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## **Prestudy Report**

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## 1 Introduction

### 1.1 Objective and participants

The objective of PlastVoltage is to prepare and launch a voluntary long-term agreement on energy efficiency for the European plastics converting industry. This project will bring together experience and best practice at national and industry levels, with a view to stimulating a new long-term agreement at European level, resulting in a firm commitment by the sector to achieve long term energy efficiency targets on the European level. Partners – mostly national plastics converters associations - from eight European countries (Belgium, France, Germany, Hungary, Portugal, Spain, The Netherlands and the United Kingdom) directly participate in this project. These countries are significant in the European plastics converting industry, thus they will act as ambassadors in the markets toward increased energy efficiency.

The outcome of PlastVoltage will be a signed voluntary long-term agreement in 2011 on energy efficiency for the plastics converting industry in Europe. Therefore, the direct long-term effect of this project will be cost effective energy savings for the plastics converting industry, in line with the European 20% target for 2020.

Furthermore, this strategic objective will create spin-off effects. On industry basis other European industries are expected to follow the plastics converting example, leading to further industry excellence in energy. At the human level the employees of the targeted companies will be more motivated to achieve greater energy efficiency and in turn to increase energy efficiency in their private life.

It should be noted that the PlastVoltage is unique, and a first initiative ever by an industry to develop a voluntary agreement for energy efficiency on European level. Also, energy efficiency related information needed to develop such an agreement is, if available at all, very variable both in quality and quantity. This applies both to information available on national levels as on European level. Consequently, PlastVoltage will also disclose and structurize information on a scale not existing before.

### 1.2 Scope

This Pre-study aims at an inventory of suitable energy efficiency indicators, policies, voluntary agreement concepts and comparisons of financial aspects (incentives, taxes & investments) versus energy savings (financial & environmental) between countries.

The outcome of WP2 is to provide solid basis for the following WPs of this project. This will be done by drawing the general picture in which the foreseen European voluntary agreement is positioned. In addition to the general picture this pre-study presents the following three specific deliverables:

- D.2.1: Current European plastics converting industry energy consumption and energy efficiency potential.
- D 2.2: Definitions and indicators
- D 2.3: Matrix of possible voluntary agreement modules and matches with existing EU and national policies and implementation possibilities

The responsible partners for the pre-study are SenterNovem (WP leader) and the Fraunhofer Institute.

### 1.3 Activities

Basically the activities for this pre-study consisted of gathering information from existing research and projects and from two special PlastVoltage questionnaires completed by the participating NPA's and by companies. The questionnaire has also been distributed among not participating NPA's. All findings were processed into this report, which has been discussed in several webinars (web based meeting) with the partners. The information gathering was focussed on the following issues, each issue being assigned to one of the two responsible partners:

- Determining of European plastics converting industry current energy consumption (Fraunhofer)
- Development of suitable energy efficiency indicators (Fraunhofer)
- Inventory of European and national initiatives and policies (SenterNovem)
- Inventory of possible support structures for implementation of energy management on SME level, e.g. facilitation by BESS e-learning scheme (SenterNovem)
- Analyses of possible voluntary agreements (SenterNovem)

The completion of the questionnaire as mentioned before turned out to be quite time consuming both for NPA's as for companies. At this point more completed questionnaires are still to be expected. Processing of the results is an ongoing process and this report will be updated accordingly with results from the questionnaires. So far results on NPA level are available from:

NPA's:

Belgium

Spain

France

Germany

The Netherlands

Finland (not partner)

Bulgaria (not partner)

Results on company level are received until now from about 60 companies from Germany, UK, Belgium, Portugal and the Netherlands.

#### **1.4 Structure report**

The report follows in general the objective of the deliverables as mentioned before. Chapter 3 describes the energy consumption of the European Plastic Converting Industry and includes elements related to targeting, monitoring and energy saving potential. Chapter 4 gives an inventory of relevant national and European energy policies and regulations. Chapter 5 describes the outlines for the European Voluntary Agreement or Umbrella Agreement for the plastic converting industry. Chapter 6 shows the possibilities to implement the European agreement on national level. Chapter 7 is an inventory of existing support structures for companies implementing energy efficiency. Supportstructures are needed to facilitate companies when implementting the European agreement on a national level. Finally, chapter 8 gives an overview of what is yet to be covered in the next stages of the project, followed by the annexes to this report.

## 2 Energy consumption of the European plastic converting industry (D 2.1 and 2.2)

### 2.1 Introduction

Data about the energy consumption of the plastics converting industry can be derived from two different methods: directly from statistics or from calculations via the specific energy consumption (SEC) and the statistical production volume of a certain process. Both methods play an important role, both for the acquisition of the data base and for following work packages (e.g. WP 4). Regardless of which method is used, statistical data are the basis. Hence in the following it is illustrated how the plastics converting industry is classified in the statistics and where statistical figures regarding energy consumption and production volume can be found.

#### 1. Statistical classifications

Data on the plastics converting industry is on European level reported for either NACE or PRODCOM categories. NACE is a European industry standard classification system, representing the statistical classification of economic activities within the European Community and consists of a 4 digit code. PRODCOM is a harmonized system across the European Community for the collection and publication of product statistics. The PRODCOM list contains about 4500 product categories and consists of 8 digit codes. The first four digits of the PRODCOM codes correspond to the NACE code of the respective industrial sector. The whole plastics converting industry is classified by one 3 digit NACE code, which is given in

**Table 2-1 NACE code for the plastic converting industry in Rev. 2 classification**

NACE code	Description
22.2	Manufacture of plastic products

A further subdivision of the industry is made on the 4 digit level of NACE classification. An overview is given in Table 2-2.

**Table 2-2 Overview of the NACE codes of the plastic converting industry in Rev. 2 classification**

<b>NACE code</b>	<b>Description</b>
22.21	Manufacture of plastic plates, sheets, tubes and profiles
22.22	Manufacture of plastic packaging goods
22.23	Manufacture of builders' ware of plastics
22.29	Manufacture of other plastic products

PRODCOM codes provide classification by product and allow for much more detailed data information than NACE. However, it has to be investigated if NACE 22.2 covers the plastics converting industry completely. In this context it is not definite, if for example fibre-reinforced plastics are considered in this classification or not.

The German production statistics in the GENESIS database of the German Federal Statistical Office classifies even more detailed. This classification consists of 9 digit codes whereas the first 8 digits correspond to the PRODCOM codes.

## 2. Statistical data on production

Production data for the plastics converting industry on PRODCOM level is provided for all EU27 countries by EUROSTAT, a European Directorate-General of the European Commission responsible for statistical information at European level.

PRODCOM provides data for the "value", the "sold volume" and the "total volume" of the corresponding PRODCOM code. The value of the products is not meaningful for our purpose. For the plastics converting industry (covered by NACE 22.2) no figures are given for the "total volume". However, figures for the "sold volume" are given at great length. The "sold volume" includes exclusively the production for sale, whereas the "total volume" also includes the production which is processed on-site. Regarding the production volume of the plastics converting industry the "sold volume" is sufficient. The "sold volume" guarantees that a certain product is not double-counted; once before and after the process step. For Germany we compared the figures for the sold and the total volume, since for Germany both volumes are given for many products. For most of those products the value for the

sold and the total volume is the same. For the remaining products the difference is negligibly small.

For most of the products, the production volume is given in tonnes; however, there are some products for which the production volume is given in the number of pieces. Those products are as followed:

**Table 2-3 Products for which the production volume is given by the number of pieces**

<b>Destatis Code</b>	<b>Description</b>
22221450	Plastic carboys, bottles, flasks and similar articles for the conveyance or packing of goods, of a capacity < 2 litres
22221470	Plastic carboys, bottles, flasks and similar articles for the conveyance or packing of goods, of a capacity > 2 litres
22221990	Other articles for the conveyance or packing of goods of plastics
22231250	Plastic baths, shower-baths, sinks and wash-basins
22231270	Plastic lavatory seats and covers
22231290	Plastic bidets, lavatory pans, flushing cisterns and similar sanitary ware (excluding baths, showers-baths, sinks and wash-basins, lavatory seats and covers)
22231450	Plastic doors, windows and their frames and thresholds for doors
32991190	Headgear of rubber or plastic (excluding safety headgear)

Those products have a great influence on the total production volume (expressed in tonnes) and have to be considered in the total production. In order to determine the production volume, the weight for a single piece of each of the products has to be known. How to convert those figures finally has to be further discussed.

In principle the PRODCOM statistics may be used as production data input.

### 3. *Statistical data on energy consumption*

Unfortunately, no data on the plastics converter energy consumption is available from the EUROSTAT database. On national level, up to now detailed information is

available only for Germany and the UK. For those countries the energy consumption is given on NACE 4 digit level and specified by energy carrier. The data are extracted from the national statistical offices. For the remaining countries data are reported on NACE 3 or NACE 2 digit level. Table 4 shows the given data for Germany and the UK on NACE 4 level as well as for France, Czech Republic and Spain on NACE 3 level.

**Table 2-4 Statistical data on the energy consumption in the plastic converting industry**

Country	Fuel	NACE 22.21 [GJ]	NACE 22.22 [GJ]	NACE 22.23 [GJ]	NACE 22.29 [GJ]	Total [GJ]
<b>GE</b>	Solid fuels					
	Liquid fuels	3 867 923	1 070 773	452 070	1 099 923	<b>6 490 689</b>
	Gaseous fuels	6 985 430	1 657 253	1 158 675	4 797 512	<b>14 598 870</b>
	Bio fuels	71 145				<b>71 145</b>
	District heating	2 137 797			128 388	<b>2 266 184</b>
	Electricity	16 692 382	9 778 314	1 715 851	13 869 919	<b>42 056 466</b>
	Others				10 793	<b>10 793</b>
	<b>Total</b>	<b>29 754 677</b>	<b>12 506 341</b>	<b>3 326 595</b>	<b>19 906 535</b>	<b>65 494 148</b>
<b>UK</b>	Solid fuels					
	Liquid fuels	1 716 588	1 130 436	5 777 784	3 726 252	<b>12 351 060</b>
	Gaseous fuels	7 410 636	209 340	2 051 532	3 098 232	<b>12 769 740</b>
	Bio fuels					
	District heating					
	Electricity	9 420 300	10 676 340	5 694 048	8 164 260	<b>33 954 948</b>
	Others					
	<b>Total</b>	<b>18 547 524</b>	<b>12 016 116</b>	<b>13 523 364</b>	<b>14 988 744</b>	<b>59 075 748</b>

<b>FR</b>	Solid fuels	
	Liquid fuels	<b>1 172 304</b>
	Gaseous fuels	<b>8 122 392</b>
	Bio fuels	<b>41 868</b>
	District heating	<b>1 632 852</b>
	Electricity	<b>22 441 248</b>
	Others	
	<b>Total</b>	<b>33 410 664</b>
<b>CZ</b>	Solid fuels	<b>67 192</b>
	Liquid fuels	<b>366 836</b>
	Gaseous fuels	<b>1 990 451</b>
	Bio fuels	
	District heating	
	Electricity	<b>3 748 918</b>
	Others	
	<b>Total</b>	<b>6 173 397</b>
<b>ES</b>	Solid fuels	
	Liquid fuels	<b>3 772 867</b>
	Gaseous fuels	<b>5 359 884</b>
	Bio fuels	
	District heating	
	Electricity	<b>14 378 720</b>

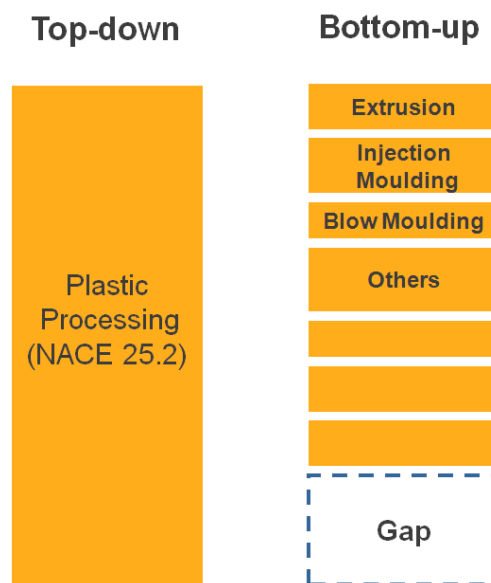
Others

**Total**

**23 511 471**

The data collection is still ongoing.

The two different methods regarding the determination of the energy consumption (directly from statistics or calculated) can be described as bottom-up and top-down.



**Figure 2-1 Bottom-up and top-down**

Bottom-up:

Bottom-up means that for the determination of the energy consumption the production volume of a certain product or product group is multiplied by the specific energy consumption of the used production process. The production volume is extracted from statistics.

Top-down:

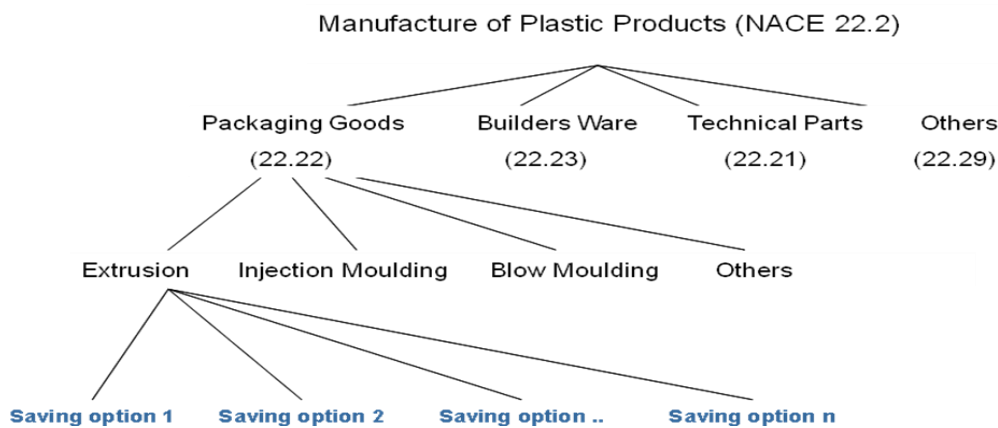
Compared to the bottom-up monitoring, the energy consumption data is not calculated, but directly extracted from statistics. The top-down monitoring is used to calibrate the data from the bottom-up monitoring.

Figure 2-1 illustrates both methods. The bottom-up model requires the specific energy consumption of a certain production process and the production volume of

the product being manufactured by this process. Since there is a variety of different processes, it is impossible to connect all plastic products or product groups to a certain process. That is why the plastics converting industry cannot be covered by the bottom-up model completely. The resulted production and energy consumption figures are lower than the actual figures. In order to fill this gap, the figures from the top-down approach are used.

