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BESS

Benchmarking and Energy management Schemes in SMEs

Intelligent Energy – Europe (EIE)
EIE/04/246/S07.38678

Deliverable 3.3
Quantitative baseline and target setting scheme

April 2007

BESS Task 3.5
The purpose of the proposed directive on energy end-use efficiency and energy services is to enhance the cost-effective and efficient end-use of energy in the Member States. Among other measures, this will partly be achieved by providing the necessary targets for the potential for a further increase in energy efficiency in the industrial sector and SMEs in particular. This task will define baselines for "business as usual" and indicative targets in the sectors involved in the BESS project by using existing statistics from Eurostat/Member States (task 3.1), industrial associations etc. and the outcome of workpackage 1 (best practices). The outcome of workpackage 5 (pilots) will be used to adjust the scenario's. The purpose will be to have these baselines as one of several benchmark-indicators in order to support the overall WP3 objective. The intention is to use already well established baseline-methodologies which are in compliance with the Emissions Trading Directive. Task 3.5 will be carried out in close co-operation with the relevant European Commission services.

The project results can furthermore be an input to systems like Odyssee (http://www.odyssee-indicators.org/) and will provide supportive information which can be used for national target setting and verification purposes needed for the implementation of the directive on energy end-use efficiency and energy services.

This report is prepared by Hans Jacob Mydske, NEPAS (WP3 leading organisation)

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0 Executive Summary

0.1 Introduction to the BESS Project

The BESS project (Benchmarking and Energy Management Schemes in SMEs) is supported by the European Commission under the EU's Intelligent Energy – Europe (EIE) Programme.

The primary objective of the project is to promote widespread use of best practice energy management and benchmarking tools and to improve energy efficiency in industrial small and medium-sized enterprises (SMEs), with particular focus on the food and drinks industry.

The main tasks of the project are:

- Development of an interactive tool (jointly with the industrial associations) for the promotion of a systematic approach to energy management and benchmarking. The tool will contain the following elements: selection of appropriate measures, implementation and day-to-day management, an e-learning scheme, and a monitoring and benchmarking system for the food and drinks industry.
- Pilots in 55 industrial SMEs.
- Comparative analysis of energy monitoring and benchmarking in 11 pilot countries.
- Targeted dissemination of the interactive tool in co-operation with the food and drinks industry associations.
- Seminars, internet and other information dissemination.

The project started in January 2005 and the kick-off meeting was held in Utrecht, the Netherlands on 7-8 February 2005. The project is scheduled to be finalised by 30 April 2007.

The project's internet address is http://www.bess-project.info.

To ensure the effectiveness of the project, contacpersons from relevant institutions such as CIAA, EC, IEA, national industry associations and industry experts have been consulted during the project and and in particular during the preparation of this report. Moreover contacts with other relevant EIE SME oriented projects have been established. All these activities were initiated already at the beginning of the project.

More information on the project can be obtained from the project partners (see Annex 13 for contact information) and the project co-ordinator:

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1 Summary and recommendations

1.1 Summary

The work of task 3.5 (quantitative baseline and target setting scheme) has been more complex and challenging that initially foreseen. Since the adoption of the Directive on energy end-use efficiency and energy services in 2006, the interest for having tools and methodologies available for such bottom-up approaches has been significant. However, there is apparently a way to go before anyone can offer this. Most of the activities that have been initiated at EU- and national levels since the Directive was adopted are still only starting to produce results, and it has been very difficult to collect any useful input from outside. One project which most probably will produce interesting results in this context is the ESMEEE project.

In view of the rather limited budget allocated to this task in Workpackage 3, not to speak about the efforts and resources that are being put into this topic in other projects and initiatives, we decided not to launch this topic in the pilot phase of the BESS-project as outlined in the Work programme. This was communicated to the IEEA in a meeting in Brussels 19 January 2006.

Instead, we have produced a report aiming to bring some perspective to the potential synergies that seems to exist between the BESS Benchmarking scheme and some existing and well documented methodologies of baseline definition. For this purpose, we have studied the main findings from the The LBNL –report 53027 "Evaluation of Metrics and Baselines for Tracking Greenhouse Gas Emissions Trends" This report discusses the use of baseline for GHG emission trends, and describes some main categories of baselines, their use and limitations.

