-5 – These products include a wide variety of designs, most being custom-designed to some extent. Energy consumption information is usually available to end-users, but price and function are usually more important considerations than energy efficiency, except for the most energy intensive processes. Superior energy efficiency is usually available at a higher purchase price, although lifetime costs may be lower due to lower energy costs. These types of furnaces and ovens may be either fired by natural gas, or via electricity.

Base-Cases 6-7 – Sales of new large-size furnaces and ovens are of a relatively low volume, but their total energy consumption is very significant. The Base Case 6-7 furnaces and ovens consume over 80% of the energy used by all furnaces and ovens in the EU, and it is estimated that industrial furnaces consume possibly up to half of EU industrial energy consumption.

The industrial ovens and furnaces can either be gas-fired, oil-fired, coke or coal-fired, or operated via electricity. Therefore, each of the oven/ furnace Base Cases 2-5 is further categorized according to the type of energy source for its operation (Table 1).

[1] Final report (Sept 2012), ENTR-2009-35, Contract SI2.549003. Download available at CIRCABC open access Ecodesign Preparatory Studies library: https://circabc.europa.eu/w/browse/5cc4bea8-95d4-43e3-ab36-c859d0694217

Table 1: Overall Oven/ Furnace Base Cases

Base Case reference	Base-Case description
BC1 (Lab)	Laboratory ovens and furnaces
BC2a (BO/e)	Medium size batch oven (electric)
BC2b (BO/g)	Medium size batch oven (gas)
BC3a (CF/e)	Batch chamber furnace (electric)
BC3b (CF/g)	Batch chamber furnace (gas)
BC4a (CO/e)	Continuous oven (electric)
BC4b (CO/g)	Continuous oven (gas)
BC5a (CBF/e)	Continuous belt furnace (electric)
BC5b (CBF/g)	Continuous belt furnace (gas)
BC6 (LF)	Large furnace (assumes fossil fuel)
BC7 (VLO)	Very large oven (assumes fossil fuel)

2. OVERVIEW OF POLICY OPTIONS AND SCENARIOS

There are two active policy options (POs) that have been selected for detailed Impact Assessment appraisal, in addition to the "No action" (i.e., "Business As Usual" [BaU]) option for each Base Case. Each PO consists of different scenarios, which are compared to the BaU option, as explained below.

Business as Usual (BaU): in this scenario, it is assumed that there will be no intervention of any energy saving technology until 2035. Hence, there will be no variation in unit furnace/oven energy consumption.

There are different sub-scenarios for each PO, as discussed below, and shown in Table 2:

Policy Option 1: Ecodesign Implementing Measures - the measures addressed under this policy option apply only to sales of new products. The different scenarios for this PO are discussed below:

- **Scenario 1: Mandatory Ecodesign Requirements (MER)** – this scenario is a combination of several energy saving measures, as explained in the main Summary Working Document. The first Tier for this scenario is assumed to be implemented in 2016. Subsequently, Tier 2 and Tier 3 mandatory ecodesign requirements are assumed to be implemented in 2020, and 2026, respectively ;
- **Scenario 2 (Reference only): Least life cycle cost (LLCC)** – statistics related to this reference scenario model what would occur if the LLCC option were to be hypothetically implemented from 2016.

Table 2: Summary of Achievable Energy Savings per Base Case Oven/ Furnace Compared to BaU under Different Policy Option and Reference Scenarios

Base Case (BC)	Potential PO1 (MER) Primary Energy Savings			Potential LLCC Primary Energy savings (reference)	PO2: Potential BAT Primary Energy savings
	Tier 1 (2016)	Tier 2 (2020)	Tier 3 (2026)		
BC1 (Lab)	38% (only the MER scenario is applied) of achievable energy savings, which correspond to BAT[2]				
BC2a (BO/e)	0%	5%	5%	5%	5%
BC2b (BO/g)	3%	27%	47%	47%	47%
BC3a (CF/e)	0%	6%	6%	6%	6%
BC3b (CF/g)	3%	27%	47%	47%	47%
BC4a (CO/e)	0%	6%	6%	6%	6%
BC4b (CO/g)	3%	27%	47%	47%	47%
BC5a (CBF/e)	0%	6%	6%	6%	6%
BC5b (CBF/g)	3%	27%	47%	47%	47%
BC6 (LF)	9%	13%	21%	21%	21%
BC7 (VLO)	9%	13%	20%	20%	20%

Note: The energy savings are shown as **Primary Energy** savings. For natural gas, Primary Energy inputs are approximated to be equal to the final gas energy use/ savings (i.e., there is no "Well to Furnace/ Oven" losses or impact considered). For electricity, the standard Ecodesign multiple of 2.5 Primary Energy: Final Energy use is utilised, i.e., for every electricity kWh, 2.5 kWh of coal, natural gas etc is assumed to be required (an EU-wide electricity generation conversion efficiency of 40%).

Policy Option 2: PO2[3] requires Best Available Technology (BAT) to be applied, via regulation, using the Industrial Emissions Directive (IED) BREF mechanism, or hypothetical benchmarking via the Emissions Trading System, ETS (or both IED and ETS): the BAT energy-saving measures under this policy option are assumed to be carried out on existing stock (via refurbishment, components renewal, etc), as well as on sales of new stock.

It is assumed that PO2 is assumed to be effective 4 years after it comes into force for each relevant sector, via latest revisions of sectoral BREFs, in line with BREF implementation requirements. Note

[2] According to the draft Lot 4 Interim Impact Assessment findings so far, the achievable BAT energy savings is 38% for BC1 (which has been confirmed by one of the laboratory oven/ furnace manufacturers).

[3] Note that PO2 does not apply to laboratory ovens/furnaces (BC1), which are in all cases too small to be within the scope of the IED. It should also be noted that varying proportions of furnaces and ovens from BC2-BC7 will fall within IED and/ or ETS depending on the industrial end-user sector concerned (as discussed in the main ENTR Lot 4 Consultation Forum Working Document).

that PO2 does not apply to smaller "non sector-specific" laboratory ovens/ furnaces (BC1). The different scenarios for PO2 are discussed below:

Modelling statistics assume 3 scenarios for the timing of the BAT uptake of PO2, as explained below.

- **Scenario 1: Optimistic** – it is assumed to be implemented in 2016 (i.e. in two years from the present [May 2014] now assuming there are no delays), and the resulting energy savings would correspond to achievable BAT energy savings of respective base cases as shown in Table 2.
- **Scenario 2: Pragmatic** - it is assumed to be implemented in 2018 (again, the resulting energy savings would correspond to achievable BAT energy savings per base cases [Table 2]).
- **Scenario 3: Pessimistic** - it is assumed to be implemented in 2022; energy savings per base case are again as shown in Table 2.

3. SCENARIOS FOR ENERGY CONSUMPTION OF INDUSTRIAL AND LABORATORY FURNACES AND OVENS

3.1 BC1: Laboratory ovens

For BC1, there is only one policy option (PO1) appraised, which consists of Mandatory Ecodesign Requirements (MER), the impact of which on energy consumption compared to BaU is shown in Figure 1. Note that the achievable energy savings under this scenario are taken to be the same as the potential BAT energy savings (q.v., as in Table 2).

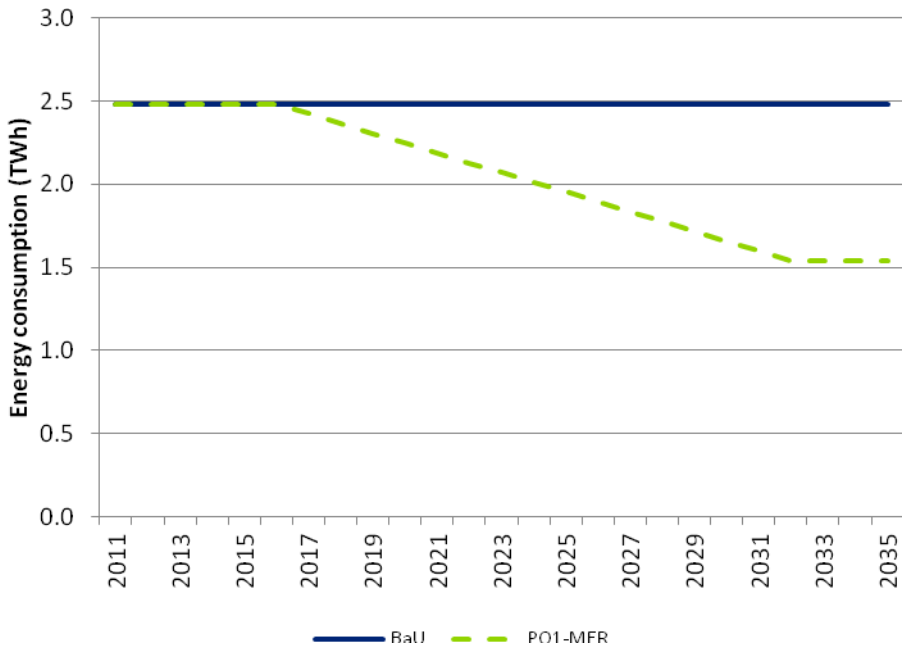

Figure 1: Modelled Final Energy consumption over time for different scenarios under PO1 for BC1

3.2 BC2: Medium-sized Batch Ovens

The ovens in this category can either be gas-fired or electricity operated. Both PO1 and PO2 may be applied to BC2. Both PO1 and PO2 may also be applied via three different scenarios. In each of the

following figures, the impact of these scenarios on energy consumption of the respective base-case is compared to BaU.