#### 4. Possible process structures

Data availability also influences the choice of the process structure for the bottom-up model in WP3. The following picture shows a possible process structure:



**Figure 2-2 Possible process structure**

The first level is the whole plastics converting industry (NACE 22.2). In a second step the industry is distinguished by the NACE 4 classification in packaging goods, builders ware, technical parts and others. Then, the product groups are further distinguished by the production process. Finally saving options are connected to each of the production processes. Assuming that there are 8 processes to consider would result in 24 different production processes per product group and even more saving options. Applying this process structure would require the availability of the production volume on NACE 4 level, the specific energy consumption of the processes and the production share of the processes (what is the share of the packaging goods being produced with extrusion in the total production of packaging goods?) The production figures are available on PRODCOM level, so the production volume on NACE 4 level is given. However, up to now representative

data for the energy consumption of the processes and the shares are not sufficiently available, but further data input is expected (e.g. by questionnaires, reports).

Alternatively the differentiation in product groups is omitted and the total production of the sector is directly connected to the production processes (specified on NACE 3 level). In this way the production processes would lower to 8. This structure requires the availability of the production volume on NACE 3 level (22.2), the specific energy consumption of the processes and the production share of the processes (what is the share of plastic products being produced with extrusion in the total production of plastics?).

A third possibility is to distinguish even more detailed on PRODCOM level what means that the product groups (22.21-22.29) are broken down in the end products. If applying this approach each of the about 100 PRODCOM products would have to be analysed with regard to its production process. This structure requires the availability of the production volume on PRODCOM level, the production process the products are manufactured with and its specific energy consumption. The use of this approach is due to the high required data input rather improbable.

Besides the availability of data, another selection criterion for the applied process structure is whether the different specific energy consumption of a certain process is influenced by the products or not. If the specific energy consumption of a certain process is the same or similar for all products being produced by this process a detailed process structure (approach 3) would not be necessary.

According to the current available data the second proposed process structure seems to be the only feasible approach. This accounts both for the bottom-up and the top-down calibration. As described above energy consumption figures on NACE 4 level, which are necessary for the calibration, are only available for the UK and Germany. On NACE 3 more data are available.

Assuming that the second approach will be applied (specified on NACE 3 level) the bottom up model would look like this:

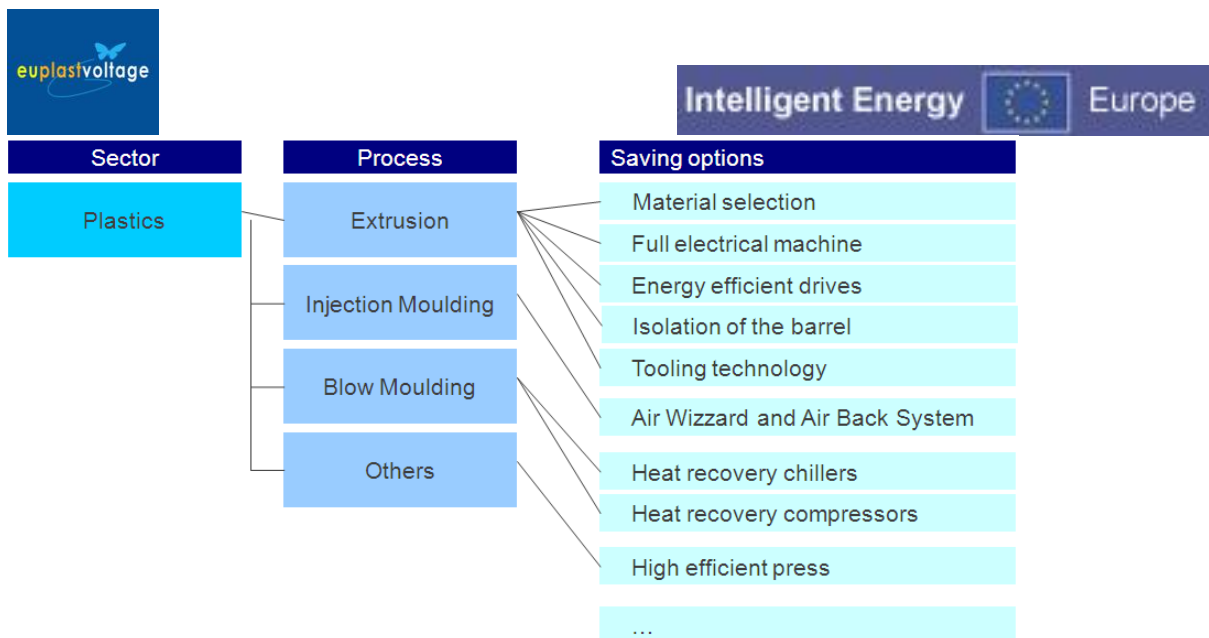


Figure 2-3 Possible process structure on NACE 3 level

As a result the energy saving potential would be process specific, without considering different product groups or products. That means that the saving potential is modelled for single processes regardless of which product is manufactured by this process. In consideration of the project target to give the saving potential of the whole plastics converting industry, the proposed approach is an adequate way to represent the industry's potential without being too detailed.

## 2.2 Specific energy consumption

As described above top-down energy consumption figures of the plastics converting industry can be derived from statistics. However, this does not apply for process specific energy consumption figures. Such data can be achieved either by literature research or directly by the companies via questionnaires.

Questionnaires have been compiled both within this project but also in the RECIPE project in which Fraunhofer ICT has been involved. The questionnaires within this project are still being processed, and this report will be up dated accordingly.

The RECIPE project conducted a benchmarking questionnaire based survey of the European plastics industry to assess energy usage, management and awareness.

The survey and data analysis was carried out between July and September 2005:

In the following the outcome of the survey is presented:

### **Companies taking part**

- **250** companies took part covering both SMEs and larger companies.
- Most companies have 50 – 249 employees with a turnover of 10 m €.
- Most response came from Germany, Spain and the UK, using 8 different plastics processes.
- Average age of machinery was 9 years, from Germany's average 6 years to the UK's average 13 years.
- 60% operated 24 hours, 5 days per week with an average machine utilisation of 75%.

### **Specific Energy Consumption (SEC)**

- The average energy consumption was **2.87 kW/kg/hr**.
- This ranged from 0.63 kW/kg/hr for compounding to 6.2 kW/(kg x hr) for vacuum thermoforming.
- Age and design of buildings made negligible difference to the SEC.
- The SEC was higher for small machines and lower for electric vs. hydraulic drives.
- The SEC is a function of the process, the age, size, and efficiency of the machinery.

### **Cost and source of energy**

- The average cost of energy across Europe was **0.08€/kWh**.
- UK had 80% using both gas and electricity, but Spain used mainly electricity.
- In Germany, 70% purchased from a local scheme and recovered energy for re-use.
- Elsewhere, 14% purchased from a local scheme or recovered energy for re-use.

This survey has generated enough information to set benchmarks with regards to specific energy consumption across Europe. The general attitude to the 'energy' issue was positive, but it is apparent that a lot of improvement could still be made.

### 2.2.1 Benchmarking energy use in polymer processing

Benchmarking is the process of assessing and setting targets for improvement and achievement in order to reduce costs and improve performance. Energy benchmarking is the collection, analysis and reporting of data to provide industrial companies with a context for assessing comparative energy efficiencies. It is an important means of energy management, which allows companies a comparison with the 'best of the best'. Using energy more efficiently helps one business improving its productivity and bottom line, making it more competitive, while reducing greenhouse gases that contribute to climate change. Energy benchmarking and monitoring allows a company to identify deficiencies and adapt to a better practice.

To start the benchmarking process it is necessary to calculate the **specific energy consumption (SEC)** for every site via the total energy used and the tonnage processed. The SEC is normally expressed in GigaJoules per tonne (GJ/t). A simple calculation is:

$$\begin{aligned}
 \text{Total energy used in 12 month period} &= x \text{ (GJ)} \\
 \text{Total tonnage produced in 12 month period} &= y \text{ (tonne)} \\
 \text{Specific Energy Consumption (GJ/T)} &= x/1000y
 \end{aligned}$$

By comparing the site-specific **SEC** against the standard values derived from the RECIPE survey and **EUPlastVoltage Questionnaire**, it is possible to evaluate the efficiency of a processing site.

The following figure and table illustrate the results for the **average specific energy consumption per process** from the RECIPE survey:

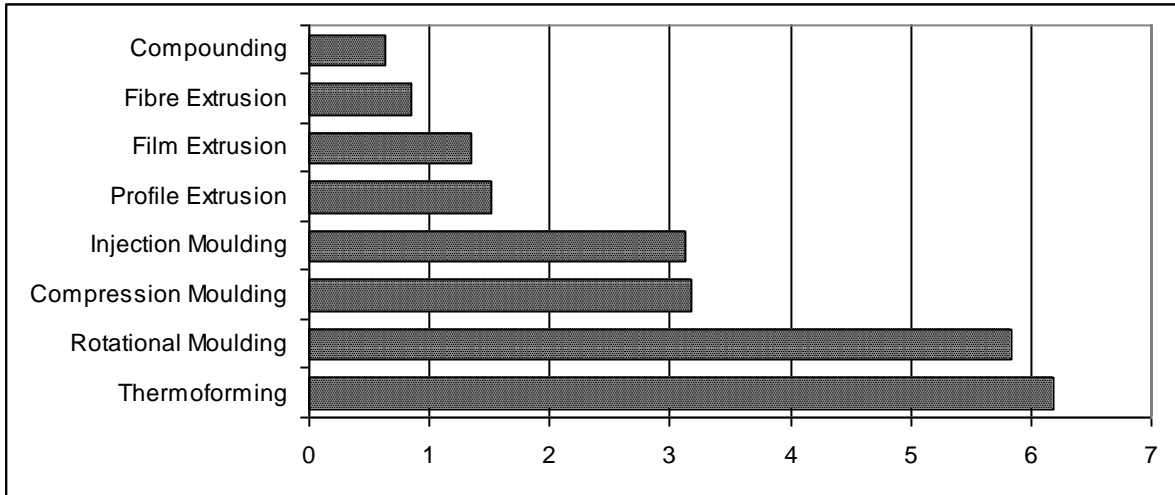


Figure 2-4 Average specific energy consumption per process (kW/(kg x hr))

Table 2-5 Average specific energy consumption per process in figures (kW/kg x hr)

Process	Average SEC in kW (kg x hr)
Thermoforming	6.179
Rotational Moulding	5.828
Compression Moulding	3.168
Injection Moulding	3.118
Profile Extrusion	1.506
Film Extrusion	1.346
Fibre Extrusion	0.850
Compounding	0.631
Overall Average	2.811

The figures show that there is a wide range regarding the SEC between the different processes. Whilst thermoforming is the most energy intensive process, the COM pounding's SEC is 90% lower.

The following figure shows the share of the site's fuel usage for Germany, Spain, UK and the average from the RECIPE survey.

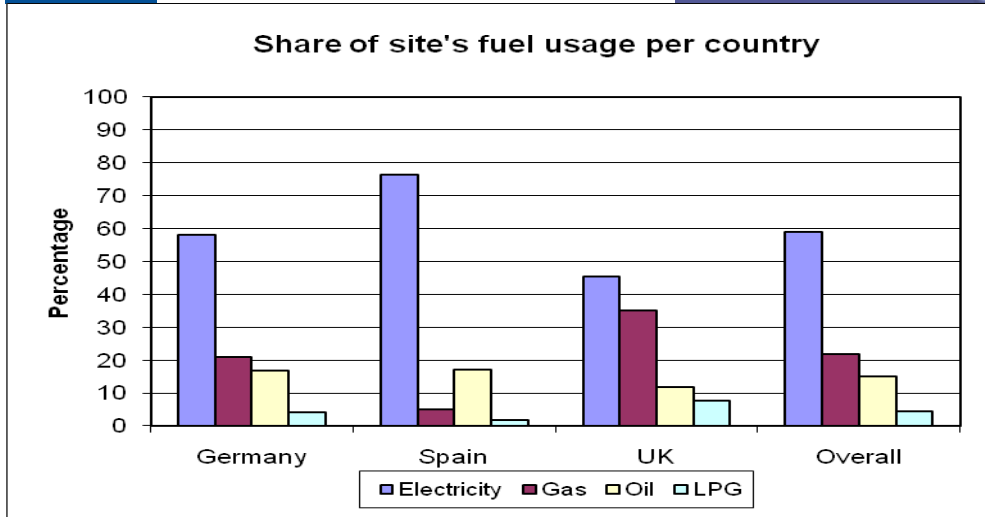


Figure 2-5 Fuel usage by country, type of fuel used (RECIPE)

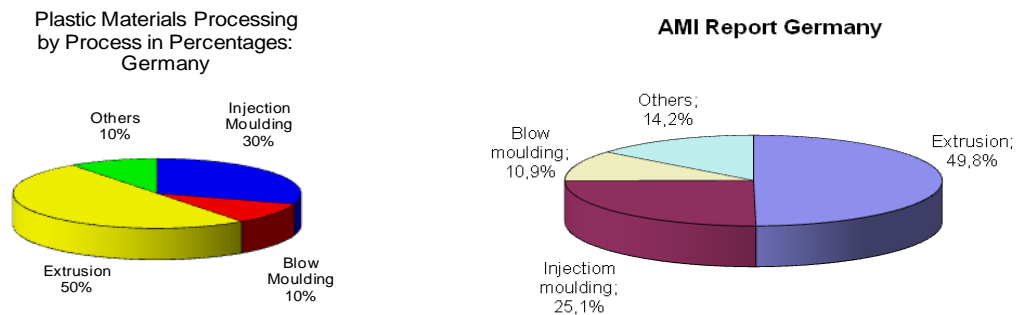
Electricity is the most used energy carrier in the plastics converting industry. Whilst in Spain almost 80% of the plants use electricity, in the UK only 55% use electricity, with a higher share of natural gas. The use of Oil and LPG is in all countries below 20%.

**2.2.2 Process specific material consumption**

In order to calculate the absolute energy consumption per process, it is necessary to have the material consumption per process as well. However, these data are often not available. Mostly the material consumption is given product specific (cf. PRODCOM) or feedstock specific, distinguished by the processed plastic (PVC, PP, PET, etc.).

The Applied Market Information Ltd. (AMI) publishes its yearly European Plastics Industry Report, which gives information on the share of the different processes in the total production of the most important plastics producing countries. This report is commercial and has been purchased within this project. The main focus of this report is on the plastics production, but also the plastics converting industry is described. However, the study considers only thermoplastics (e.g. polyurethanes or composites are not accounted for), so there is a gap between the AMI figures and the actual processed plastics.

The total amount of processed plastics is available from a study by the Comparison Plastics Europe Market Research Group (PEMRG). This is a commercial available, confidential study.