With the BESS project as our starting point for the baseline task, we have of course been looking for direct synergies between the BESS Benchmarking scheme and the existing baseline methodologies, as discussed in the above mentioned LBNL study. The BESS benchmarking scheme is built on historic bottom-up data from individual SME input, and this is also the case for some of the baseline methodologies, e.g. the so called ***established future target baseline.***

However, an individual SME's baseline is of limited value for any other than the SME itself, as is the case for the benchmarking. In order to get sector level data, it is necessary to study the sectoral energy efficiency potential. Such sectoral potential studies exist, however only for a rather limited number of sectors and definitely not in all countries.

From an individual SME's point of view, the company can perfectly well estimate its own energy efficiency potential in terms of technical solutions, profitability, timing as well as external framework conditions, and draw a line from the historic figures for specific energy by way of the BESS benchmark solution. And this is exactly the crossing point where we have identified the potential use of the BESS benchmarking scheme in the context of baseline definitions.

In view of the above, we have therefore limited the outcome of our task to discuss how the BESS Benchmarking scheme could be used in practical terms as a tool for baseline definition at individual level in SMEs. However, with sectoral energy efficiency potential studies in place, one can also envisage to use the BESS Benchmarking scheme for sectoral baseline definition schemes as well.

1.2 Recommendations

The indicative model below illustrate how the bechmarking scheme from the BESS benchmarking scheme can be used to set a starting point (average from 5-10 years of historic data), and use the baselines to make one or more indicators that expresses deviation between actual figures (SEC) and the BAU scenario, alternatively the fixed % scenario.

The table and graphics on the last page of this report illustrate in simple terms how a ***established future target baseline*** can be constructed.

Clearly, this methodology will serve the purpose of the BESS benchmarking by establishing a new benchmark class (future), enabling the SMEs to benchmark their performance also against their own defined targets in the near future. However, the potential benefit for the purpose of monitoring the implementation of the proposed directive on energy end-use efficiency and energy services is also interesting.

2 State of the art for baseline definition

2.1 LBNL Research

The main findings from the The LBNL –report 53027 “Evaluation of Metrics and Baselines for Tracking Greenhouse Gas Emissions Trends” is referred to in the following and to a large extent also directly used as text from the report.

The report discusses the use of baseline for GHG emission trends, and describes some main categories of baselines, their use and limitations. In the context of BESS, we can directly compare GHG trends with energy efficiency trends, hence the terms GHG and Energy Efficiency are equal.

Accounting for actions to reduce GHGs can be done on a project-by-project basis or on an entity basis. Establishing project-related baselines for mitigation efforts has been widely discussed in the context of two of the so-called “flexible mechanisms” of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (Kyoto Protocol) - Joint Implementation (JI) and the Clean Development Mechanism (CDM). Issues regarding the development of entity specific baselines, which can be used by such entities as companies, municipalities, and organizations, have been explored in the context of baseline protection, emissions trading, credit
for early action initiatives, and climate change registries.

Table 1 provides an overview of the various baseline types that are discussed further below. For all types of baselines, there is the issue of whether they should be static or dynamic. Static baselines are constant throughout the lifetime of the project while dynamic baselines are revised sometime during the project lifetime.

Table 1: Characteristics of Various Baselines Used to Calculate Energy Use or GHG Emissions Reductions.