3.2.1 BC2a: Electric Batch Ovens

PO 1 - consists of 3 different potential sub-scenarios (MER, LLCC and BAT); Figure 2 shows the potential energy savings corresponding to MER, LLCC and BAT, over time.

The LLCC scenario for this base case gives the same energy-saving results as BAT; therefore, BAT (heavy continuous line) is depicted (i.e., superimposed over the LLCC scenario curve).

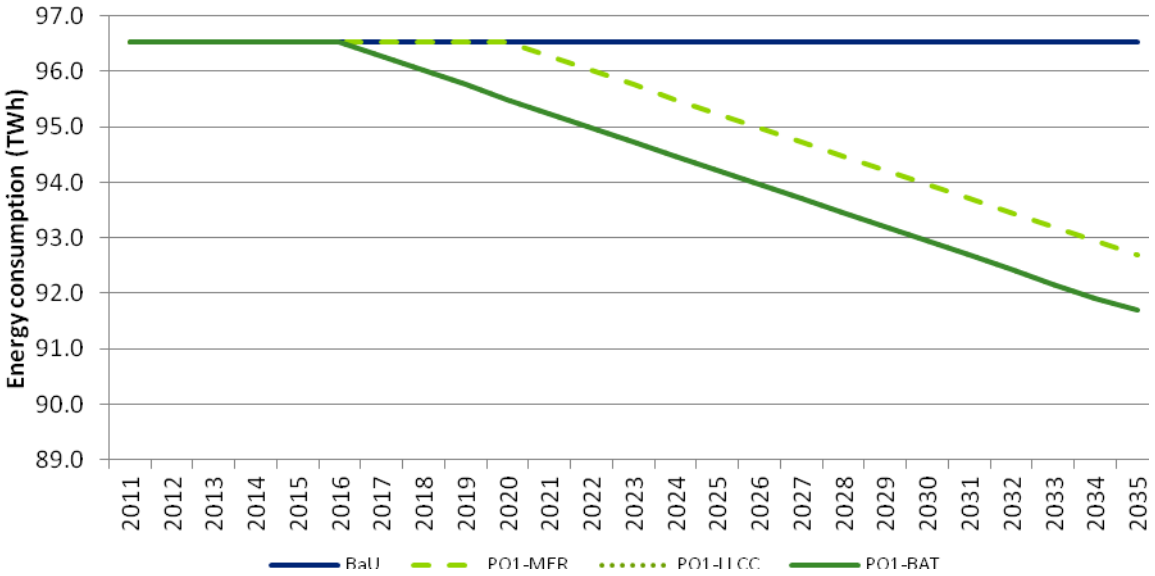

Figure 2: Final Energy consumption over time for different scenarios under PO1 for BC2a (Electric Batch Ovens)

PO2 – also consists of three different time-related sub-scenarios (Optimistic, pragmatic and pessimistic), with regard to when BAT potential energy savings may be adopted, as shown in Figure 3.

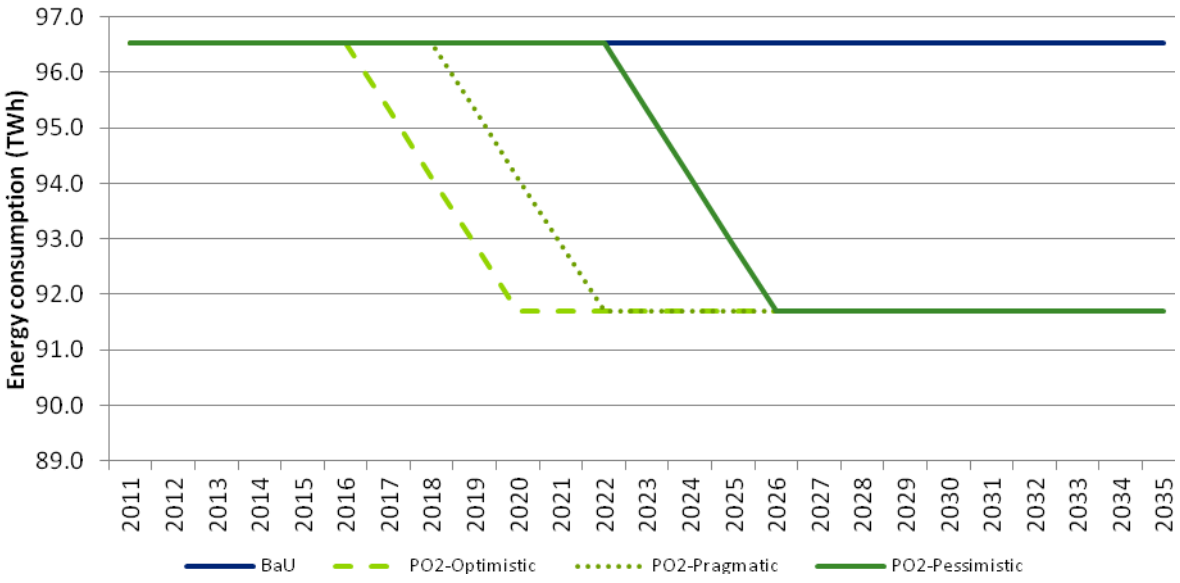

Figure 3: Final Energy consumption over time for different scenarios under PO2 for BC2a (Electric Batch Ovens)

3.2.2 BC2b: Gas-fired Batch Ovens

PO1 - Figure 4 depicts the three MER, LLCC and BAT sub-scenarios of PO1 over time, for Base Case 2b. The results from the BAT and LLCC sub-scenarios were identical, and thus are shown superimposed over one another.

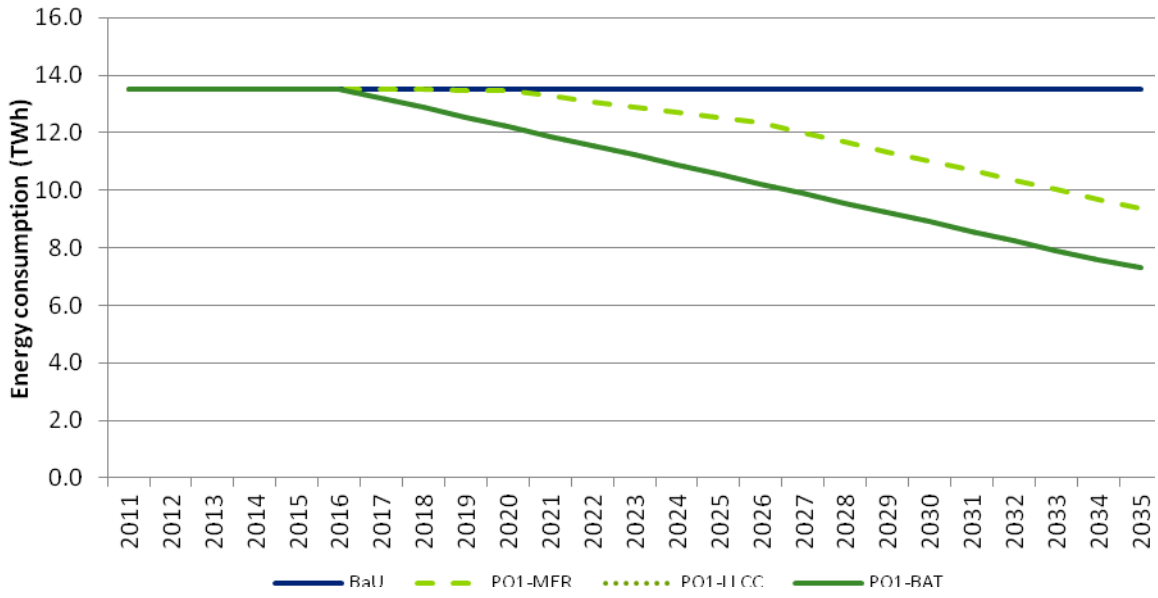

Figure 4: Final Energy consumption - different scenarios under PO1 for BC2b (Gas-fired Batch Ovens)

PO2 – again, three time-related sub-scenarios (Optimistic, pragmatic and pessimistic) for the IED-type BAT policy option are modelled, as shown in Figure 5.