**Figure 2-6 Converted plastics in Germany distinguished by process in percent (Left hand side: Plastics Europe, Right hand side: AMI)**

The upper figure shows the converted plastics in Germany distinguished by process in percent. The pie chart on the left-hand side is based on the Association of Plastics Manufacturers in Europe (Plastics Europe), the pie chart on the right-hand side is based on AMI. The data of the AMI report are in good correlation compared to the Plastics Europe data, although only thermoplastics are considered. Both figures show the same share for extrusion and blow moulding. However, there is a small difference regarding the figures for injection moulding and other processes. Plastics Europe's share for injection moulding is 30%, whereas AMI assigns only 25% to injection moulding. In return the share of other processes is 5% higher at the AMI figures. Since the data from Plastics Europe are not free to be published widely, the figures of the AMI report are used in the following.

The below figure compares the bottom-up calculation of the energy consumption with the top-down energy consumption given by the National Statistics Offices (s. Table 2-4). The bottom-up figures are obtained by multiplying the specific energy consumption (s. Table 2-5) by the material consumption given in the AMI report. In the AMI report material consumption figures are available for a variety of countries, whereas absolute statistical figures for the energy consumption of the plastics converting industry are only available for Germany, Spain, France, UK and the Czech Republic.

**Table 2-6 Comparison of the calculated bottom-up energy consumption with the statistical top-down energy consumption per country**

Country	consumption per country in thousand tonnes	Energy consumption in GJ	Energy consumption from National Statistics Offices in GJ	Relative deviation in %
Italy	6326	46244790		
Germany	8112	62264804	65494148	-4,9%
Spain	3220	24611278	23511471	4,7%
France	4076	32647385	33410664	-2,3%
Benelux	3356	25964237		
UK	3233	25254763	59075748	-57,3%
Poland	2254	17396978		
Scandinavia	1884	14289271		
Other E Europe	2935	19121818		
Other W Europe	2195	15749291		
Sum Europe	32168	228666024		

The comparison shows small differences regarding the values for Germany, Spain and France and a wider difference for the UK. Furthermore the figures are afflicted with uncertainty. This has several reasons:

The given material consumption figures in the AMI report only include the thermoplastics. The actual material consumption in the plastic converting industry is higher. So the calculated bottom-up energy consumption is by trend too low. Moreover, for the calculation, the SEC based on the RECIPE survey, is used. With the results from questionnaires a sector cannot be exactly represented because only a part of the sent questionnaires is filled and returned. The statistical base of an association is often more accurate.

Another reason for uncertainty gives the statistical figures. The given top-down energy consumptions are based on the NACE classification. However, it has to be further investigated if NACE 22.2 actually covers the plastics converting industry completely. If not, the actual figures are higher.

Finally, the material consumption figures of the AMI report are 2008 data, whereas the statistical energy consumption figures are from 2007. More updated figures are not available at present.

However, with regard to the small deviation between the top-down and bottom-up figures for Germany, Spain and France, as a starting point, the figures from the AMI report in conjunction with the SEC from questionnaires is a good basis to calculate the process-specific bottom-up energy consumption.

### 2.2.3 Plastic materials demand in Europe

According to Plastics Europe the European plastics demand in 2007 was 47 Mt. AMI constitutes 40.5 Mt as consumed plastics in 2007. However, Plastic Europe does not cover polyurethanes (PUR), whereas AMI only includes thermoplastics.

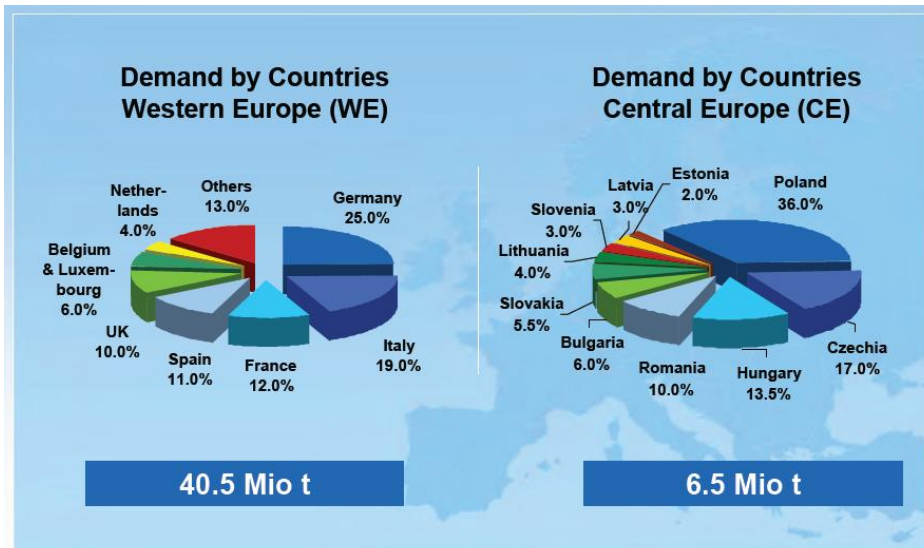
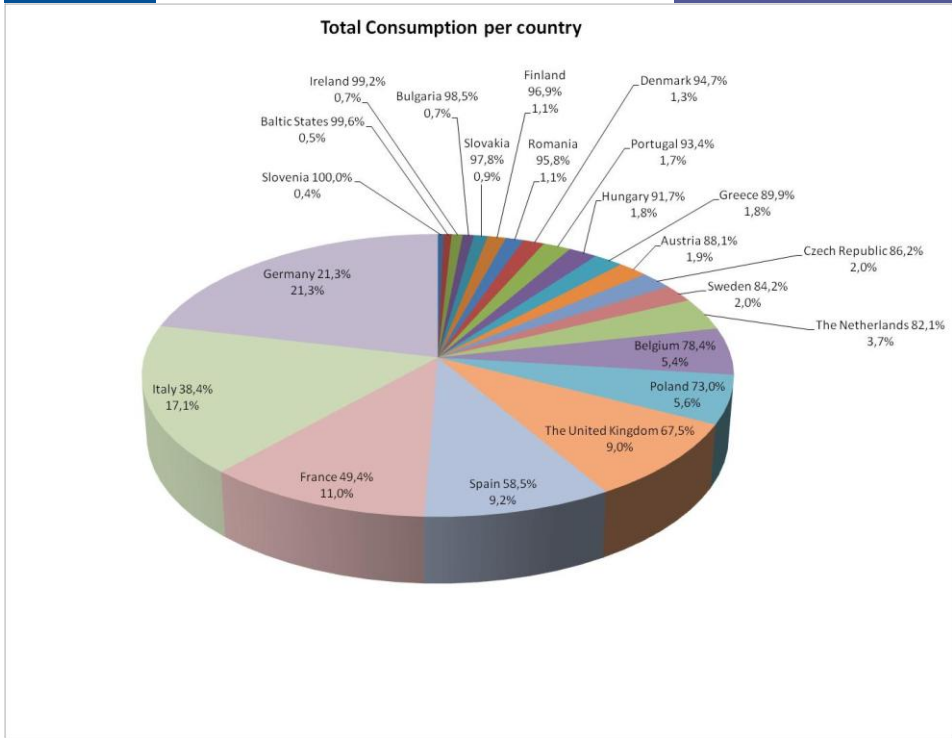


Figure 2-7 Plastic materials demand by countries in 2007

Source: Plastics Europe Market Research Group (PEMRG)



**Figure 2-8 Total and cumulated consumption of thermoplastics in different member countries in 2007**  
 Source: AMI's 2009 European Plastics Industry Report

The upper figures show that 80% of European plastics are consumed by 8 countries (Germany, Italy, France, Spain, UK, Poland, Belgium, and Netherlands). The remaining 20% are distributed across 15 European countries. According to Plastics Europe Germany processed 12.5 Mt plastics in 2007.

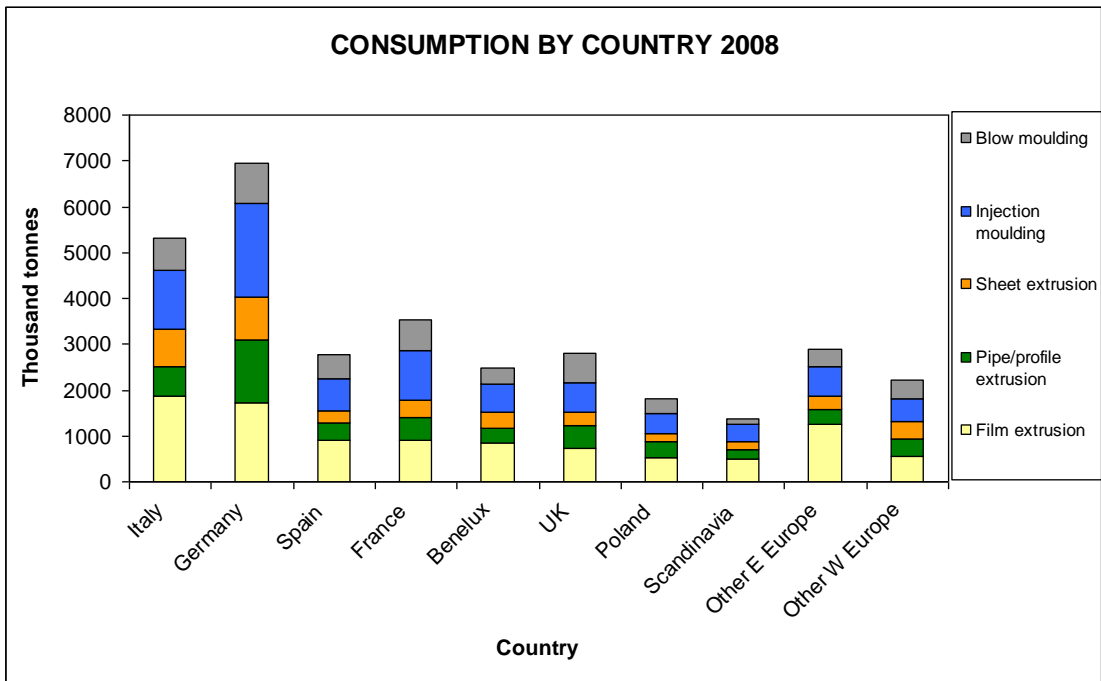


Figure 2-9 Consumption of thermoplastics in Europe by the end use processes

Source: AMI's 2009 European Plastics Industry Report

The upper figure shows the plastics consumption for selected countries and the share of the different conversion processes.

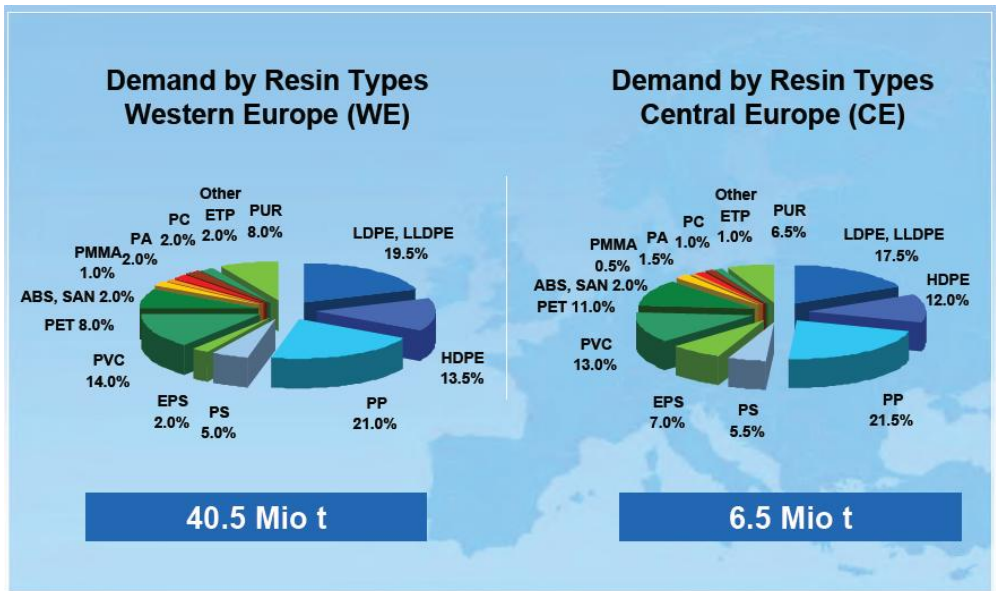


Table 2-7 Plastic materials demand by Types (2007)

Source: Plastics Europe Market Research Group (PEMRG)

The upper figure shows the plastics demand by the type of plastics. Low-density-polyethylene, high-density-polyethylene and polypropylene cover the demand by more than 50%.

The figure below shows the forecast based on the AMI report. The red line illustrates the consumption of plastics predicted in the year 2007, the blue line indicates the development based on 2009. The high decline of consumption in 2008 is attributed to the global finance and market crisis. For this reason within this report figures are used based on 2007 wherever applicable for being more representative than 2008 or 2009 figures.

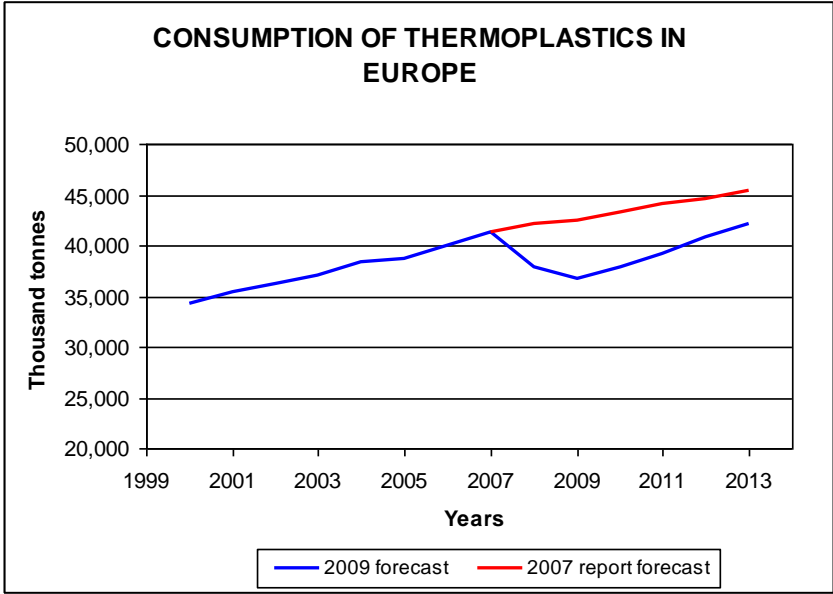


Table 2-8 Recession related plastic materials consumption for thermoplastics

Source: AMI's 2009 European Plastics Industry Report

### 2.3 Energy efficiency indicators and definitions

The use of energy efficiency indicators is necessary to determine and control the

- energy efficiency goals and targets
- to show the trends over periods and years
- to determine changes in production and usage rate

The most relevant indicator will be the **specific energy consumption (SEC)** because it covers all energy consumption in relation to the corresponding production process. The energy consumption and type of energy as well as the material amount processed is estimated regularly in the companies.