Baseline Focus	Type of Baseline	Baseline Used For:	Use of Industry-Specific Metrics	Notes
Project-related	Project-specific	JI/CDM Emissions trading (credits) Registries	- Varies on a case-by-case basis	High transaction costs, high uncertainties (Begg et al., 1999; Ellis and Bosi, 1999; Parkinson et al., 2001)
Project-related	Multi-project (standardized)	JI/CDM	- Energy use or GHG emissions/unit of output	Has been evaluated for the electricity, cement, steel sectors (Bosi, 2000; Bode et al., 2000; Ellis, 2000; Sathaye et al., 2001)
Project-related	Benchmark value	JI/CDM	- Energy use or GHG emissions/unit of output - Absolute energy use or GHG emissions/year	Ellis et al., 2001; Ministry of Economic Affairs, 2000
Entity-specific	Historical frozen	Absolute targets or reductions Registries Credit for early action Emissions trading (credits)	Not used	
Entity-specific	Business-as-usual projected Growth baselines	Credit for early action Emissions trading (credits)	- Energy use or GHG emissions/unit of economic output - Energy use or GHG emissions/ unit of product produced	CCAP, 1998; Nordhaus et al., 1998
Entity-specific	Future target	Credit for early action	- GHG emissions/year adjusted in a straight line downward from a base year to a designated reduction target in a future year	Nordhaus et al., 1998
Entity-specific	Ex-post reconstructed	Credit for early action Emissions trading (credits)	Not used	BPI, 2002

2.2 Project-related baselines

Project-related baselines are needed to account for the GHG emissions that are reduced through specific mitigation projects. For the Kyoto Protocol, projects under both JI and CDM are required to demonstrate that their emissions reductions are “additional to any that would otherwise occur” (United Nations, 1997). The UNFCCC defines a baseline for a CDM project as “the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity.” This requirement to prove “additionality” leads to the need for a baseline that estimates what would have happened in the absence of the project. For JI and CDM projects, the UNFCCC has proposed three methodologies to be used to determine emissions reductions for a project activity using project-related baselines: “(a) Existing actual or historical emissions, as applicable; or (b) Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment; or (c) The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.” In addition, the baseline can be static or dynamic. That is, the project participants can choose to use a baseline that is valid for “(a) A maximum of seven years which may be renewed at most two times, provided that, for each renewal, a designated operational entity determines and informs the Executive Board that the original project baseline is still valid or has been updated taking account of new data where applicable; or (b) A maximum of ten years with no option of renewal” (UNFCCC, 2002a).

Baselines for calculating GHG emissions reductions from mitigation projects can be project specific, multi-project, or can be based on the use of benchmark values.

Project-specific baselines are determined on a project-by-project basis using specific measurements or assumptions. Multi-project, or standardized, baselines use existing or estimated emissions levels from a defined set of actual or projected projects to derive a baseline level (Ellis and Bosi, 1999). Benchmark value baselines define business-as-usual or best-practice benchmark metrics that are used to set the baseline (Ellis et al., 2001).

2.2.1 Project-specific baselines

Project-specific baselines are constructed for a particular project using data related to that project to make a judgment of what energy consumption or GHG emissions would have been without the project. Project-specific baselines were commonly used for analysis of the UNFCCC Activities Implemented Jointly (AIJ) pilot projects and are often assumed to be more accurate that other types of baselines. However, one evaluation of the use of project-specific baselines for energy production retrofit projects found uncertainties of ± 80% (Begg et al., 1999) while another found uncertainties of ± 35% for demand-side projects, ± 45% for heat supply projects, ± 55% for cogeneration projects, and ± 60% for electricity supply projects (Parkinson et al., 2001)

Data requirements and costs for preparation of project-specific baselines are considered to be high and their transparency is considered to be low (Ellis and Bosi, 1999; Vine and Sathaye, 1999). Specifically, projects related to the Activities Implemented Jointly (AIJ) pilot phase were initiated at the first United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties to test the impact of implementing emissions reductions projects in some countries (developing countries or countries with economies in transition). An evaluation of a number World Bank-managed Prototype Carbon Fund projects found that the costs associated with preparing a project-specific baseline study and presenting a case for environmental additionality are about US$20,000 per project (World Bank, 2000a). Even so, project-specific baselines are applicable to many sectors and all types of projects and they are currently preferred both in the description of JI and CDM in the Kyoto Protocol as well as within implementation schemes such as the World Bank's Prototype Carbon Fund (World Bank, 2000b) and the project-level reporting of the U.S. Voluntary Reporting of Greenhouse Gases Program (U.S. EIA, 2002).

Project-specific analyses use a variety of methods for calculating the "without project" baseline including the use of industry-specific metrics. In such cases, the types of metrics used are similar to those discussed in Section 4 on entity-specific baselines.