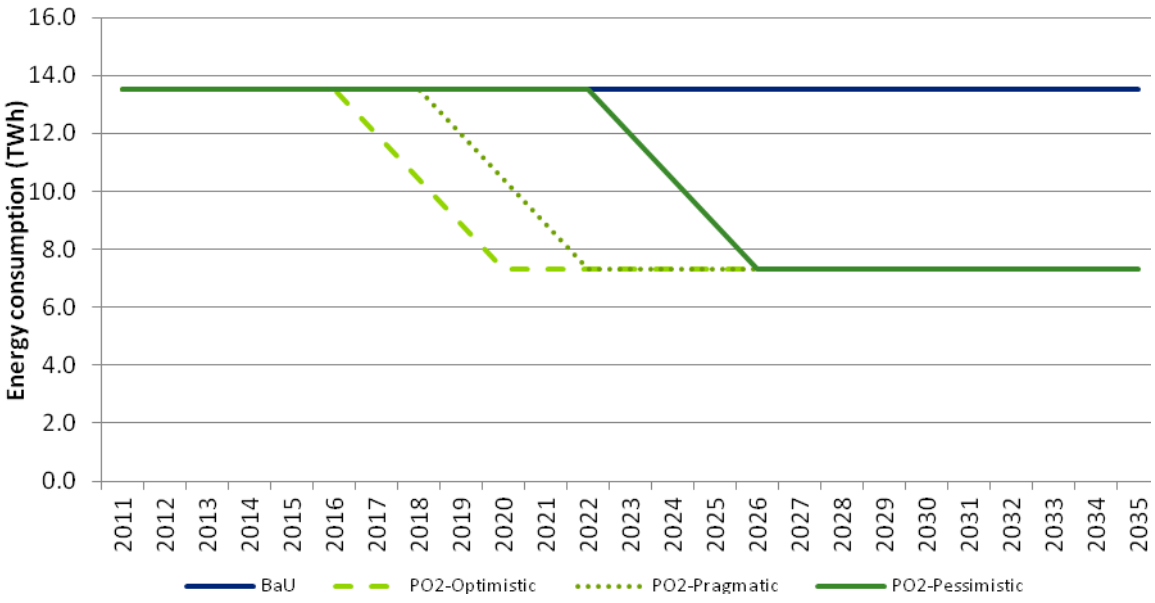

Figure 5: Final Energy consumption - different scenarios under PO2 for BC2b (Gas-fired Batch Ovens)

3.3 BC3: Batch Chamber Furnaces

BC3 ovens may be electricity-operated (BC3a) or gas-fired (BC3b).

3.3.1 BC3a: Electricity-fired Batch Furnaces

PO1 – Figure 6 shows the three different sub-scenarios (MER, LLCC and BAT). BAT and LLCC savings are identical, and are mutually superimposed in the graphic plot.

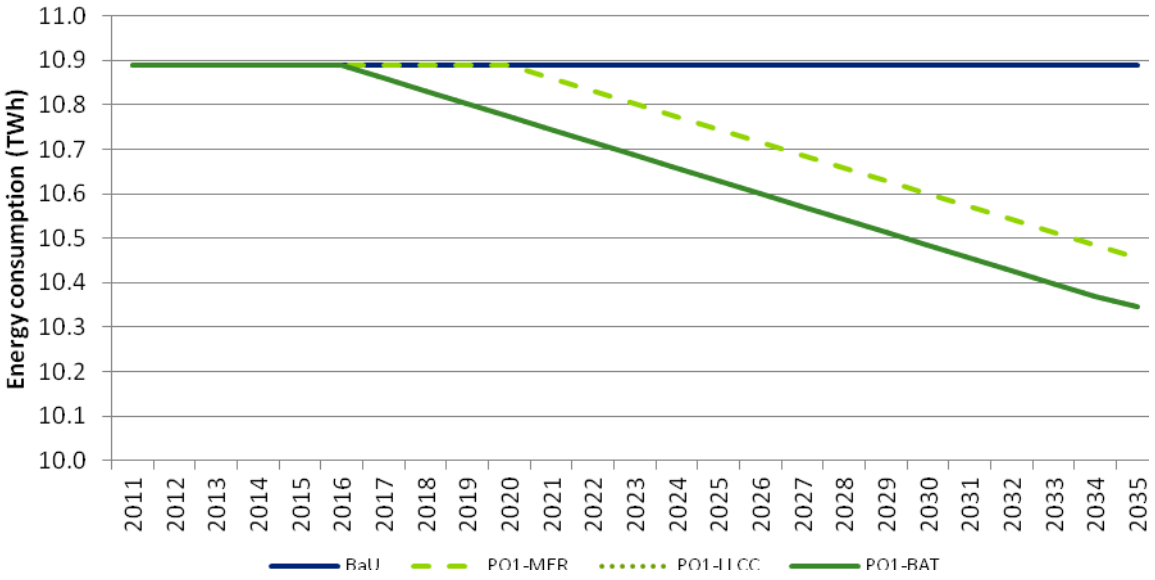

Figure 6: Final Energy consumption over time for different scenarios under PO1 for BC3a (Electric Batch Chamber Furnaces)

PO2 – The IED-related three potential energy-saving scenarios (Optimistic, pragmatic and pessimistic) are plotted in Figure 7, over time.

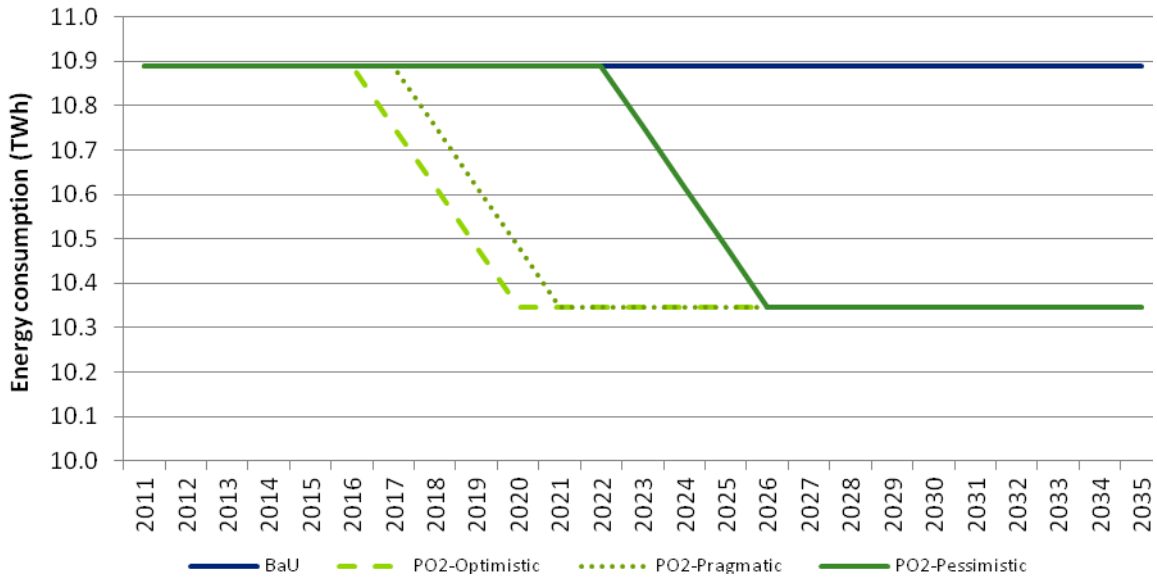

Figure 7: Final Energy consumption - different sub-scenarios: BC3a (Electric Batch Chamber Furnaces)

3.3.2 BC3b: Gas-fired Batch Chamber Furnaces

PO1 – Figure 8 shows the three MER, LLCC and BAT sub-scenarios, LLCC and BAT being identical.