The SEC is calculated by the consumed energy and the complete processed tonnage. The SEC is normally expressed in GigaJoules per tonne (GJ/t). A simple calculation is:

Total energy used in 12 month period	=	x (GJ)
Total tonnage processed in 12 month period	=	y (t)
Specific Energy Consumption (GJ/t)	=	x/1000y

This SEC is calculated for every plastics converting site in Europe. In order to obtain a measure of efficiency for the different processes, the SECs of sites based on the same process are averaged.

Other Indicators then the SEC are sometimes more in relation to costs like the **relative energy costs per turnover and year:**

Total energy costs in 12 month period	=	x (€)
Total turnover in 12 month period	=	y (€)
Relative Energy costs (in %)	=	100x/y %

Additional to the SEC, parts of the energy consumption could be monitored with the indicators heat consumption per production and year or power consumption per production and year.

To monitor the energy consumption in companies, they have to report regularly their

- energy consumption (gas, LPG, electricity, oil, fuel etc.) and energy costs
- production data
- conservation measures with quantified saving figures
- other energy related improvements/influences including quantification
- level of E-management

There are a lot of different possibilities available how to monitor these data. From filling out templates in a paper form to automatically transfer data to control systems. For the project it might be necessary to review these templates depending on the details necessary for the model to be developed in WP 4.

With the collected data for each year it is possible to define an **Energy Efficiency Index EEI** for a production plant or site by setting the specific energy consumption each year in relation to a reference year.

Specific energy consumption (energy/production)	=	x (GJ/t)
Spec. energy consumption (reference year)	=	y (GJ/t)
Energy Efficiency Index EEI	=	x/y

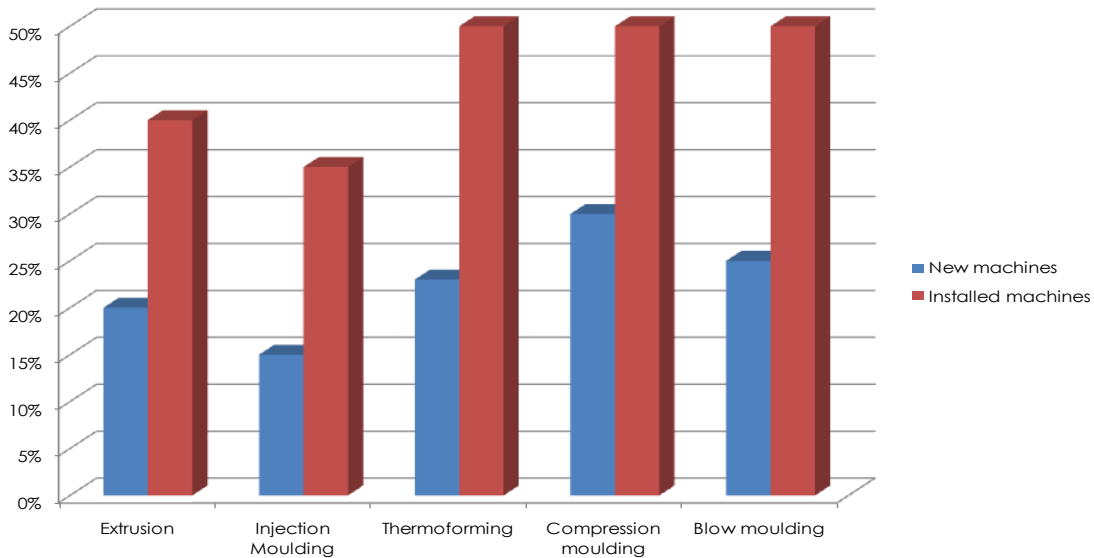
With this Energy Efficiency Index it is easier to monitor the efficiency of measures and to define targets in energy consumption reduction for a company.

In order to calculate saving potentials and to judge single saving options with regards to their efficiency and costs the following input data are required:

- Production volume per process [kton]
- Energy prices [EUR]
- Specific energy consumption (SEC) of the process [GJ/t]
- Specific saving potential of the saving option [GJ/t]
- Lifetime of the saving option [years]
- Specific O&M costs of the saving option [EUR/t]
- Specific investment costs of the saving option [EUR/t]
- Market diffusion of the saving option [%]

## **2.4 Energy efficiency potential**

There are several case studies in the different processing techniques for plastics available. Depending on the mean age of all plastics processing machines the saving potentials are at least 50%. In industrial branches where the average age of the equipment is older the saving potentials are higher. The least potential is for injection moulding, because of many improvements being made in the recent years and the relative shorter usage times of the machines.



**Figure 2-10 Process specific saving potentials for new and installed machines**

Analysis of potential and possible energy efficiency targets:

**Plastics processing machines in general**

- Until 2015 energy savings about 35% beyond all proceedings based on today's state of technology
- Depending on the mean age of all plastics processing machines in Germany, the saving potentials are at least 50%

Several measures in general:

- Regarding the drive system as a whole you can save up to 20% of energy with energy saving solutions.
- Energy efficient drives may reduce losses emerging during the operation by new technologies by up to 20%.
- With preheated material you can save at large up to 5% of the total energy.
- With the optimization of cooling systems you can save more than 60% of energy. In more than 80% of the operating hours for chiller systems free cooling systems can be used. As soon as the ambient temperature lies underneath the required cooling water temperature, the free cooler takes the full chiller power. This free cooler only uses 2-3% of the energy consumption compared to the chiller.

- With waste heat recovery of compressed air systems and a decrease of the supply pressure at 0.5 bar you can save 25% of the level of energy and the electricity costs.

### **Extrusion**

- About 20% at today's state of the art of technology
- About 40% at machines with an averaged age

Several measures:

- A modern extrusion line - amongst others with direct drive as standard - as it is offered by Cincinnati Extrusion, can save 20-25% of the total energy consumption compared to conventional machines (optimized screw design).
- By using natural gas heating, the energy costs can be reduced to 40%.
- According to KraussMaffei Berstorff the volumetric efficiency of a single-screw extruder featured with AC motor increases about 5-12% (Depending on the operation point).
- A special internal screw cooling enables a bisection of the cooling section (or duplication of the production) by reducing the energy consumption up to 30%.
- An enclosed melt filter (for example by Gneuß Kunststofftechnik GmbH) reduces the energy consumption for the system up to 30% compared to conventional systems.

### **Extrusion and Injection moulding**

Several measures:

- An isolation of the plasticizing unit may reduce the energy consumption for the barrel heating about 40% and the machine's total energy consumption at about 3-5%.
- By using natural gas for heating the plasticizing unit an energy conservation of about 30% in peak was detected depending on the process temperature.

### **Injection moulding**

- About 20% at today's state of the art technology
- About 40% for machines at an averaged age

Several measures:

- With electrical dosage systems there will be a gain in productivity so that the energy consumption per product may decrease and it's possible to save up to 20% of energy compared to hydraulic dosing (Arburg GmbH + Co KG, 2009)
- Advantages of hybrid machines over hydraulic machines are - besides a gain in productivity and a shortening of cycle time - the energy saving of 20% and the reduction of processing temperature through an extension of dosing time.
- By a pumping rotation speed aligned to the cycle the no-load losses will be minimized and energy conservation up to 30% (related to the total cycle) is possible.
- Compared to modern hydraulic moulding machines, all-electric machines can enhance the energy efficiency about 50% and partially even up to 60%.
- Compared to compression chillers you can save up to 40% of energy by using hybrid cooling, which is a combination of dry cooling and evaporative cooling.
- 5-point-double toggle as form closure evidenced: On the one hand it has a positive effect on the machine's dynamics. On the other hand it only needs little oil and therefore little energy for moving the platen and not any energy for keeping the closing pressure. At large-scale machines this solution is 30-50% more advantageously than hydraulic machines with a self sucking system.
- Sumitomo Demag serially installs into its machines electrically adjustable variable capacity pumps with driving motors on the highest efficiency grade. The pump provides only the required pressure and oil charge for the current process automatically. The efficiency can be enhanced about 12-15%.

### **Thermoforming**

- About 23% at today's state of the art technology
- Based on 20 years old machines (on average) you can save depending on the machine's size at 30-50%

Several measures:

- An optimal balanced drive and the acceleration of mechanical procedures lead to 12.4% less energy consumption.

- Saving potential regarding the heating is 20-50% through a different type of heating and the installation of isolation at the heating area.
- Compared to a simply ceramic heater system the use of a new preheating system saves 60% of energy. Another solution is an upstream extruder. This will offer the advantage that the material isn't heated and cooled down twice. On the one hand you can save up to 50% of the total process energy and on the other hand it benefits the material quality.
- A reduction of the heating temperature at 3 Kelvin benefits the radiation losses and conserves the moulded part quality. Altogether this solution is easy to realize and can save 0.8% of the total energy.
- A decrease in film thickness of 10% causes a saving of material and a total energy conservation of 10%.

### **Compression moulding**

- Over 50% energy saving potential both at today's state of technology and average-aged machines

Several measures:

- Use of pendulum storage for heat and chill energy. At an ideal dimensioning of the storage system the required heat energy demand can be reduced about 49-65% depending on the selected storage volume.

### **Blow moulding**

- Over 50% energy saving potential both at today's state of technology and average-aged machines

Several measures:

- The death volume modification by reducing the volume of the valve block and the blast nozzle causes savings up to 7%.
- The reduction of the blowing pressure by optimizing the whole process causes savings of 25%.

The utilization of blowing pressure for pre-blowing and stretching after the shaping saves 25% of the air consumption.

## 3 Inventory of national and European initiatives and policies (D. 2.3)

### 3.1 Policy levels

The VA developed within Plast Voltage will have to be fine tuned with Existing EU policies. The VA has to be flexible for implementation on national level, fitting in with existing national policies. Therefore this inventory is based on different levels of policymaking:

- EU energy policies targeting SME's in general
- EU energy policies targeting the plastic converting industry
- National energy policies targeting SME's in general
- National energy policies targeting the plastic converting industry

### 3.2 EU energy policies targeting SME's

**Small Business Act for Europe.** The Small Business Act for Europe proposes a partnership between the EU and the Member States. A set of ten common principles should guide the policies both at the EU and at a national level<sup>1</sup>. In relation to PlastVoltage three of these common principles are important:

- Facing environmental challenges together
- Improving access to finance
- Support for SMEs at regional level

**EU Action Plan for Energy Efficiency** The objective of the EU's Action Plan for Energy Efficiency<sup>2</sup> is to control and reduce energy demand and to take targeted action on consumption and supply in order to save 20% of annual consumption of primary energy by 2020 (compared to the energy consumption forecasts for 2020). This objective corresponds to achieving approximately a 1.5% saving per year up to 2020.

The Commission included in the Action Plan all measures presenting the best cost-efficiency ratio, i.e. those with the lowest environmental cost over the life cycle,

<sup>1</sup> Putting Small Businesses first; European Commission; Enterprises and Industry; 2008

<sup>2</sup> <http://europa.eu/scadplus/leg/en/lvb/l27064.htm>

which do not overrun the budget given for investments in the energy sector. Some are priority measures, and should therefore be adopted without delay, whilst others are to be implemented throughout the six-year period set for the Action Plan.

The Action Plan includes **several types of measures to facilitate investments designed to boost energy efficiency**. The Commission also calls on the banking sector to offer financing opportunities tailored to small and medium enterprises (SMEs) and enterprises providing energy efficiency solutions (businesses providing energy services). In addition, the private banking sector, the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB) and other international financial institutions will facilitate the establishment of public-private partnerships.

**Directive 2006/32/EC on end-use energy efficiency and energy services.** On the basis of Directive 2006/32/EC on end-use energy efficiency and energy services (Energy Service Directive), the Commission plans to draft guidelines, a code of conduct and a certification procedure applicable to all sectors. Member states are required to formulate National Energy Efficiency Action Plans (NEEAPs) to implement the ESD Directive on national level. One of the elements in the NEEAP's can be the introduction of Voluntary Agreements. Most member states have their NEEAP in place, of which several include the VA option.

**EU standard for energy management (EN 18001).** A European standard for energy management has been recently issued by the European standardisation issue CEN/CLC/TF. National standardisation institutes implement this standard in member states.

### **3.3 EU policies targeting plastic converting industry**

The European polymer and its supply chain industries are subject to a wide range of legislation and identifying all that applies to an organisation is a complex and time consuming process. Important decision relating to legislation must be made with increasing regularity, with each decision having far-reaching consequences. Although there is increasing pressure on businesses in all sectors to improve their energy and environmental performance, many SME's still have a low awareness of their obligations and are failing to take the sustained action needed to reduce their impact. In the ENER-Plast Project a questionnaire was distributed to collect in the EU Member States the legislation and national initiatives in the polymer processing industry.

This '**European Energy and Environmental Legislation Reference Guide**' is a unique publication examining the legislation applicable to the polymer industries. This Reference Guide is an important resource for the polymer industry, highlighting the necessary legislation, regulations and practices to which organisations must comply within the EU Member States. This Guide will provide you with concise and relevant

guidance on your obligations in relation to energy and environmental legislation. It also 'signposts' grants and schemes to assist with compliance and further information and provides a sensible starting point for businesses with limited time and resources that want to improve their energy and environmental performance.

On the basis of the RECIPE and ENER-Plast questionnaires a new questionnaire was started, asking for some missing data and strengthening the attitude for energy savings. In the ANNEX the questionnaires from this project is depicted.

### 3.4 National policies targeting SME's

Partly prompted by the National Energy Efficiency Action Plans (NEEAPs), partly by own initiative, several member states established energy policies targeting SME's. According to the NEEAPs, Voluntary Agreements are good practice in the industry of the following EU member states: Belgium, Denmark, Finland, Greece, Netherlands, Portugal, Slovenia, Spain, Sweden and the United Kingdom.

The table below gives an overview of energy policies and regulations in member states.

Country	Energy policy/regulation SME's
Austria	National Energy Action plan (ESD) ** National Climate Policy
Belgium Walloon region	Audit covenant
Belgium Flemish region	Audit covenant National Energy Action Plan (ESD)**
Bulgaria	National Law for energy efficiency* National Energy Action Plan(ESD)** National Long term programme for Energy Efficiency*
Czech Republic	Energy Management Act (2001) National Energy Action Plan (ESD)**
Cyprus	National Energy Action Plan (ESD)**
Denmark	Long Term Agreement National Energy Action Plan (ESD)**
Estonia	National Energy Action Plan (ESD) **
Finland	Eco efficiency agreement* National Energy Action Plan (ESD)**

France	Greenhouse Gas Protocol for plastic converting industry* Certification scheme for green technologies* National Energy Action Plan (ESD) **
Germany	National Energy Action Plan (ESD) **
Greece	Long Term Agreement in development National Energy Action Plan (ESD)**
Hungary	National Energy Action Plan (ESD)**
Ireland	Long Term Agreement National Energy Action Plan (ESD)**
Italy	National Energy Action Plan (ESD)**
Latvia	National Energy Action Plan (ESD)**
Lithuania	National Energy Action Plan (ESD)**
Luxembourg	National Energy Action Plan (ESD)**
Malta	National Energy Action Plan (ESD)**
The Netherlands	Long Term Agreements for industries National Energy Action Plan (ESD)**
Norway	Long Term Agreement
Poland	National Energy Action Plan (ESD)** New Energy Efficiency Act (2010) National Energy Policy (2030)
Portugal	National En National energy (ESD)** National energy legislation
Romania	National Energy Action Plan (ESD) ** Efficient Use of Energy Government Ordinance
Slovakia	National Energy Action Plan (ESD) **
Slovenia	National Energy Action Plan (ESD) **

Spain	National Energy Action Plan (ESD) **
Sweden	Long Term Agreement
	National Energy Action Plan (ESD) **
UK	Long Term Agreement
	National Energy Action Plan (ESD) **

Sources: [www.ltauptake.eu](http://www.ltauptake.eu) toolkit, tool 0.2; PlastVoltage questionnaires (\*); [http://ec.europa.eu/energy/efficiency/end-use\\_en.htm](http://ec.europa.eu/energy/efficiency/end-use_en.htm) (\*\*)

In these countries an appropriate policy and institutional framework might be expected to be available to negotiate new or renewed Voluntary Agreements with the plastic industry. Also a selection of additional facilitation with e.g. energy management consultancy, audits, tax reduction, subsidies and other programmes might be available to promote or support the accession of Voluntary Agreements in these countries.