2.2.2 Multi-project (standardized) baselines

Multi-project, or standardized, baselines are seen as an alternative to project-specific baselines, striking a balance between ensuring environmental integrity and minimizing transaction costs while encouraging emissions reduction projects. Multi-project baselines across many projects, for particular sectors or given technologies have been proposed because project-specific baselines may have higher transaction costs, reducing the number of projects that attract investment. These multi-project baselines can be used as an alternative to project-specific baselines depending upon the preference of the developer and/or the host country government.

Multi-project baselines are constructed to derive a weighted average, percentile, or best practice energy and carbon intensity metric from similar projects to which the energy and carbon intensity of the proposed project is compared (Bosi, 2000, Bode et al., 2000; Ellis, 2000; Sathaye et al., 2001). For example, one approach for constructing multi-project baselines is to use carbon intensity values for recently-constructed plants to calculate the baseline, assuming that these represent the best available technology. An advantage of this approach is that the data for such plants are observable. Another approach is to use a "forward-looking" baseline that includes near-future plants, making assumptions about which plants would most likely be built.

A forward-looking baseline has the advantage that it can consider new, more efficient technologies. Arguably this type of baseline is more realistic regarding what new technologies are likely to be used. However, there is no guarantee that the planned plants will actually be built. While a "forward-looking" baseline could be methodologically more accurate, one based on "recently constructed" units is likely to have more accurate data (Sathaye et al., 2001).

2.2.3 Benchmark value baselines

Benchmark value baselines define metrics in the form of energy consumption or GHG emissions rates per unit of activity, which are then multiplied by expected activity levels to calculate a baseline. For example, for industrial project baselines, benchmark values representing the average or best practice could be defined in terms of GJ/ton output or kg

CO_2/ton output. Energy consumption benchmark values would then need to be converted to GHG values using fuelspecific emissions factors (Ellis et al., 2001). Similar benchmarks could be developed on an annual basis, e.g. absolute energy use per year or absolute GHG emissions per year based on standard values for specific facility types. The Dutch Emissions Reduction Unit Procurement Tender (ERUPT) program, which purchases carbon credits from JI projects requires that the baseline be set up using expected baseline emissions factors that are then multiplied by the expected baseline activity levels. The baseline emissions factors are static for the crediting period (through 2012), but the baseline activity levels can be dynamic, allowing for changes depending upon the monitored activity levels of the project (Ministry of Economic Affairs, 2000).

2.3 Entity-specific baselines

Entity-specific baselines cover GHG emissions for an entire entity (e.g. corporation, municipality, organization) for a given period of time, typically yearly. Such baselines are developed in order to have a starting point for calculating GHG emissions reductions attributable to actions of the entity. Entity-specific reporting protocols have been developed by the World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD, 2001) and for specific GHG emissions registries, such as the California Climate Action Registry (California Climate Action Registry, 2002b). GHG emissions reduction activities in reduction commitments or for use within can be historical frozen baselines, business- or ex-post reconstructed baselines.

2.3.1 Historical frozen baseline

The historical frozen baseline approach uses an entity’s historic energy use or emissions as the baseline. The historic values can either be from one year or averaged over a series of years. While this type of baseline is the least subjective, the least costly, and most easily implemented, it does not account for growth or changes in the structure of the entity (Credit for Early Action Table, 1999). Sectoral or industry-specific metrics are not used for calculating this type of baseline.

2.3.2 Multiple year historical frozen baseline

A multiple year historical frozen baseline defines a series of years from which to measure future reduction against. The use of multiple years is viewed as preferable to a single year as a means to smooth out annual fluctuations while still providing a historic baseline.

2.3.3 Business-as-usual projected baseline

A business-as-usual projected baseline combines historic trends with projected emissions estimates based on assumptions about growth and entity changes. This type of baseline is more subjective than either a historical frozen baseline or an ex-post reconstructed baseline (Credit for Early Action Table, 1999).advocated a growth baseline for developing countries using a “greenhouse gas intensity indicator” based on country's emissions per unit of economic output (Baumert et al., 1999).