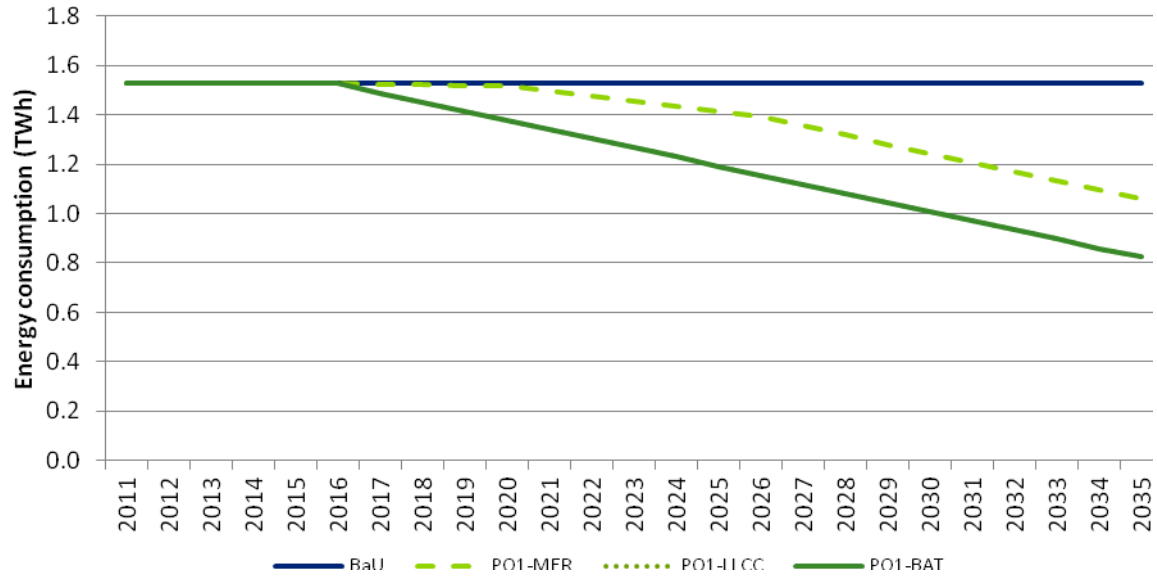

Figure 8: Energy consumption over time for different scenarios under PO1 for BC3b (Gas-fired Batch Chamber Furnaces)

PO 2 – Figure 9 shows the three different sub-scenarios (Optimistic, pragmatic and pessimistic) associated with the BREF-related BAT policy aim.

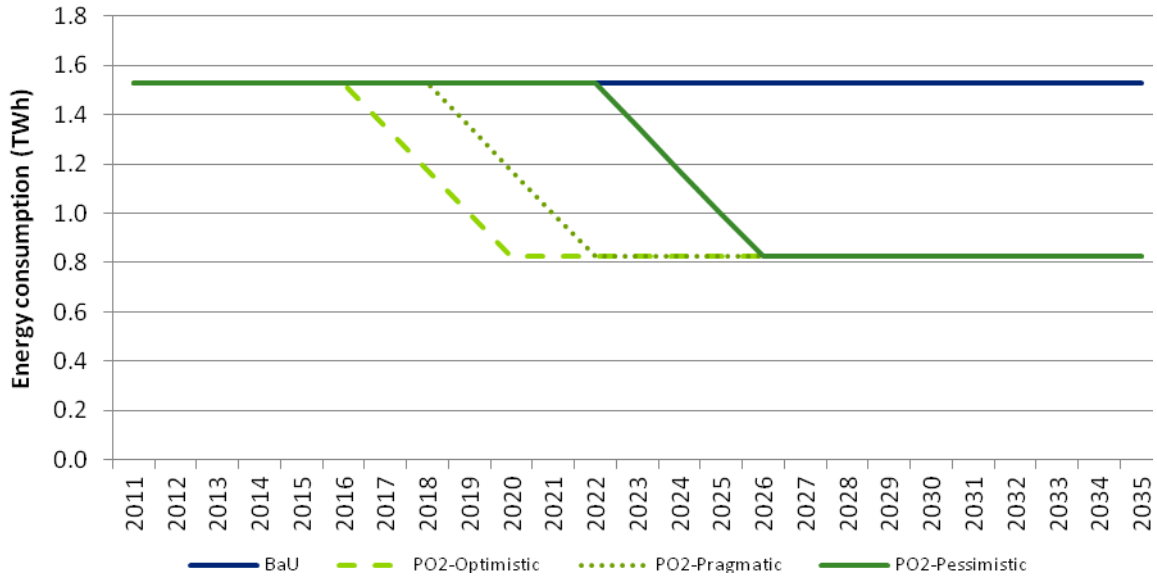

Figure 9: Energy consumption over time for different scenarios under PO2 for BC3b (Gas-fired Batch Chamber Furnaces)

3.4 BC4: Continuous Ovens

BC4 ovens may be can either be gas-fired or operate via electricity.

3.4.1 BC4a: Electric Continuous Ovens

PO 1 – the three different sub-scenarios (MER, LLCC and BAT) are presented in Figure 10, using data taken from Table 2. Once again, as in other BCs, the LLCC savings mirror those of BAT, resulting in one shared plotted curve.

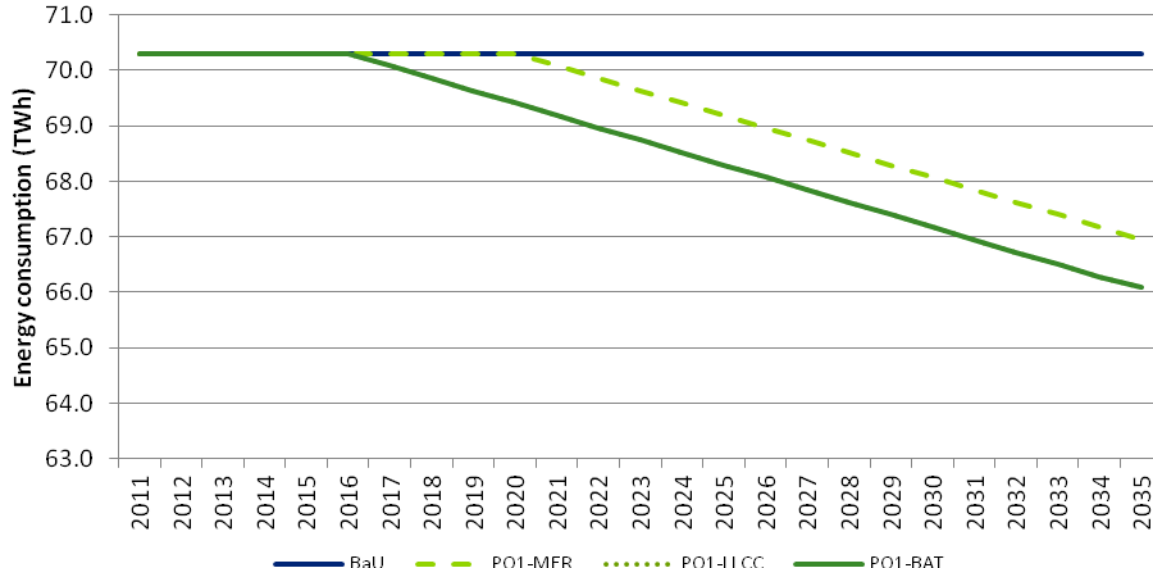

Figure 10: Final Energy consumption over time for different scenarios - PO1 for BC4a (Electric Continuous Ovens)

PO 2 – Figure 11 consists of three different sub-scenarios (Optimistic, pragmatic and pessimistic) for BAT adoption via IED BREFs, regarding related potential energy savings for each scenario.

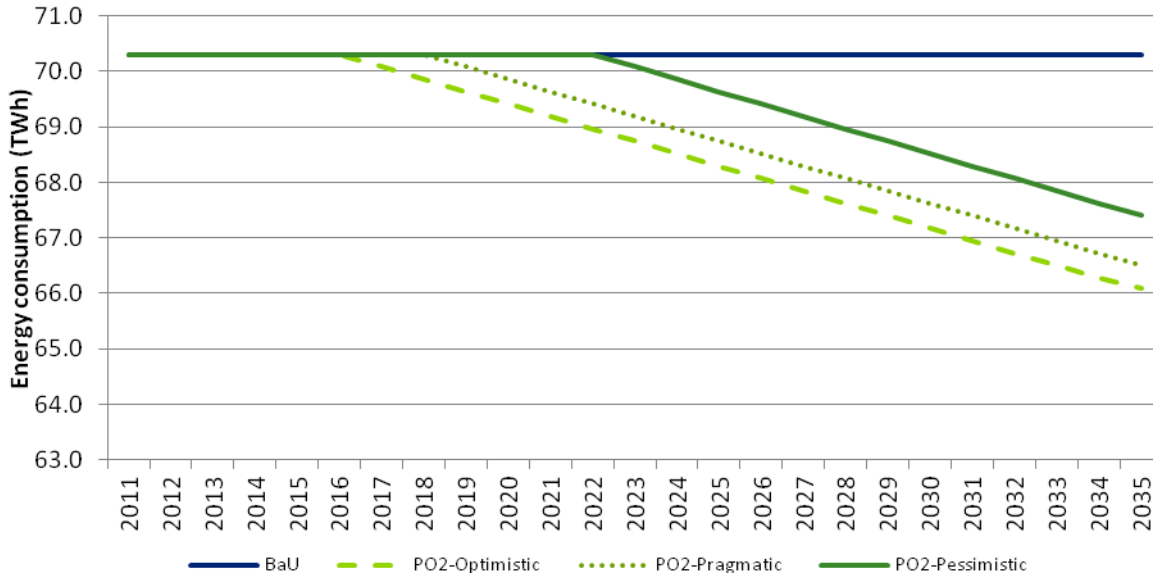

Figure 11: Final Energy consumption over time for different scenarios under PO2 - BC4a (Electric Continuous Ovens)

3.4.2 BC4b: Gas-fired Continuous Ovens

PO 1 - three different sub-scenarios (MER, LLCC and BAT); the potential energy savings from Table 2 modelling are shown in Figure 12, again BAT and LLCC being identical.