In addition the member states Hungary, Luxembourg, Poland and Romania have expressed the intention in their NEEAP to start industrial VAs<sup>3</sup>.

This overview does not mean that other member states are not interested in industrial VAs.

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<sup>3</sup> Synthesis of the complete assessment of all 27 National Energy Efficiency Action Plans as required by Directive 2006/32/EC on energy end-use efficiency and energy services Brussels, 23.6.2009 SEC(2009)889 final

## 4 European Voluntary Agreement model for the industry (D2.3)

### 4.1 Marketing and negotiation of a VA

Before parties can start a VA in general, two very important and often underestimated goals have to be achieved:

- they have to be convinced they all want to build a VA
- they have to successfully negotiate a VA with enough gains for each party

See chapter 5.1 for more information on this.

On the level of the Umbrella Agreement (UA) for the European Plastic Converting Industry, few problems are expected on willingness of parties: all parties know each other and at least all NPAs in the PlastVoltage project already explicitly want to start a UA, proven by the fact they entered the PlastVoltage project.

There is a small chance an NPA that is not participating in the PlastVoltage project will not be very keen on participation in the UA. For those, the same description is relevant as is described in chapter 5.1.

In March 2010 a PlastVoltage conference will be organised by the EuPC, for NPAs and representatives of energy agencies and governments of EU member states. This conference will inform all parties about PlastVoltage and the implementation of the umbrella agreement on national level, including the benefits to join the PlastVoltage process. The conference also aims at establishing relationships on national level between interested parties. Steps to take for successful development of a national VA or other implementation strategy will be explained.

### 4.2 Inventory of possible VA models.

This project aims to set up and launch a voluntary long term agreement (VA) for the European plastic sector, i.e. for the EUPC, which represents the national plastic sectors.

A number of possible agreement models, as are identified in toolkit, tool 2.2, have been discussed in the consortium. These models, adapted to the situation of the European plastic sector, are described in paragraph 5.1. For the European agreement, there was consensus that only a so called Freelance Agreement, in which national authorities are not necessarily involved, logically is describing the situation of the European plastic sector.

First, the EUPC will set up a voluntary agreement with national plastic associations. This agreement we call an 'Umbrella Agreement' (UA), since it also contains possible

structures (or recipes) how to implement voluntary agreements (VA) on a national base in a later stage. Both are visualised schematically in the figure below:

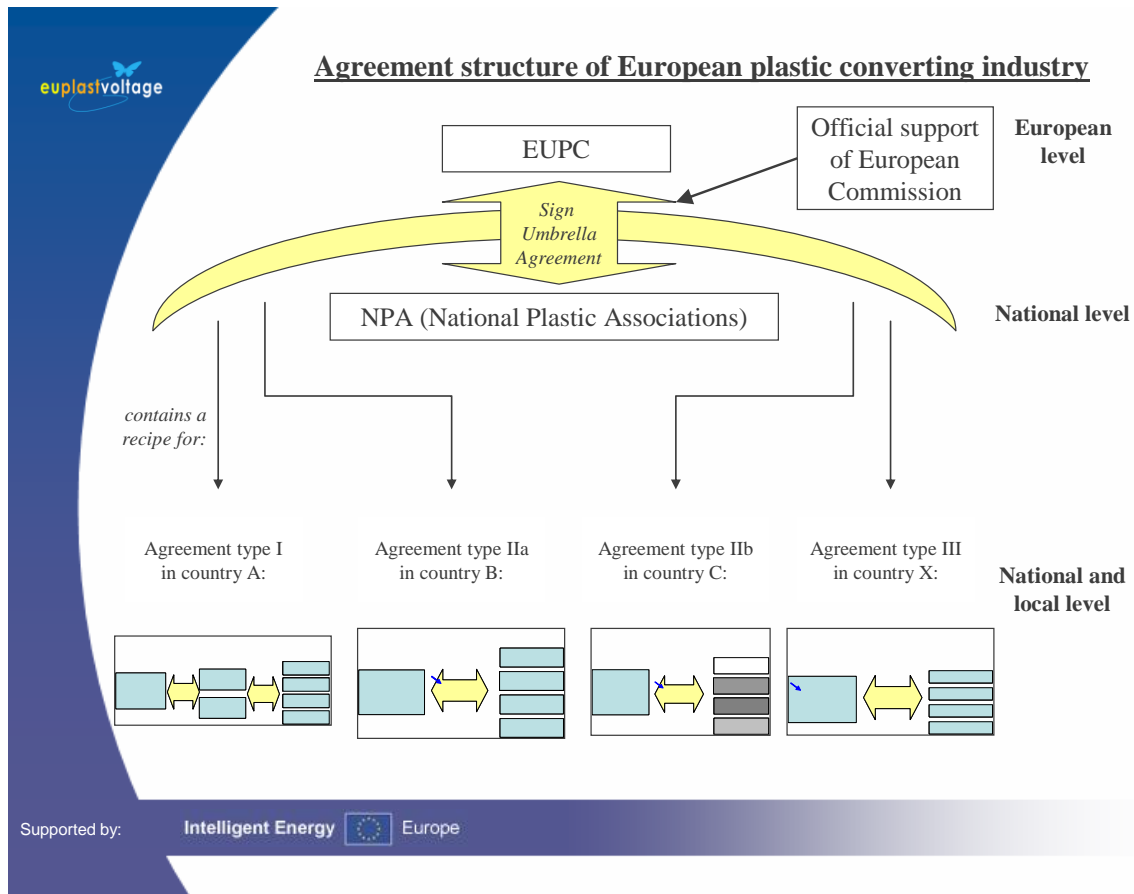


Figure 6.1: European Umbrella Agreement leading to several National Agreement types

As shown, the umbrella agreement (UA) will be signed between the EUPC and preferably all national plastic associations (NPA's). It is aimed to also achieve the 'Official support of the European Commission'. The UA works as an umbrella (as visualised) for all national VAs, which may be different types of agreements. Differences can be e.g. whether the national authority is involved, or whether the agreement is identical or can be altered for the companies that sign it. More about the possible structures of *national* agreements is explained in Section 5.1, which can be inserted as a separate section of the Umbrella Agreement.

Before a VA can be negotiated and established, one should bear in mind that the most important step in the process is to inform and convince the other parties that are needed in the agreement.

- On a European level this can be the other European NPA's that are not a partner in this EU PlastVoltage project, but are also aimed to sign the UA.
- On a national level this can be the companies that will be asked to sign the agreement or an accession document to it. Or this can be an occasional national

government.

Information on this very important initiation and negotiation phases can be found in the [www.ltauptake.eu](http://www.ltauptake.eu) toolkit.

### **4.3 Proposal for content of paragraphs in Umbrella Agreement**

The Umbrella Agreement (UA) as described above should be formalised by a document signed by all parties. The agreement document describes the goal and how it can be achieved.

Besides the agreement between the EuPC and the national plastic associations (NPA's), the UA document also describes different viable ways for implementation of a national Voluntary Agreement (VA).

The paragraphs (chapters) of the UA as agreed on by the consortium<sup>4</sup> are:

- *Definitions*
- *Background*
  1. *Parties in the agreement*
  2. *Joining the agreement*
  3. *Mission statement, targets and aims of the agreement*
  4. *Benefits including facilitation*
  5. *Obligations*
  6. *Sanctions*
  7. *Monitoring and reporting*
  8. *Confidentiality*
  9. *Board of the agreement*
  10. *Duration of the agreement*
  11. *Termination of the agreement*
  12. *Evaluation*
  13. *Other issues*
  14. *Signatures*
- *Appendices*

All paragraphs have two sections:

*Section 1: European Umbrella Agreement*

*Section 2: Guidance on national implementation*

For a general explanation on the aimed content of each paragraph, please refer to Chapter 5.3. Those explanations apply to an agreement both on European level as on national level.

Below you find explanations to paragraphs from the list above that specifically apply to an agreement on a European level, i.e. the UA.

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<sup>4</sup> Consortium meeting Brussels October 9, 2009

- 2. Joining the agreement. The consortium agreed that there should be no thresholds related to company size to join the agreement; in order to enable SME's to join.
  
- 3. Targets and aims of the agreement  
 The EU energy efficiency goal is set to 20% reduction in 2020 compared to 2005. The consortium agreed to set the same goal for the plastic processing industry. This goal is to be divided evenly over all participating countries / NPA's.  
 Additional aims could be to fulfil a target in the field of energy management (in order to comply with the EC directive on energy management) or the field of (supply) chain efficiency.
  
- 4. Benefits  
 The sector shows its willingness to contribute to national and European energy efficiency goals. They expect no legislation but cooperation with government. In turn, government should also stimulate energy efficiency and innovation initiatives. Joining the agreement and meeting its goals is facilitated by support systems.
  
- 6. Sanctions  
 It should be decided whether sanctions will be applied to an NPA when the NPA or the total of its companies don't comply with an obligation stated in the UA.
  
- 7. Monitoring and reporting  
 It is advised that NPAs provide an annual report on the performance of their company's energy efficiency, both individually as well as an aggregated total. Reporting should comply with the European Energy Service Directive (ESD). The UA should choose their preferred performance indicator (see Chapter 3). It should also be used in the underlying national VAs, in order to be able to compare and sum the national results.
  
- 10. Duration  
 The UA should state the duration of the agreement. It should state requirements for the duration of the underlying national VAs. The consortium agreed upon a timeframe to 2020.

Please note: the choices made in the UA (such as targets) will also be the starting point for the content of the future national VAs.

Further and more detailed contents will be elaborated in Work Package 6 on the "Long-term agreement proposal".

#### **4.4 Possible interference with existing legislation and policies**

The contents of the future UA will also lead, directly or indirectly, to prerequisites for the numerous *national* VA's that will be built. Possible interferences of existing legislation and policies with *national* voluntary agreements are described in Chapter 6. Those possible interferences should therefore already be kept in mind when composing the contents of the UA.

## 5 National Voluntary Agreement models for the industry (D2.3)

### 5.1 Marketing and negotiation of a VA

In general, the preparation of an national VA brings together people from industry and from administrative positions, who do not know each other, or who perhaps had former antagonist relationships, for example when negotiating the regulations that apply to industry. The VA process requires a new attitude by these people, i.e. to consider the others as partners in building a common project.

In the situation of the plastic industry, the initiative is from the side of the industry, which can sign a VA with its national government or even start a unilateral VA. Therefore, this subchapter is *specifically relevant* to countries in which an NPA or government is not already convinced to start a VA.

Before parties can start a VA, two very important and often underestimated goals have to be achieved:

- they have to be convinced they all want to build a VA
- they have to successfully negotiate a VA with enough gains for each party

As a start to achieve this tool form 0.8 [www.ltauptake.eu](http://www.ltauptake.eu) "Create confidence between partners" is very relevant here, and can be used by interested parties. Furthermore, in March 2010 a PlastVoltage conference will be organised by the EuPC, for NPAs and representatives of energy agencies and governments of EU member states. This conference will inform all parties about PlastVoltage and the implementation of the umbrella agreement on national level, including the benefits to join the PlastVoltage process. The conference also aims at establishing relationships on national level between interested parties. Steps to take for successful development of a national VA or other implementation strategy will be explained.

The two goals mentioned above, are part of all 5 phases distinguished in the [www.ltauptake.eu](http://www.ltauptake.eu) Toolkit. They can be found in phase 0 (Preparation), 1 (initiation) and phase 2 (negotiation) of the complete timeline of the toolkit. In the complete VA planning and implementation procedure the following phases have been identified:

- Phase 0 : Preparation
- Phase 1: Initiation of the process
- Phase 2 : Negotiation of the agreement
- Phase 3 : Implementation of the agreement
- Phase 4 : Evaluation

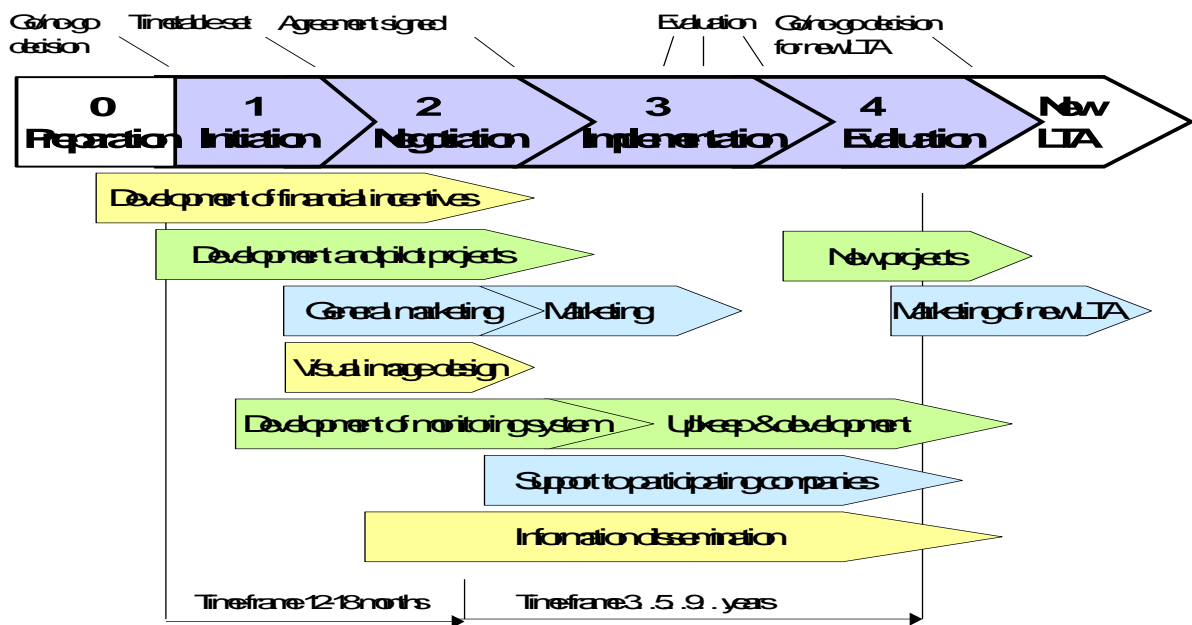


Figure 1 the VA preparation procedure

Assumptions for the timeframe developed:

- The main VA negotiations are carried out by branch associations, which have the competence to do so on behalf of single companies
- Negotiations can theoretically be held between single companies and state administration, but this would be too time-consuming (with the exception of large energy consumers – e.g. companies with energy consumption above 2 PJ)
- Whether or not governments provide incentives is something that is agreed internally and must be independent of any political developments (e.g. no changes in incentive schemes after parliamentary elections)
- There is a legal possibility to sign the agreement between the government and the private sector
- Energy efficiency potentials are determined by the companies themselves (but calculated according to standard methodology) and results are accepted as input

## Brief description of each phase

### Phase 0: Preparation

This early phase scans the possibilities of establishing a long-term agreement scheme in the national framework. The key question in this phase is: are VAs possible and what are the benefits of establishing a scheme? At the end of this phase there should be a clear decision: to go (or not to go) forward with establishing an agreement scheme.