2.3.4 Future target baseline

The Center for Clean Air Policy proposal related to credit for early action uses a baseline, expressed in tons of GHG emissions per year, that starts in 1998 and is reduced in a straight line until reaching a 7% reduction target in 2007.13 Companies would earn credit for early action by reducing emissions below the declining baseline (Nordhaus et al., 1998). A variation of this proposal uses a declining generation performance standard in carbon emissions per kWh for the electric sector. As with the previous proposal, the baseline would be established by drawing a straight line from the actual generation emissions intensity in 1998 to a "desired national performance rate" in 2007. Credits would be calculated by multiplying the difference between the target baseline value and actual performance by the amount of kilowatt-hours (kWhs) generated for each year (Nordhaus et al., 1998).

2.3.5 Ex-post reconstructed baseline

An ex-post, or reconstructed, baseline tracks energy use or emissions from a starting year and is then determined on an annual basis by accounting for verifiable reductions attributed to specific mitigation actions. This approach is most accurate because actual emissions are known and reductions can be verified by a third party. However, it can be more complex and costly (Credit for Early Action Table, 1999).

- Canadian Baseline Protection Initiative

  The Baseline Protection Initiative (BPI) in Canada began in March 2001 and is a voluntary program that "ensures that organizations that act early to reduce greenhouse gas emissions are not disadvantaged should potential climate change policies based on emissions levels be implemented." Entities that want to participate in BPI must report their total GHG emissions and register their GHG emissions reduction actions and associated emissions reductions with the BPI Registry (VCR-MRV, Inc, 2002b; BPI, 2002). In the BPI program, participant baselines are reconstructed after emissions reduction projects have been completed. After reporting their actual total annual GHG emissions, participant emissions reductions actions and associated emissions reductions are validated by a validation service to determine if they meet the BPI eligibility criteria and rules. Once these implemented projects have been validated, participant baselines are adjusted by BPI Program Managers to reflect the reduction actions that they have taken since January 1, 1990. The adjusted baseline is then used as an estimate of what the participant's GHG emissions would have been without the implemented mitigation actions (BPI, 2002).

2.4 Baseline Typology

As can be seen from the above discussion, many different baseline methods have been proposed, and some are currently in use by various registries or trading schemes. Table 2 provides an overall typology for a number of baseline methods, categorizing them according to the way the baselines are calculated. First, the methods are divided into three major categories according to the basic approach used to calculate the baselines, and within these categories, variations of the methods are listed. Each of these variations is then rated on its complexity and robustness. "Complexity" is an indication of whether many calculations are necessary to establish the particular baseline. Baselines that are highly complex may necessitate the use of expertise outside of the Registry and will, therefore, be more costly to implement. "Robustness" is a measure of the likelihood that the method is rigorous enough to be accepted for early action credit or other tradeable credits.

2.4.1 Absolute Baselines

The first major group of baseline methods listed in Table 12 are absolute baselines, which are those that extrapolate a total level of emissions into the future. These methods are said to be static because they are not adjusted year to year to reflect an entity's output. While this type of baseline is the least subjective, the least costly, and most easily implemented, it does not account for an entity's growth (Credit for Early Action Table, 1999). Once these baselines are determined, they remain unchanged, unless they are adjusted to correct for a structural change, such as an acquisition or divestiture. A participating entity's own emissions in some base year or years are used to determine absolute baselines. There are several ways that these future levels of emissions can be calculated. The simplest is a fixed base year baseline that identifies one year against which to measure all future emissions. Examples of the use of this type of baseline include the U.S. Voluntary Reporting of Greenhouse Gases Program, the Canadian Voluntary Challenge and Registry, and the California Climate Action Registry. As an alternative to holding only base year emissions constant, an average can be taken over several years. This fixed multiyear average baseline may be preferred to a single year baseline as a means to smooth out an unrepresentative number due to anomalous circumstances (such as an unusually high or low level of production) that may have affected emissions in any single year.