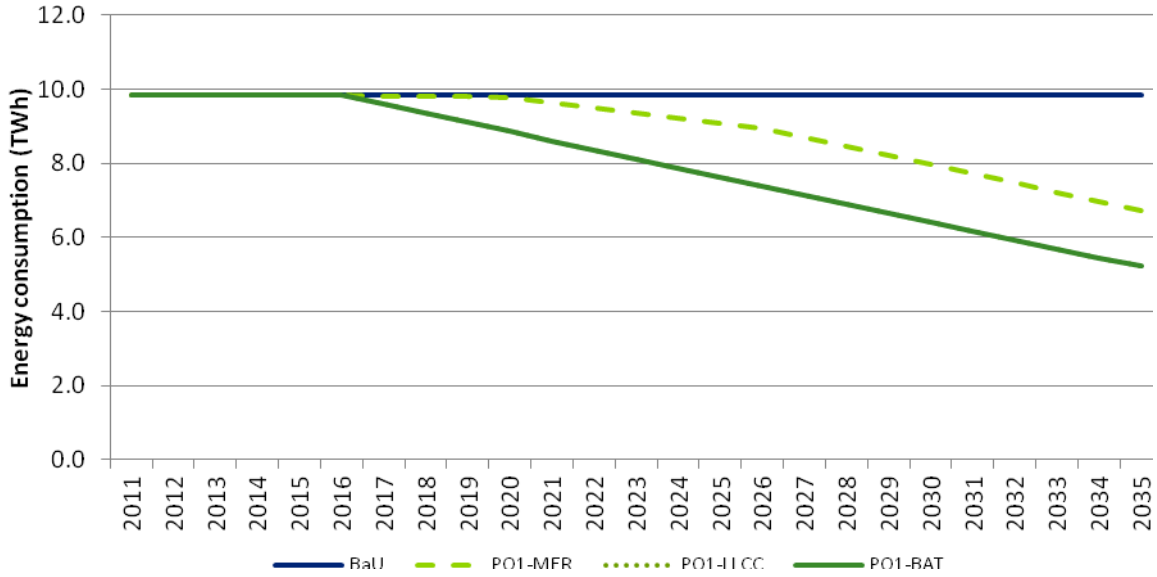

Figure 12: Final Energy consumption over time for different scenarios - PO1 for BC4b (Gas-fired Continuous Ovens)

PO 2 – Figure 13 illustrates three different sub-scenarios (Optimistic, pragmatic and pessimistic) based on the time taken to achieve BAT energy savings (as shown in Table 2 data) via BREF implementation.

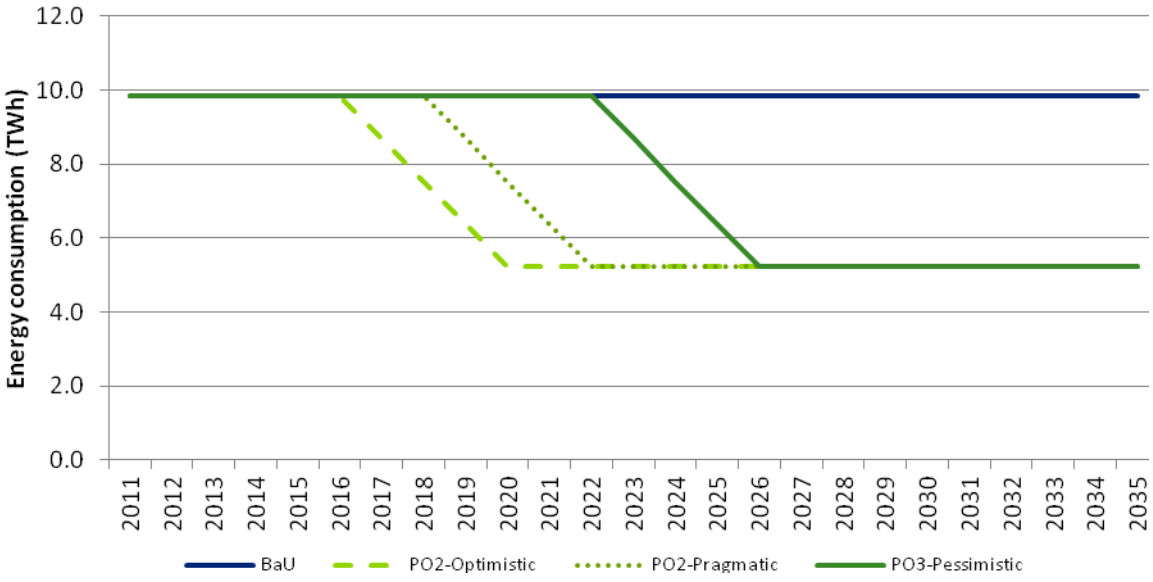

Figure 13: Final Energy consumption over time for different scenarios - PO2 for BC4b (Gas-fired Continuous Ovens)

3.5 BC5: Continuous "Belt" Furnaces

The ovens under this category can either be gas fired or operate on electricity. There are two policy options appraised for this base-case and each PO comprises of three different scenarios. The impact of these scenarios on energy consumption of the respective base-case is then compared with BaU.

3.5.1 BC5a: Electric Continuous "Belt" Furnaces

PO 1 – the three different sub-scenarios (MER, LLCC and BAT) are shown in Figure 14; BAT energy savings are equal to LLCC, as in several other BCs.

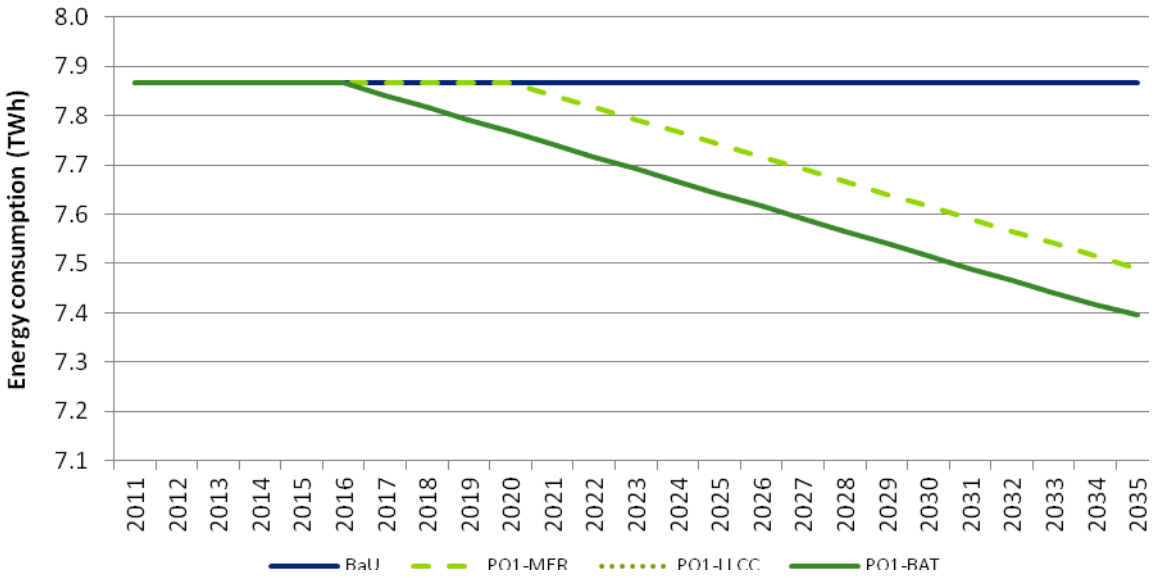

Figure 14: Final Energy consumption over time for different scenarios - PO1 for BC5a (Electric Continuous "Belt" Furnaces)

For PO2, Figure 15 shows the Optimistic, pragmatic and pessimistic BAT scenarios.