### Phase 1: Initiation

The initiation phase of the VA design process includes the preliminary negotiations when the impacts of the possible agreement scheme are evaluated and the roles and schedules in the preparation process are discussed. The actual content of the agreement is not yet under discussion during this phase.

### Phase 2: Negotiation

The negotiation phase concentrates on the preparation of the agreement, its structure, content and the fine-tuning needed when finalising the agreement documents. This phase also includes more thorough cost-effectiveness and impact assessments. The actual VA preparation phase ends in the signing of the agreements.

This phase also includes other activities that are going on in parallel to the actual agreement preparation – these include marketing of the VA and the preparation of the monitoring and reporting system.

### Phase 3: Implementation

The implementation phase is the operational lifespan of the agreement. It begins when the agreements have been signed and ends when the scheme is either terminated or modified into the next generation of agreements.

### Phase 4: Evaluation

The evaluation phase in the VA lifespan begins at the half-way mark of the VA lifespan, when the first evaluation of the scheme is made. The phase ends when the decision is taken to start a new generation of VAs or to terminate the agreement scheme.

A more extensive description of the planning and tasks for each phase can be found in the Annex.

Sources:

[www.ltauptake.eu](http://www.ltauptake.eu) toolkit: mainly tool 1.1 “LTA planning and implementation timeframe” and tool 0.7 “toolkit overview”.

## 5.2 Inventory of possible VA models

There is not one or a fixed number of possible structures of a national Voluntary Agreement (VA). You can read "Tool 2.2 Agreement Scheme options" of the [www.ltauptake.eu](http://www.ltauptake.eu) toolkit for a general overview of all possibilities.

However, for the national implementation of the Umbrella Agreement (UA) for the plastic industry, some limitations can be made in the possibilities:

- in all cases a sector association (the NPA) will be a party in the agreement
- it is very likely that all companies in a country will sign identical accession documents to one agreement (no differences between companies)
- It is expected that in most cases the national government is willing to participate as a party in the agreement. This is for the business sector is already showing its interest in achieving goals, which will surely fit into the policy goals of any government.

Furthermore, it is also possible that the national implementation of the UA does not lead to a VA on a national level, but another initiative proves more suitable, such as a change of existing policy or legislation.

Below the (theoretically) possible structures for national voluntary agreements are shown.

Note: concerning the focus on marketing of a VA to a new party, which is described in the previous chapter, this is very important, independent of the type of model described below.

The so-called Framework Agreement (type I), is the type that is expected to be most prevailing, since all three assumptions as stated above apply. In this structure, the national government and the NPA sign an agreement, and individual companies can choose to sign an accession document in order to join the agreement. See figure 7.1.

Instead of the government on ministerial level, the government on federal or regional level could be the authoritative partner, depending on the geographical scope of the agreement.

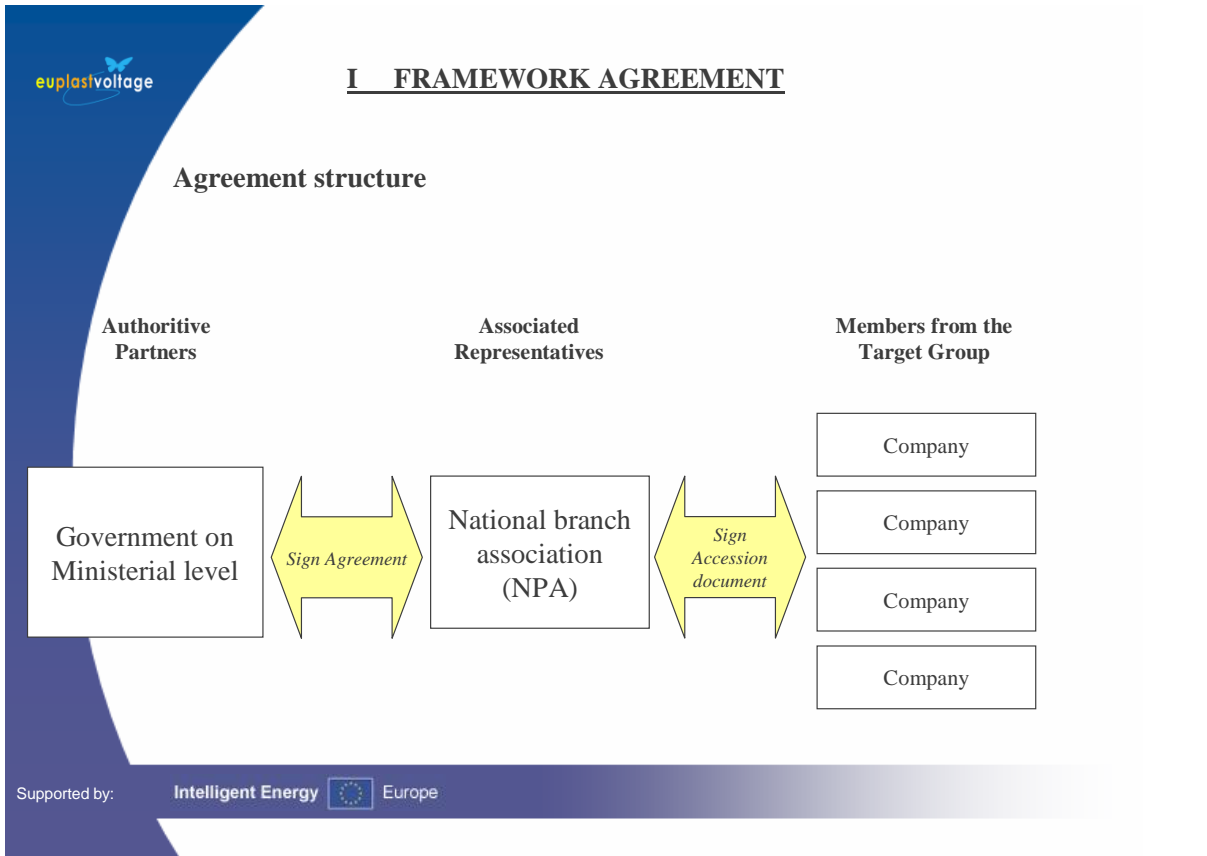


Figure 7.1: example I of a national Voluntary Agreement

In the so-called Freelance Agreement, the government is not part of the agreement, so the agreements are signed directly between the NPA and the companies in the sector. Here two subtypes are possible: one with identical agreements for every company (type IIa) and one with (slightly) different agreements for some companies (type IIb). See Figure 7.2 and 7.3

## IIa FREELANCE AGREEMENT

### Agreement structure

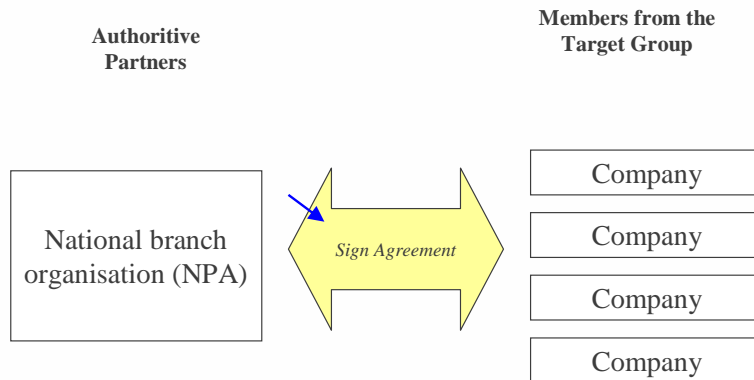


Figure 7.2: example IIa of a national Voluntary Agreement

## IIb FREELANCE AGREEMENT

### Agreement structure

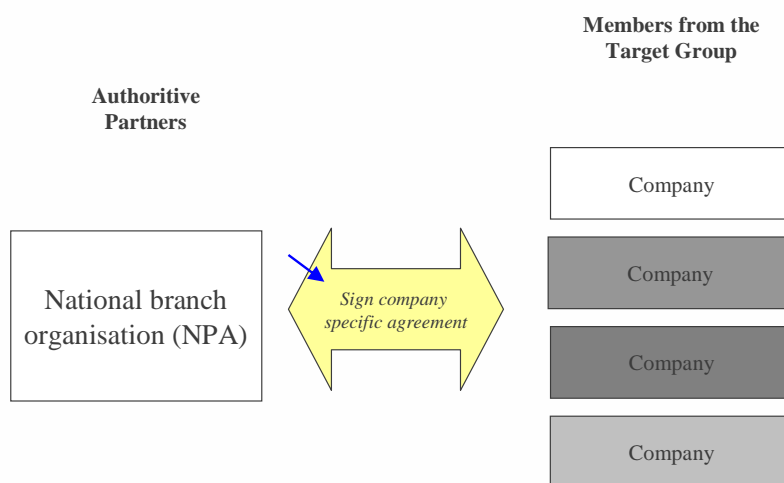


Figure 7.3: example IIb of a national Voluntary Agreement

The final possible structure for an agreement in the European plastic sector has been called the Generic Agreement. In the rare (theoretical) case the NPA is not willing or not able to act as a partner in the agreement, but the national government is willing to participate, direct agreements between the government and the companies can be signed. It is assumed here that the agreements will be standardised agreements, to avoid too much of a hassle for the government (which might deal with many companies). See Figure 7.4.

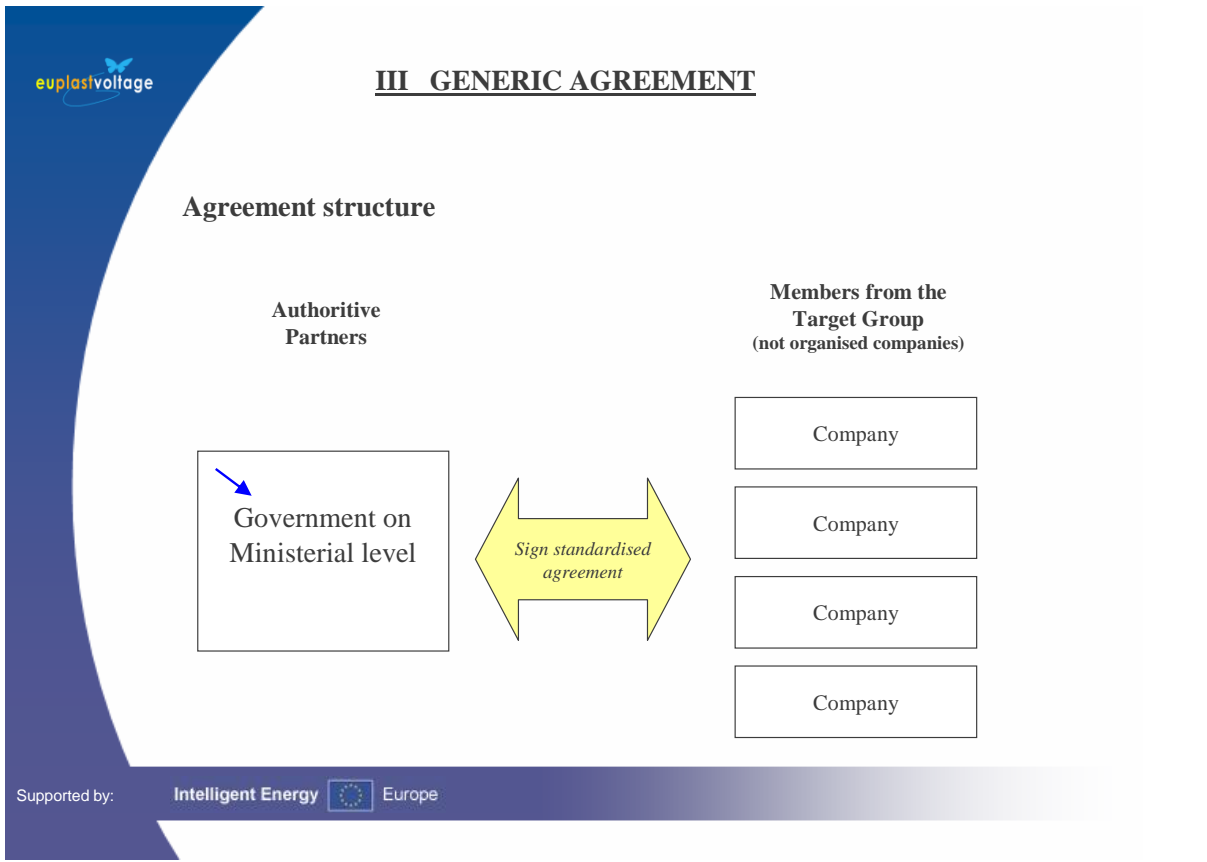


Figure 7.4: example III of a national Voluntary Agreement

### 5.3 Guidance for content of paragraphs in national Voluntary Agreement

The model table of content below aims to show the types of issues that should be included when discussing the content of the agreement. The items in the table of contents and their descriptions have been taken from the [www.ltauptake.eu](http://www.ltauptake.eu) toolkit tool 2.2. The information source of that tool 2.2 is the agreement documents that are used in the eight EU LTA Uptake partner countries, plus the UK, Ireland and Denmark. Due to the different agreement types and structures, not all items are represented in every agreement.

The model presented here is very useful and helpful for all parties during the planning phase and can be used as the first template and the first iteration. Contents of the paragraphs for national VAs will be further elaborated in Work Package 5 on the "National implementation aspects".

The explanations under the headers are not from the agreement documents, but are comments from the author of this text. A company-specific agreement document differs from the document presented here.

#### Title

The title of a long-term agreement should clearly show the purpose of the agreement and the targeted industrial sector or single company, e.g. 'Long-Term Agreement to Improve Energy Efficiency in the .... Industry'.