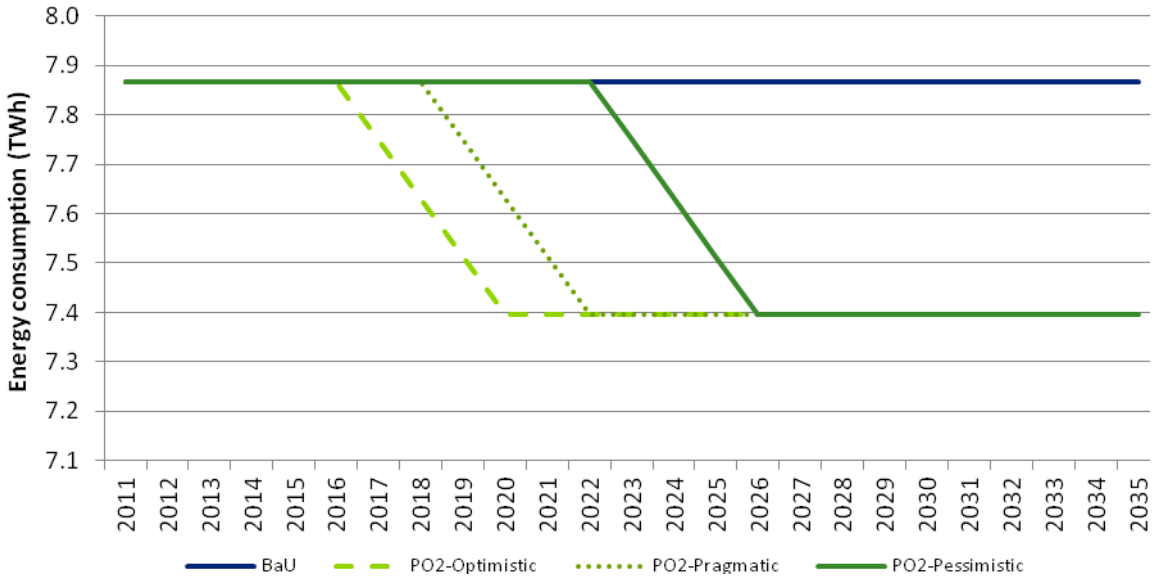

Figure 15: Final Energy consumption over time for different scenarios - PO2 for BC5a (Electric Continuous "Belt" Furnaces)

3.5.2 Gas-fired Continuous "Belt" Furnaces

PO 1 – the three different sub-scenarios (MER, LLCC and BAT) are shown in Figure 16. Note that in BC5b there is a slight divergence between LLCC and BAT potential energy savings over time, and that there is a very slight convergence between MER and LLCC potential energy savings towards the year 2035.

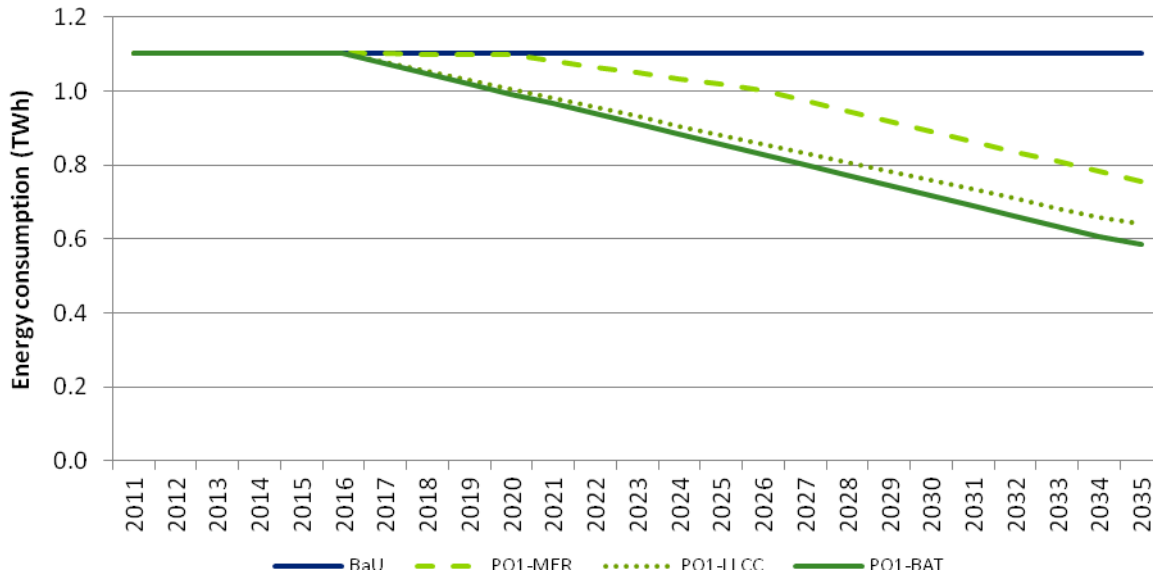

Figure 16: Final Energy consumption over time for different scenarios - PO1 for BC5b (Gas-fired Continuous "Belt" Furnaces)

PO 2 – the three different time-related sub-scenarios (Optimistic, pragmatic and pessimistic) for BAT sectoral BREF adoption are shown in Figure 17 (below).

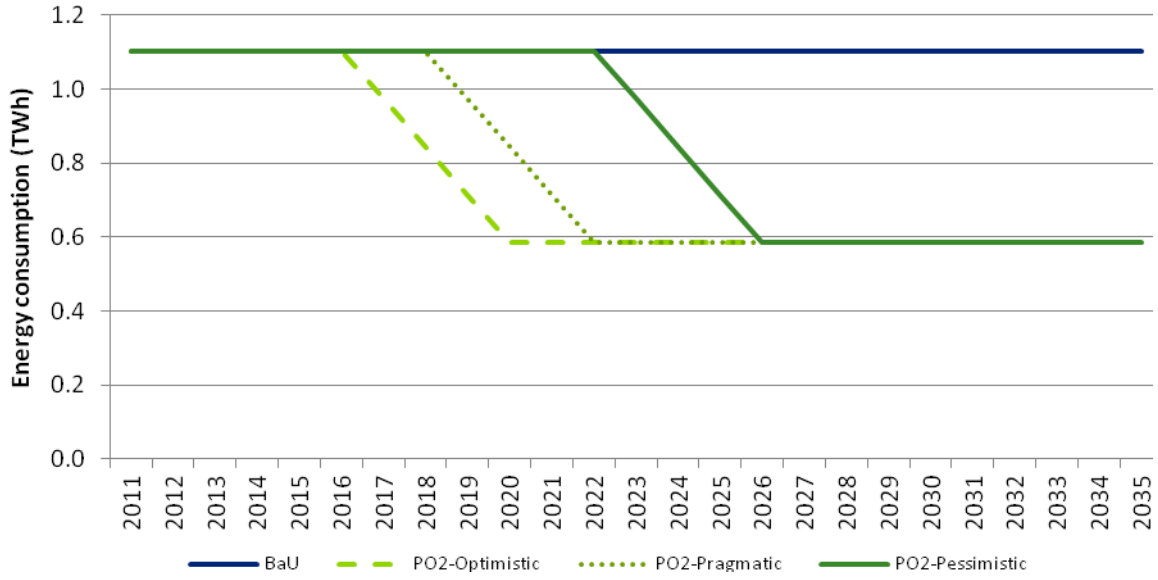

Figure 17: Energy consumption over time for different scenarios - PO2 for BC5b (Gas-fired Continuous "Belt" Furnaces)

3.6 BC6: Large Furnaces (assumes fossil fuel energy input – primarily gas)

The furnaces in this Base Case category are assumed to operate on fossil fuel (either natural gas, fuel oil, coke or coal, but primarily assumed to be natural gas) as the main energy source.

For PO 1, the three different sub-scenarios (MER, LLCC and BAT) are shown in Figure 18, which illustrates that BAT is equivalent to LLCC.

NB Note that **BC6 has by far the highest potential energy savings amounts of all BCs with regard to the energy per se figures**, even though the proportion of energy savings available - as a percentage - is more moderate than in many of the other Base Cases (potentially indicating the maturity of BC6 technologies, in some user sectors), as indicated in Table 2. Between 2016 and 2035 it is simulated via modelling that potentially c. 140 TWh (MER) and c. 180 TWh (BAT) of final energy savings may be gained by adopting the ecodesign-related measures proposed, where feasible.