#### Definitions

The agreement document usually includes a chapter on definitions, including the key terminology in the agreement. These definitions may include the explanations to terms such as: enterprise, facility, energy use, energy efficiency, benchmark or energy index, energy audit, energy conservation plan, energy management system, etc. If the reporting data is verified by a third party, or if the energy management system is approved by an accredited body, there may be also explanations of other relevant terminology.

#### Background

The background of the agreement describes the national policy on improving energy efficiency. The Kyoto Protocol, EU directives and other top-level documents may be mentioned. At an EU level, the Energy Services Directive describes voluntary agreements as possible measures to improve energy efficiency at the end-user, and the agreements are frequently included in the National Energy Action Plan developed under the framework of this directive. The main emphasis is on national energy and climate strategy - how the principles of voluntary action are encouraged by the government.

If there have been earlier agreement periods, the 'background' chapter may introduce this historical data and results.

In the most recent agreement documents the EU Energy Services Directive is mentioned as the basis for targets set within the LTA.

## 1. Parties in the agreement, agreement structure

This chapter introduces the various parties involved in the agreement scheme and the structure of the agreement.

The parties usually consist of: the Authority (usually the government ministry in charge of energy issues in industry or other agreement sector), the Confederation of Industries (the top-level organisation representing the particular industry), the Sector Associations included in the agreement, and the Enterprises (individual companies participating in the agreement). It is important to have an independent body to act as moderator during the negotiation phase. It is possible, but not necessary, to appoint an independent body to supervise the implementation of the activities from the Energy Action Plan c.q. the energy-efficiency measures. This body can also verify the effect of the implemented measures. This information can be used for the regular progress reports.

The agreement may have different structures: it is usually a framework/umbrella agreement between the Authority and the Confederation of Industries, or between the Authority and Sector Associations. Individual companies sign an accession document with the Sector Association. However, there are agreements where the Enterprise joining the agreement is approved by the Authority.

## 2. Joining the agreement

This chapter concerns the agreement structure and the issues that may be included in the previous chapter. The main point is to describe how Sector Associations and individual Enterprises may participate in the agreement.

Initially, a framework agreement is signed by the Sector Associations, Confederation of Industries and the representatives of the Authority. New Sector Associations may join later. Individual Enterprises start signing their accession document after the framework agreement has been signed or at a later stage.

The official list of participants is sometimes mentioned in this chapter, including the responsibilities of the 'list keeper'. There may be some requirements concerning the Enterprises entering the agreement, such as:

- a minimum level of annual energy use (energy-intensive industry)
- certain production processes
- special requirements concerning energy use

### 3. Targets and aims of the agreement

The main targets of the agreement are specified in this chapter. There may be objectives for the Sector Associations to obtain certain coverage among their member Enterprises joining the agreement (a certain percentage of energy use or specific number of Enterprises). The energy-saving / energy-efficiency improvement target is defined in most LTAs. This can be shown as a percentage of the consumption in a baseline year or as a quantitative target (defined as energy units).

The agreement scheme may include targets for energy saving in the various sectors, and also allow individual target setting by each Enterprise entering the agreement.

In some agreement schemes the facility-specific target is defined after an energy audit has been completed. If the key element of the agreement is an energy management system, there may not be any quantitative targets but just the requirement for continuous improvement.

The aims of an individual Enterprise may also be included in this chapter: usually the aim is to improve energy efficiency by implementing profitable energy-saving investments and introducing a systematic energy management system into the Enterprise.

### 4. Benefits

For *industry* the motives to participate in an LTA may be numerous, the major one being avoidance of future regulation and/or additional taxation on energy used or carbon emissions. Other incentives include lowering production costs, learning about possibilities to do so, as well as about investment and solutions relating to reducing costs (production costs or the costs of compliance with different requirements), gaining exemptions from existing regulations, gaining access to subsidies or tax rebates, developing a green image (as demanded by customers or investors), obtaining strategic advantages, saving on insurance costs and increasing the company's capital market value.

Leaving some flexibility regarding options to comply with a given target makes it very likely that industry will select the cheaper solutions in order to meet an agreed environmental target, especially if agreements are combined with some trading mechanisms, as is the case in the UK. (Source: [www.ltauptake.eu](http://www.ltauptake.eu) toolkit, tool 0.5)

Benefit for other actors than industry can be found in [www.ltauptake.eu](http://www.ltauptake.eu) toolkit, tool 0.5.

## 5. Obligations

This is an important chapter in the agreement document, and defines the obligations of the various parties involved in the agreement.

The obligations differ between the various types of long-term agreements, and depend on the national policy framework, legislation and energy taxes. There are many different ways of arranging the annual reporting and monitoring, and the responsibilities in this area are very country-specific.

The following section mentions some typical obligations. None of the existing agreements include all of these obligations.

Individual Enterprises joining the agreement must:

- draw up and implement an energy conservation plan
- implement an energy audit for the facility and/or processes
- define energy-efficiency targets and key figures for follow-up
- establish and implement systematic energy management (within a defined time range)
- implement profitable energy-saving measures (within a certain payback period)
- strive for continuous energy-efficiency improvements
- take energy issues into account when purchasing equipment and systems
- strive to implement new energy-efficient technologies whenever economically possible
- monitor their energy use and energy-saving improvements and to report these on an annual basis

Sector Associations must:

- encourage their members to participate in the agreement
- keep a list of participants and contact persons
- actively inform their members about the development and implementation of the agreement
- provide technical assistance and advice on energy-efficiency improvements
- appoint a representative to the governing board of the agreement
- provide an annual reporting service (by subcontracting to a third party)
- provide advice on reporting procedures to the Enterprises
- participate in development and demonstration projects together with other parties
- participate in the development of the agreement scheme together with other parties
- contribute to the identification of the energy-efficiency baseline

The national Confederation of Industries must:

- establish a governing board for the agreement, to steer and monitor the scheme
- participate in the development of the monitoring system
- participate in the annual reporting procedure
- participate in development and demonstration projects together with other parties
- participate in the development of the agreement scheme together with other parties

The Authority (usually a government ministry) must:

- provide fiscal incentives to support Enterprises in their efforts to improve energy efficiency (these may be tax exemptions, subsidies for energy audits and for energy saving investments)
- (some agreements include the statement that no additional measures or regulations concerning energy efficiency or CO<sub>2</sub> emissions will be imposed on the Enterprises participating in the agreement)
- provide resources/financial support to the Sector Associations / Energy Agency / independent experts, to assist the Enterprises within the agreement scheme
- participate in the development and upkeep of the monitoring system (by providing financial support)
- participate in development and demonstration projects together with other parties
- participate in the development of the agreement scheme together with other parties
- carry out an evaluation of the agreement scheme after a certain time period

## 6. Sanctions

The agreement document should include a chapter on sanctions (if they have been defined) for the participating parties who fail to fulfil the obligations set out in the agreement. Usually the Enterprise and Sector Association / governing board of the agreement / other agreement party must enter into the negotiations, and the Enterprise concerned is given a reasonable time in which to meet its obligations.

Sanctions typically depend on the national legislation and policy framework. The most common sanctions are:

- the Enterprise is expelled from the agreement
- the Enterprise must pay back all subsidies it has received for energy audits or energy-saving investments

- the enterprise must pay energy or CO<sub>2</sub> tax (in full) if it has been exempted from this tax as part of the agreement

## 7. Monitoring and reporting

This chapter describes the reporting procedure in general terms: the way in which the Enterprises report, which organisation collects the data and prepares the sector summaries and the overall progress report, which body approves the reports and the procedures for publishing reports.

Deadlines for submitting annual data are also generally defined in the agreement. More detailed information about the reporting data may be shown in an appendix.

The reporting data from each Enterprise usually includes:

- energy consumption and production data
- information concerning the implementation of the energy conservation plan
- information concerning the implementation of the energy management system
- energy-efficiency improvements

This chapter also defines whether the reporting data needs to be verified by an independent body.

The content of the annual sector summaries and the overall progress report may also be defined in this chapter.

## 8. Confidentiality

Confidentiality is a very important issue when dealing with industry; therefore it is necessary to include a chapter on confidentiality issues in the agreement. This chapter deals with the confidentiality of reported data and the rights of the LTA parties to publish this data. Some agreements also mention whether or not the list of participating Enterprises is considered public information.

## 9. Board of the agreement

Many agreement schemes have a governing board or a control group consisting of members from the various parties in the agreement. This governing board may be chaired by an independent body appointed by both government and industry. This chapter describes the qualifications of the board members and the duties of the governing board.

Board duties may include: analysing the ways in which the targets of the LTA are met, evaluating the need for improvements in the agreement scheme,

approving the annual reports before publication, approving new participants, etc. The board may also decide on sanctions for participants that have not fulfilled their obligations.

## **10. Duration of the agreement**

The duration of the agreement is specified with a date for the start, and a date for the end of the agreement.

## **11. Termination of the agreement.**

Additionally the total duration in years can be mentioned, e.g. ...with a total duration of 5 years, starting to take effect on January 1st, 2009 and ends on December 31st, 2013."

This chapter lists the rules for terminating the agreement before the aforementioned specific end date. Termination can be implemented by the Authority or the Confederation of Industries if the obligations stated within the agreement have not been fulfilled, if it is likely that the targets will not be met or if the conditions have changed drastically (e.g. if a regulation overruling the LTA benefits is introduced). The Sector Association may terminate the agreement, for example if there are no possibilities available to go on fulfilling the obligations. An individual Enterprise may also leave the agreement, and the procedure for implementing this is described in this chapter.

The rules may include, for example, the termination of tax exemptions granted to the Enterprises participating in the LTA, should there be some law or regulation overruling the possibility for tax exemption.

## **12. Evaluation**

The agreement document may include some requirements concerning the evaluation of the agreement scheme after it has been running for a defined number of years.

This chapter may include some points on which the evaluation team should focus. It may also define the responsibilities of the agreement parties concerning the evaluation. The main point is that, based on the evaluation, the agreement parties can discuss the extent to which the agreement scheme needs to be modified for the remaining years of operation, or discuss the requirements for setting up the next generation of agreements.

## **13. Other issues**

Any other issues relating to the agreement may be included in this chapter: e.g. obligations for reporting to the government and the public, as well as how, how often and which kind of data, and which body is responsible for these actions.

## 14. Signatures

The agreement is signed by the various parties, depending on the agreement structure. Usually the framework/umbrella agreement is signed by the representatives of the Authority and the Confederation of Industries (or Sector Associations). The accession document/underlying agreement is signed by representatives of the Enterprise and the Sector Association.

## Appendices

### 1. Energy use

This appendix may include information on gross and net energy use and consumption breakdown divided by end-use. In some agreements this information is required in a certain format when joining the agreement.

### 2. Quantitative targets

In some agreements the quantitative energy-saving targets are specified in an appendix. The energy calculation units are specified, as well as any conversion units (if required).

The UK, for example, uses energy targets and carbon targets, as well as relative and absolute targets - the rules for converting and handling the data are shown in the appendix.

## Variations

Some agreements have made a list of rules for changes to the agreement that is likely to happen during the agreement period. These rules are of special interest if fixed absolute targets have been defined for the sector and for the facility. The rules may include information on:

- including and excluding facilities
- variation of output or product mix
- variation of targets
- 

## Reporting data

Some agreement documents include a reporting template showing which data the Enterprises must report annually.

## Certification

Some long-term agreements include certification requirements for the Enterprises when establishing an energy management system. This certification process may be described in detail in the appendix.

## 5.4 Possible interference with existing legislation and policies

This chapter consists of an overview of possible interference of existing legislation or policies, with our envisaged VA. First, a general overview is provided. Second, a more detailed overview is provided in which possible interferences are allocated to the relevant paragraphs of the agreement document.

It should be noted that the information below could apply to both European (UA) and national voluntary agreements.

### 5.4.1 General overview

The considerable positive attitude toward Voluntary Agreements with industry in countries with a voluntary agreement does not mean that legislative or policy constraints are absent. Sometimes negotiating parties fear interference with legislation issued by other authorities than the ones who signed the Voluntary Agreement, e.g. authorities on a European, national, regional or local level. Without giving a complete overview we herewith list some important examples:

1. Contradiction with environmental legislation or permit submission issued by local or regional authorities: Sometimes, when voluntary agreements are agreed on a national level it is expected to overrule the local or regional authority responsibilities regarding CO<sub>2</sub> emission reduction. This is not always true. It depends much on the national situation. In general it is important to involve (associations of) local authorities in an early stage of the negotiation process to consider where VAs can contribute to local policy without additional bureaucracy.
2. EU policies: In this respect the following specific EU policies are mentioned:
  - a. The (integrated pollution prevention and control (IPPC) directive. In the frame of this directive so called Best Available Techniques Reference documents (BREFs) are issued. Although there is not a BREF foreseen for plastic converters some BREFs may have impact on any plastic converters VA. These are the BREF on Energy Efficiency (02-2009); the BREF on Economics and Cross Media Effects (07-2006) and the BREF on General Principles of Monitoring (07-2003);
  - b. The Aarhus treaty: Certain data the government has produced or acquired, may not be confidential, but should be open for the public. This could lead to a conflict when it concerns company data that were supplied to the government confidentially, as agreed in the VA.
  - c. Emission Trading System In January 2005 the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) commenced operation as the largest multi-country, multi-sector Greenhouse Gas emission trading scheme world-wide. The scheme is based on Directive

2003/87/EC, which entered into force on 25 October 2003. The EU ETS is focused initially on big industrial emitters which collectively produce almost half of the EU's CO<sub>2</sub> emissions and cover emissions from large emitters in the power and heat generation industry and in selected energy-intensive industrial sectors. The EU is considering expansion of the system to further industrial sectors from 2013. It might be interesting for the European plastic converters to consider the benefits or constraints of entering the ETS system in relation to its VA approach.

- d. In the Energy Service Directive (ESD) the following very general prerequisites are mentioned about VAs: 'The voluntary agreements covered by this Directive should be transparent and contain information on at least the following issues: quantified and staged objectives, monitoring and reporting.' ...the voluntary agreements shall have clear and unambiguous objectives and monitoring and reporting requirements linked to procedures that can lead to revised and/or additional measures when the objectives are not achieved or are not likely to be achieved.' ESD requires all member states to create a National Energy Action Plan (NEEAP), in which a VA can be proposed.

In general, additional energy efficiency policies are not always limitations to negotiate VAs. If identified and made subject of negotiation in time by the parties it even results in synergy.

#### 5.4.2 Interferences allocated by paragraph

Besides the general overview of above, in the table below is attempted to specifically allocate possible interference of legislation or policies to the *proposed paragraphs* of a VA (as described in Chapter 5.3). This information could be helpful in the agreement negotiation phase, when discussing the contents of each paragraph.

It should be noted again that this is far from a complete list: only the most relevant legislation is mentioned. To keep a better overview, national legislation is mentioned only once (irrespective whether it occurs in one or in several countries).

Mainly chapter 3 of this report was used when composing this table. The following sources were also briefly screened, which one could also use, to find more nation-specific information on existing legislation and policies:

- 'European Energy and Environmental Legislation Reference Guide':

<http://www.enerplast.eu/pgm/tools&results.php>

- MURE database (**M**esures d'**U**tilisation **R**ationnelle de l'**E**nergie):

<http://www.isisrome.com/mure/index.htm>

- Tool 1.3 "EU legislation and directives" of the [www.ltauptake.eu](http://www.ltauptake.eu) toolkit:

[http://www.ltauptake.eu/lta\\_phase.asp?id\\_phase=1&id\\_tools=174](http://www.ltauptake.eu/lta_phase.asp?id_phase=1&id_tools=174)

Table: possible interferences of existing legislation and initiatives with a VA (to be elaborated)

No.	Paragraphs of National Agreement (see description in ch. 7.2)	Type of legislation/ policies that might be relevant (see overview from ch. 4)	Description of interference with agreement / implementation possibilities.	Remarks
	Definitions			
	Background			
1	Parties in the agreement		+ If a VA is mentioned in a country's NEEAP, this is a great argument for convincing the government of the concerning country that it should participate in a VA.	If no environmental legislation is existent, it is more doubtful whether the government will be willing to cooperate as a party in the VA.
2	Joining the agreement			
3	Targets and aims of the agreement	National: National Energy Efficiency Action Plan (NEEAP) resulting from ESD	+ In a number of NEEAPs a VA is mentioned as an instrument to achieve the energy efficiency goals of the concerning country. This is a great argument for convincing the government of the concerning country that it should participate in a VA. -/- In case a country has not finalised its NEEAP yet, it also works the other way around: the target set in a voluntary agreement provides an important element for the national action plan of a country, since it shows clearly how the country will build towards the energy efficiency goal in 2020.	The targets of the VA should of course be higher than existing legislation.
		EU: EN16001 standard on energy management	+ This standard provides guidelines how to achieve structural energy efficiency improvements in companies. If a country wants to adopt guidelines in the field of	

			energy management, it should follow the guidelines of this standard. However, all EU countries have agreed on the contents of the standard. A VA therefore should integrate relevant elements from this standard (e.g. monitoring, evaluation).	
4	Benefits	NL: Act on taxes with an environmental base (1)	+ Provides option to pay less environmental tax when complying with VA (implemented in NL).	
5	Obligations			
6	Sanctions	NL: Act on taxes with an environmental base	-/- Provides option to pay more environmental tax when not complying with VA (implemented in NL).	
7	Monitoring and reporting	NL: Act on taxes with an environmental base	+ The monitoring requirements of the VA supply worthwhile data, which can be used for calculating part of the environmental tax (or other relevant legislation).	
		EU: European Energy Service Directive (ESD)	O The ESD states a number of requirements on the monitoring methodology used in the VA.	
		NL: EPRTR reporting obligation	+ Reporting of monitoring data in a new VA could happen in the same reporting system as for reporting of EPRTR data. In the Netherlands this happens already. Advantage is that companies are already used to the reporting system + Secondly, there is no need to ask twice for some general data, which are needed in both the EPRTR and VA reporting.	
8	Confidentiality	EU: Aarhus treaty	-/- Certain data the government has produced or acquired, may not be confidential, but should be open for the public. This could lead to a conflict when it concerns company data that were supplied to the government confidentially, as agreed in the VA.	In NL a minimum amount of data is depicted that is made public as the Aarhus treaty requires.

9	Board of the agreement			
10	Duration of the agreement	EU: European Service Directive (ESD) and as a part of this the National Energy Efficiency Action Plans (NEEAPs)	O Note that an important year in goal setting of EU directives is 2020.	
11	Evaluation			
12	Other issues			
13	Signatures			
	Appendices			

Note: "+" means an expected positive interference. "-" means a negative interference. "o" means a neutral interference.

## 6 Inventory of support structures for the industry (D2.3).

### 6.1 Importance of support structures

The availability of support structures are for companies to facilitate their activities aiming at energy efficiency is crucial, and specifically when small and medium sized companies are involved with few resources of their own. As a result of both European and national energy policies several support structures are available, as shown below. To support the plastic converting companies to be involved in the PlastVoltage agreement on energy efficiency it is important that the support structures available are promoted as soon as possible. Parties involved with national implementation are most suited for this task, including additional PlastVoltage dissemination structures (website, meetings etc.).

### 6.2 Inventory existing national and EU support structures (tools, coaching/consulting, finance, business to business).

There are several projects finalized or still running and partly funded from IEE to support SME's in general and/or specifically in the polymer processing industry in Europe with tools to increase energy efficiency. Financing and support is very different between EU member states.

The EU LTA Uptake project resulted in a web based toolkit for policymakers, energy agencies and companies/sectors to develop tailor made voluntary agreements. The toolkit is tested and implemented by member states and resulted so far in 3 VA's ([www.ltauptake.eu](http://www.ltauptake.eu)). This toolkit is very useful for implementation of the PlastVoltage VA on national level.

The ExBESS project resulted in a web based toolkit for SME's, offering tools for energy efficiency and a comprehensive energy management system ([www.bess-project.info](http://www.bess-project.info)). The toolkit has been tested and implemented in 19 member states and in 6 different SME sectors. This toolkit can be used to support national SME's in the plastic converting industry. The toolkit will be adapted to the industry a.o. for the benchmark application and for sector specific measure lists.

The EU Eco-Management and Audit Scheme (EMAS) is a management tool for companies and other organisations to evaluate, report and improve their environmental performance. The scheme has been available for participation by companies since 1995 and was originally restricted to companies in industrial sectors. In November 2009 the revised version of EMAS has been adopted ([http://ec.europa.eu/environment/emas/index\\_en.htm](http://ec.europa.eu/environment/emas/index_en.htm)).

In the RECIPE Project a Total Cost of Ownership calculation model for injection moulding has been developed and a best practice guide for the main polymer processing techniques.

In the ENERGYWISE PLASTICS project, started in October 2009 results from RECIPE will be transferred in an e-learning tool for the polymer processing industry, making the best practice knowledge available in different languages to the EU member states.

In the ENER-PLAST project a web tool for energy efficient equipment will be developed as well as a carbon impact calculator for polymer processing companies. The web tool will have two main strands, a database to depict energy efficient equipment and mainly filled in from the machine suppliers and a search tool for the buyers to find the energy efficient equipment in the database for the planned application. The ENER-Plast project additionally develops a web tool for the best practice and environmental related information in the supply chain for polymer processing.

On national level the PlastVoltage questionnaire shows support systems for energy efficiency in industry is available in Belgium, Finland, France, Germany and The Netherlands.

## 7 Issues to be addressed next in PlastVoltage

The chapters before show that a lot of information has been gathered, but also that a lot work is yet to be done to find common denominators and to detail and structure the information in the direction of an umbrella agreement and suitable national implementation strategies.

However, on some issues the consortium already found consensus concerning the Umbrella Agreement (UA):

- Unilateral freelance agreement model on EU level
- Include guidance for (best) options for implementation on national level
- No thresholds to enter: SME's can join too
- Timeframe and target follows EU target: 20% by 2020
- Involve national level a.s.a.p through NPA's

The success of the European UA lies in its implementation on national level, therefore WP 5 (Implementation aspects) is highly important. To start developing the national support from companies and policymakers for the UA and its implementation on national level in advance a meeting in March 2010 is being organised between NPA's, national policymakers and energy agencies.

This report also gives the necessary information, or –sources, to be used in the next WP's of the PlastVoltage project. Specifically it describes the outline for the European VA for the plastic converting industry (Chapter 6) and possible implementation models on national levels (Chapter 7). The next WP's serve to further elaborate and detail the European VA and its national implementation. Below the next WP's are given with reference to the information to be used in these WP's from WP2.

WP	Reference to information WP2
WP 3 Procedures and targets (Fraunhofer Institute)	Chapter 3, 4
WP 4 Monitoring procedures (La Plasturgie)	Chapter 3, 4, 6, 7
WP 5 National implementation aspects (IK)	Chapter 6, 5, 7 and results from WP 3, 4
WP 6 VA Proposal (NRK)	Chapter 6, 7 and results from WP 3, 4, 5
WP 7 Communication and dissemination (BPF)	Results from all WP's

It is expected that WP's 3 and 4 will need special attention because it's complexity and the difficulty to establish a common procedure and monitoring method for all NPA's involved and their companies.



## Appendices

## Appendix 1 Planning and tasks per phase of VA implementation

Source: [www.ltauptake.eu](http://www.ltauptake.eu) tool 1.1)

Below is described in general how to plan different tasks and phases of VA negotiation, starting with phase 0 (preparation) and ending with phase 4 (evaluation).

### Phase 0 - Preparation Phase

- During this phase, the government starts to consider VA as a policy tool
- Industry faces upcoming regulation and policy targets. It is willing to commit to some form of energy and environmental policy, but would like to provide its own input. For example, industry takes a proactive role, resulting in the consideration of a VA.
- This phase is concluded by signing a Letter of Intent between the Government Ministry and the industry confederation, to develop a future VA proposal. At this point in time, the contents of the future VA are still wide open.

Stakeholders involved:

Ministry of Industry/Economy, Environment, Finance. All ministries that may have some involvement in the future VA have to agree to start negotiations with industry (intensive discussions between ministries are needed beforehand)  
Confederation of Industry and/or industry branch associations. The first initiative will probably come from the national industry confederation / association, but branch associations will soon have to be involved and may also be signatory parties to the Letter of Intent.

### Phase 1 – Initiation Phase

After signing the Letter of Intent each side determines its individual possibilities.

The government studies the possible incentives it may provide:

- Financial incentives, other incentives
- Budget available, conditions for providing support
- Selects an organisation to administer the VAs

Industry studies possible targets it may wish to commit to:

- What type of target should be agreed (energy efficiency, CO<sub>2</sub>, other)
- Timeframe of energy target
- What to expect in return

- Set out energy efficiency potential studies per industry branch → (agreement with state administration about methodology of study)

Specific tasks for industry include:

- Reaching agreement on who will represent industry during negotiations
- The first initiative may have come from an industry confederation, but a branch association will be more suitable for further negotiations
- Members (companies) will have to agree on the association's competence in negotiation
- The results of energy efficiency studies determine what the branch association will offer the government
- Agreeing on regular meetings between the association and its members
- Agreeing on who will carry out energy efficiency studies

Specific tasks for the government include:

- The ministry responsible must agree with the Ministry of Finance on the financial possibilities for incentives
- Agreement with Ministry of Environment → is the proposed VA in line with environment / climate policy?
- Determining its position on energy efficiency or other targets
- Reserving manpower for:
  - Negotiation phase
  - Implementation phase

Other specific issues to include during the initiation phase (*sometimes country-specific*):

- Mentioning the VA in legislation (may be needed to include this in legislation, so that contracts between the government and the private sector have legal value)
- Find a method of determining energy efficiency potential; may use existing studies (e.g. audits)

## Phase 2 - Negotiation Phase

The actual negotiations are culturally / country-specific. The duration of the negotiations may be influenced by the level of distrust existing between both sides, and whether or not similar forms of agreements already exist. If this is not the case, then the time for negotiations may need to be longer, and time needs to be reserved for creating trust.

Recommendations for successful negotiations:

- It may be necessary to propose an independent moderator
- Split negotiations into several phases (creation of trust may be the first aim)
- Allow sufficient time between negotiation rounds to gather feedback from members

- There may be a need to reassess the available energy efficiency studies
- Do not set a fixed deadline for reaching agreement

Finalisation of negotiations:

- Agreement reached on targets, incentives, monitoring, sanctions and ways to resolve possible conflicts
- Set a timeframe for implementation:
  - VA starts day/month/year
  - First reporting period will be after x years
  - Regular verification of monitoring data
- Negotiations may have worked out details for some sectors, but not for others. The first will work as a pilot for the latter
- A suggestion can also be a *stepwise implementation* → a shorter pilot phase first, followed by a longer period with mandatory targets

### **Phase 3 – Implementation Phase**

Specific government tasks during this phase:

- Special department at ministry or agency to be established with sufficient manpower and budget
- Branch association to appoint people to work on VAs

Specific Industry tasks during this phase:

- Efforts required from companies, to set up energy efficiency studies, regular monitoring etc.

### **Phase 4 - Evaluation Phase**

Key issues for evaluation phase:

- Evaluation based on monitoring and verification studies
- Evaluation of VA results carried out by an independent organisation
- Evaluation (report) to be discussed between the government and industry
- Evaluation provides input for new VA negotiations

## Appendix 2 Abbreviations

ENER-Plast	From Design to Manufacturing: Instruments for reducing the energy consumption and carbon emissions of the polymer industry and supply chain; <a href="http://www.enerplast.eu">www.enerplast.eu</a> ,
EuPC	European Plastics Converters; <a href="http://www.eupc.org">www.eupc.org</a>
EUROMAP	European Committee of Machinery Manufacturers for the Plastics and Rubber Industries; <a href="http://www.euomap.org">www.euomap.org</a>
IE 1, IE 2	Neue internationale Wirkungsgradklassen für Motoren (IE=International Efficiency)
IEE	Intelligent Energy for Europe
MURE	Measures d'utilisation rationelle de l'énergie  MURE has three main components: <ul style="list-style-type: none"> <li>• a qualitative database of measures undertaken by the 15 Member States of the EU and directly by the EU to promote energy conservation in four end-use sectors: Households, Transport, Industry and Tertiary (the services sector). Measures may be legislative, normative, fiscal and financial, but also information campaigns, energy audits, negotiated agreements etc.</li> <li>• a quantitative database of energy related statistics covering the 15 EU Countries and desegregated by end-use sector.</li> <li>• a simulation tool to carry out calculations of energy savings and emissions reduction potentials in each of the four sectors.</li> </ul> <p>The database of measures currently includes some 1000 items, consistently described and classified according to specific keywords, thus allowing to carry out queries based on such descriptors as, e.g. the nature of the measure, the targeted audience, the technologies involved, etc.</p>
NACE	Nomenclature générale des activités économiques dans les Communautés Européennes Wirtschaftszweig-Klassifikationen der Europäischen Union
NPA	National Plastic Association
PRODCOM	PRODUCTION COMMUNAUTAIRE ist eine Standardklassifikation und dient vor allem der Europäischen Union zur Produktionsstatistik insbesondere im Maschinenbau und der Elektrotechnik. Es besitzt eine detailliertere Unterteilung, und zwar über eine 8-9 stellige Zahl (8-stellig EU-weit und 9-stellig zum Teil national).
SPE	Society of Plastic Engineers
UA	Umbrella Agreement: the proposed voluntary agreement between the EuPC and the NPA's.



VA

Voluntary Agreement In this report with VA is often referred to the numerous *national VAs* that are envisaged.



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