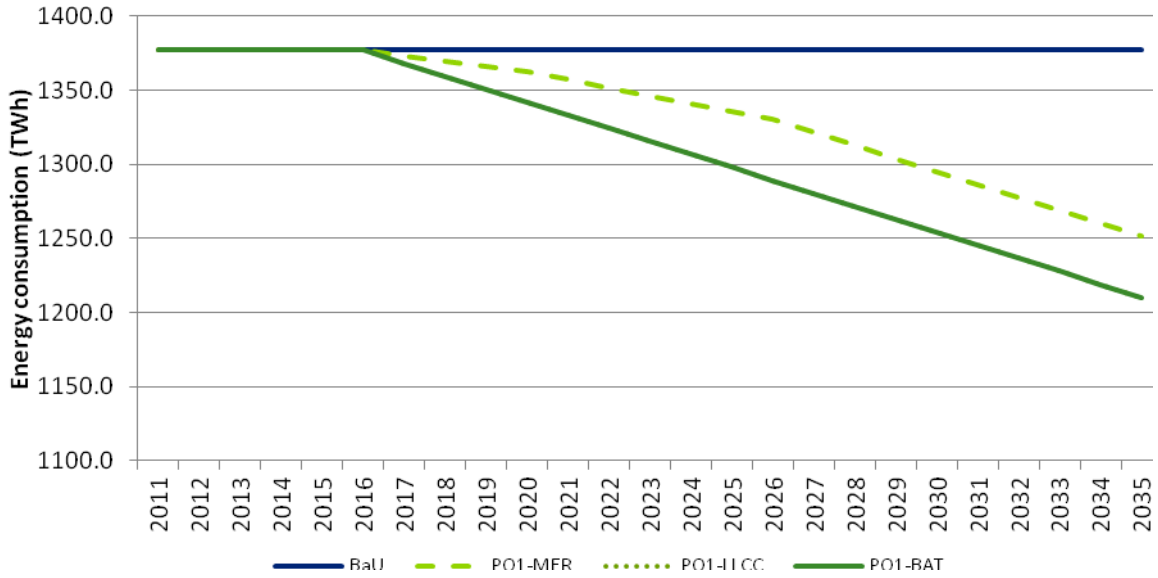

Figure 18: Final Energy consumption over time: different sub-scenarios - PO1 for BC6 (Large Furnaces)

PO 2 consists of the three different sub-scenarios (Optimistic, pragmatic and pessimistic) related to BAT potential energy savings, depending on the timetable for adoption of the technologies concerned. Figure 19 presents energy consumption/ savings scenarios over time for PO2.

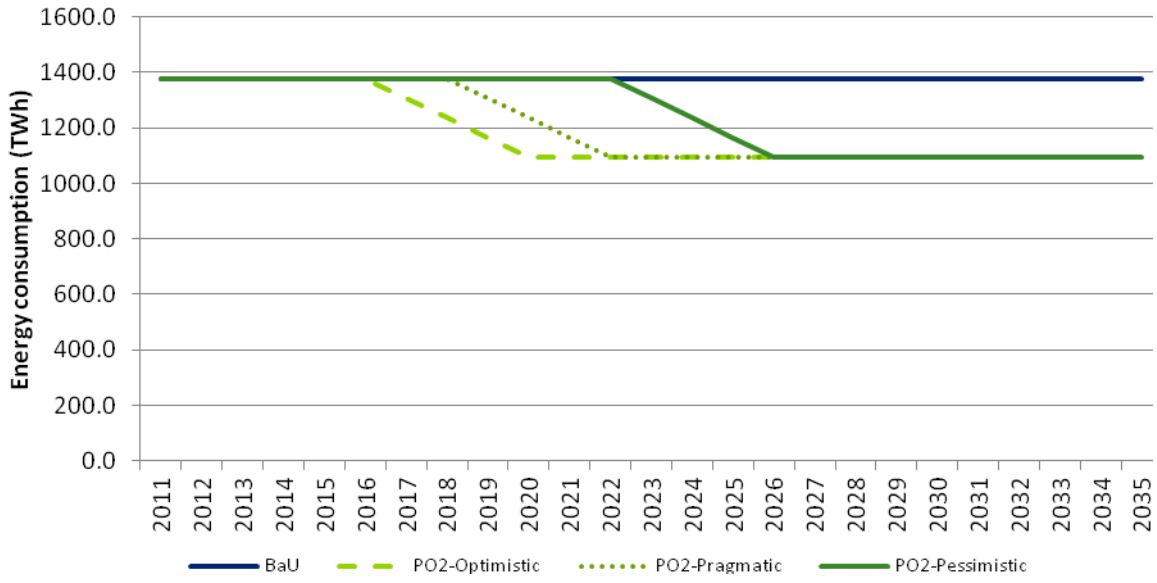

Figure 19: Final Energy consumption over time for different scenarios under PO2 for BC6 (Large Furnaces)

3.7 BC7: Very Large Oven (assumes fossil fuel energy source)

The ovens under this category are assumed to operate on the varieties of fossil fuel (primarily natural gas, as explained in BC6) as the principal energy source.

PO 1 – the three different sub-scenarios (MER, LLCC and BAT) and corresponding potential energy savings (from Table 2) are shown in Figure 20. LLCC and BAT scenarios for this base case are identical.

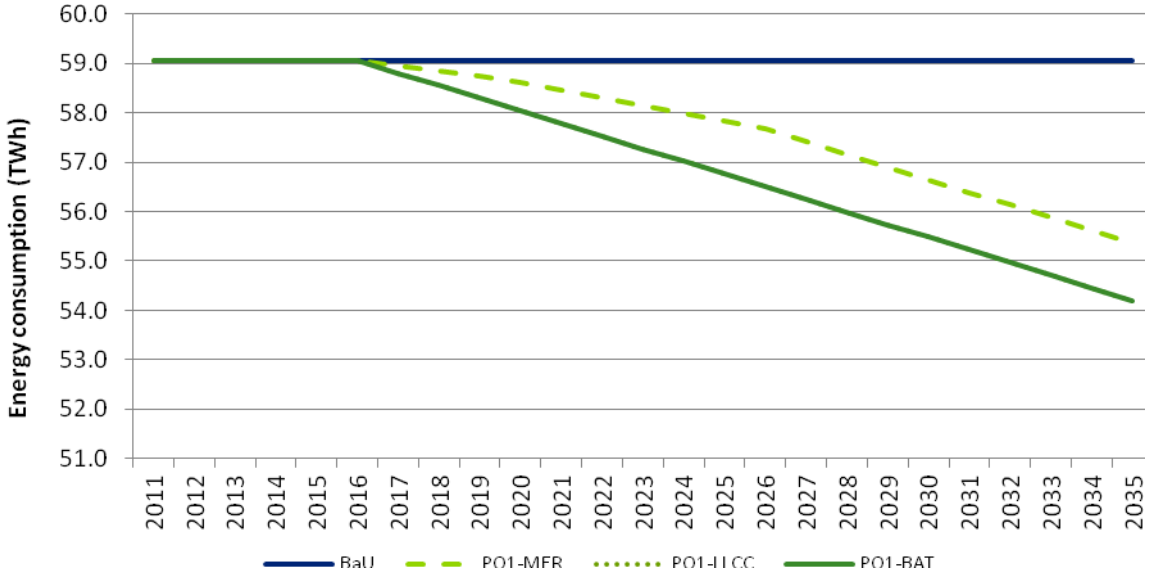

Figure 20: Final Energy consumption over time for different scenarios under PO1 for BC7 (Very Large Ovens)

PO 2 – Figure 21 shows the three different BAT sub-scenarios (Optimistic, pragmatic and pessimistic adoption), with corresponding potential energy savings over

time.

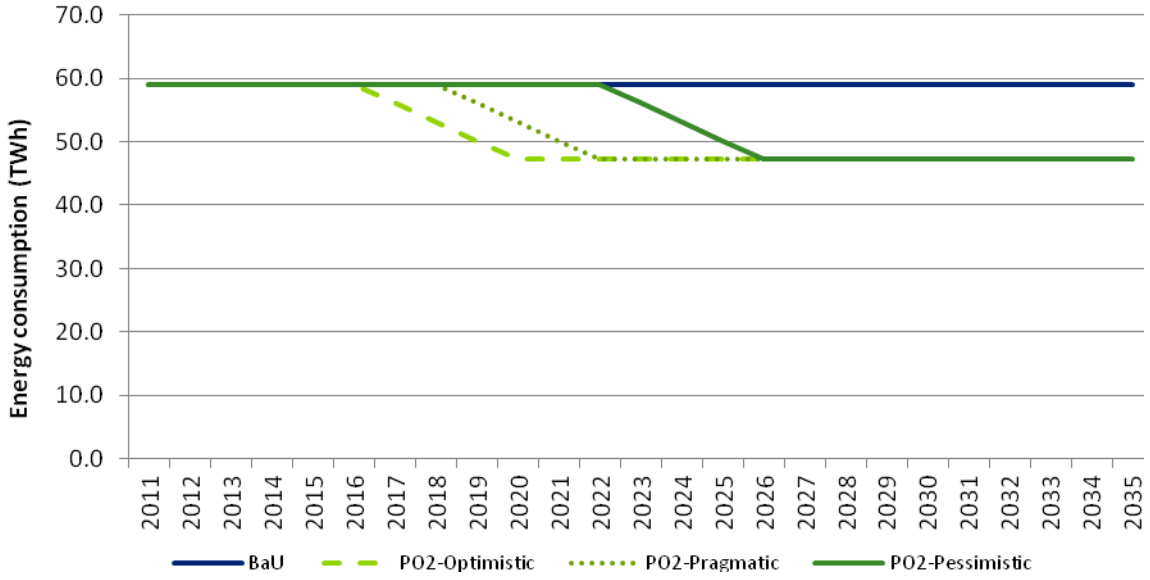

Figure 21: Final Energy consumption over time for different scenarios - PO2 for BC7 (Very Large Ovens)

4. SUMMARY TABLES OF MODELLED POLICY INTERVENTIONS: 2011-2035

The tables summarizing the energy consumption by scenario (for each base case as well as overall) are presented below for each Policy Option, with respect to the different sub-scenarios.

PO1: SUMMARY OF DIFFERENT ENERGY CONSUMPTION SCENARIOS

1. **BaU Final Energy consumption scenario (TWh)**

Year	BC1	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2016	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2018	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2020	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2022	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2026	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2030	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2035	2.48	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06

2. PO1- MER Final Energy Use scenario (TWh)

Year	BC1	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	2.48	96.53	13.53	10.89	1.53	70.31	9.84	7.87	1.10	1376.86	59.06
2016	2.43	96.53	13.50	10.89	1.52	70.31	9.83	7.87	1.10	1369.59	58.84
2018	2.31	96.53	13.46	10.89	1.52	70.31	9.82	7.87	1.10	1362.31	58.63
2020	2.19	96.01	13.09	10.83	1.48	69.86	9.79	7.82	1.07	1351.61	58.31
2022	1.95	95.50	12.71	10.77	1.43	69.41	9.64	7.77	1.03	1340.91	57.99
2026	1.72	94.48	11.68	10.66	1.36	68.52	9.08	7.67	0.95	1312.67	57.16
2030	1.54	93.45	10.35	10.54	1.31	67.62	8.20	7.57	0.84	1277.57	56.13
2035	1.54	92.17	8.74	10.40	1.25	66.50	6.98	7.44	0.70	1233.71	54.86
Savings at 2035 c.f. BaU	0.94	4.36	4.79	0.49	0.28	3.81	2.86	0.43	0.40	143.15	4.2
2035 % Savings c.f. BaU	37.9%	4.5%	35.4%	4.5%	18.3%	5.4%	29.1%	5.5%	36.4%	10.4%	7.1%

3. PO1-LLCC Final Energy Use scenario (TWh)

Year	BC1	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	-	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2016	-	96.01	12.87	10.83	1.45	69.86	9.83	7.82	1.05	1359.32	58.55
2018	-	95.50	12.21	10.77	1.38	69.41	9.59	7.77	1.00	1341.77	58.04
2020	-	94.99	11.55	10.72	1.30	68.97	9.10	7.72	0.95	1324.22	57.53
2022	-	94.48	10.89	10.66	1.23	68.52	8.61	7.67	0.91	1306.68	57.02
2026	-	93.45	9.56	10.54	1.08	67.62	7.63	7.57	0.81	1271.58	55.99
2030	-	92.43	8.24	10.43	0.93	66.73	6.65	7.47	0.71	1236.49	54.97
2035	-	91.70	7.31	10.35	0.82	66.09	5.42	7.39	0.64	1192.62	53.69
2035 % Savings c.f. BaU	-	5.0%	46.0%	5.0%	46.4%	6.0%	44.9%	6.1%	41.8%	13.4%	9.1%

4. PO1-BAT Final Energy consumption scenario (TWh)

Year	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2016	96.01	12.87	10.83	1.45	69.86	9.83	7.82	1.05	1359.32	58.55
2018	95.50	12.21	10.77	1.38	69.41	9.59	7.77	0.99	1341.77	58.04
2020	94.99	11.55	10.72	1.30	68.97	9.10	7.72	0.94	1324.22	57.53
2022	94.48	10.89	10.66	1.23	68.52	8.61	7.67	0.88	1306.68	57.02
2026	93.45	9.56	10.54	1.08	67.62	7.63	7.57	0.77	1271.58	55.99
2030	92.43	8.24	10.43	0.93	66.73	6.65	7.47	0.66	1236.49	54.97
2035	91.70	7.31	10.35	0.82	66.09	5.42	7.39	0.58	1192.62	53.69

PO1: OVERALL (All Base Cases) industrial ovens/furnaces – Final Energy consumption scenarios (TWh)

Year	BaU	MER	LLCC	BAT
2011	1647.51	1647.51	1647.51	1647.51
2016	1647.51	1639.95	1627.11	1627.10
2018	1647.51	1632.39	1606.71	1606.70
2020	1647.51	1619.57	1586.31	1586.29
2022	1647.51	1606.75	1565.91	1565.88
2026	1647.51	1573.58	1525.10	1525.07
2030	1647.51	1532.86	1484.30	1484.26
2035	1647.51	1482.03	1435.83	1435.77
2035 Energy Savings c.f. BaU	-	10.0%	12.8%	12.9%

PO2: SUMMARY OF DIFFERENT ENERGY CONSUMPTION SCENARIOS

1. **BaU Final Energy Use scenario (TWh)**

Year	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2016	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2018	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2020	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2022	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2026	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2030	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2035	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06

2. **PO2- Optimistic BAT Adoption Final Energy Use scenario (TWh)**

Year	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2016	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2018	95.32	11.97	10.75	1.35	70.09	8.68	7.75	0.97	1306.30	56.11
2020	92.91	8.86	10.48	1.00	69.64	6.37	7.51	0.71	1165.17	50.20
2022	91.70	7.31	10.35	0.82	69.19	5.21	7.39	0.58	1094.61	47.25
2026	91.70	7.31	10.35	0.82	68.29	5.21	7.39	0.58	1094.61	47.25
2030	91.70	7.31	10.35	0.82	67.40	5.21	7.39	0.58	1094.61	47.25
2035	91.70	7.31	10.35	0.82	66.28	5.21	7.39	0.58	1094.61	47.25
Savings at 2035 c.f. BaU	4.83	6.22	0.54	0.71	4.03	4.62	0.48	0.52	282.25	11.81
2035 % Savings c.f. BaU	5.0%	46.0%	5.0%	46.4%	5.7%	47.0%	6.1%	47.3%	20.5%	20.0%

3. PO2-Pragmatic BAT Adoption Final Energy Use scenario (TWh)

Year	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2016	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2018	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2020	95.32	11.97	10.62	1.35	70.09	8.68	7.75	0.97	1306.30	56.11
2022	92.91	8.86	10.35	1.00	69.64	6.37	7.51	0.71	1165.17	50.20
2026	91.70	7.31	10.35	0.82	68.74	5.21	7.39	0.58	1094.61	47.25
2030	91.70	7.31	10.35	0.82	67.85	5.21	7.39	0.58	1094.61	47.25
2035	91.70	7.31	10.35	0.82	66.73	5.21	7.39	0.58	1094.61	47.25

4. PO2- Pessimistic BAT Adoption – Final Energy Use scenario (TWh)

Year	BC2a	BC2b	BC3a	BC3b	BC4a	BC4b	BC5a	BC5b	BC6	BC7
2011	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2016	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2018	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2020	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2022	96.53	13.53	10.89	1.53	70.31	9.83	7.87	1.10	1376.86	59.06
2026	92.91	8.86	10.48	1.00	69.64	6.37	7.51	0.71	1165.17	50.20
2030	91.70	7.31	10.35	0.82	68.74	5.21	7.39	0.58	1094.61	47.25
2035	91.70	7.31	10.35	0.82	67.62	5.21	7.39	0.58	1094.61	47.25

PO2: OVERALL (All Base Cases) Industrial Ovens/ Furnaces Final Energy Use scenarios (TWh)

Year	BaU	Optimistic	Pragmatic	Pessimistic
2011	1647.51	1647.51	1647.51	1647.51
2016	1647.51	1647.51	1647.51	1647.51
2018	1647.51	1569.29	1647.51	1647.51
2020	1647.51	1412.85	1569.15	1647.51
2022	1647.51	1334.41	1412.72	1647.51
2026	1647.51	1333.52	1333.96	1412.85
2030	1647.51	1332.62	1333.07	1333.96
2035	1647.51	1331.50	1331.95	1332.84
2035 Energy Savings c.f. BaU	-	19.2%	19.2%	19.2%