Future target baselines are calculated by extrapolating a straight line from base year emissions to a future target. This is the type of baseline used in the Kyoto Protocol. On the basis of the U.S. target in the Kyoto Protocol, the Center for Clean Air Policy proposed a credit for early action baseline that starts in 1998 and is reduced in a straight line until reaching a 7% reduction target in 2007. Companies would earn credit for early action by reducing emissions below the declining baseline (Nordhaus et al., 1998). Future target baselines are interesting because while they are not complex to apply, they may be "robust" in terms of generating potential GHG offset credits if there is a national target or cap in place. However, with no statutory target in force, it is unlikely that a trading scheme would recognize estimated credits from a participant's emissions below a "future target" baseline set by the Registry.

Finally, the entity's own historical trend may be used to extrapolate future emissions targets. This may be done using either linear or nonlinear methods, and commonly available spreadsheet applications can be used to perform these calculations. However, determining the number of years of data needed to establish a trend is rather arbitrary. Using only three or four years data does not yield a trend with much statistical confidence, but data limitations will prevent many participants from providing a reliable time series that goes back much further than that.

2.4.2 Intensity Baselines

In contrast to absolute emissions baselines, intensity baselines estimate GHG savings according the emissions rate at which an entity produces its output. Thus, participants' early actions to reduce GHG emissions may be recognized even if growth in production causes overall emissions to rise, despite any improvements in emissions intensity that have occurred. These baselines are said to be dynamic because the estimated business-as-usual emissions to which the entity is compared depend on the entity's annual production and must be calculated from year to year.

Intensity derived baselines are linked to metrics since a participant's rate of emissions for the base year(s) must be known in order to order calculate future base case emissions. The emissions rate may be determined for one or more years in order to establish the baseline rate, or it may need to be monitored over several years in order to determine historic trends.

A fixed base year intensity baseline, similar to the analogous fixed base year absolute baseline, holds the entity's emissions rate from the base year constant. This rate is then multiplied by the entity's own output from year to year. For a fixed multiyear average intensity baseline, similar to the multiyear average absolute baseline, the rate may also be calculated as an average of several years in order to smooth over an anomalous single year. However, fixed rate methods, whether single year or multiyear, are unlikely to result in credits because some autonomous level of intensity decline is expected due to improvements in energy conversion and production technologies.

Alternative methods that use arbitrary rates of decline to calculate emissions rate include a scheme where a baseline rate is first calculated, expressed as CO2 equivalent per dollar of company sales, in a baseline year. Then the rate is adjusted downward by X% per year to reflect business-as-usual efficiency improvements (Nordhaus et al., 1998). The proposal by Nordhaus et al. (1998) arbitrarily suggests 1% per year as an expected business-as-usual rate of change.

Similar baselines schemes have also been proposed by the Center for Clear Air Policy and the World Resources Institute (CCAP, 1998; Baumert et al., 1999). These approaches recognize that growth in production may outpace improvements in intensity, resulting in increasing emissions overall. The annual rate of improvement can be determined in several ways. First, this rate may be chosen somewhat arbitrarily by carbon trading program administrators based upon a reasonable estimate of what a given industry should be able to attain. Second, the rate may be based on the participant's own historic rates of change of carbon intensity, which can be used to construct an entity-specific historical trend baseline. Third, if data on the GHG intensities of several participants within the same sector are available, then historic industry-wide rates of change may be used for all participants in that sector and an industry-wide historical trend baseline can be constructed. Finally, an in-depth assessment of the economically feasible technical potential forreducing GHG intensity may be performed in order to support construction of an expert judgment baseline.

2.4.3 Reconstructed Baselines

An ex-post project-based baseline tracks energy use or emissions from a starting year and is then determined on an annual basis by accounting for verifiable reductions attributed to specific mitigation actions. These are not truly baselines per se, but are simply the sum of an entity's actual emissions in a given year and the savings from specified mitigation actions. This approach is most accurate because actual emissions are known and reductions can be verified by a third party, but it can be more complex and costly (Credit for Early Action Table, 1999). This type of baseline is used by the Baseline Protection Initiative (BPI) in Canada (BPI, 2002).

2.5 LBNL Conclusions

In the research related to baselines, Berkeley Lab evaluated various methods used to calculate baselines for documentation of energy consumption or GHG emissions reductions, noting those that use industry-specific metrics. Berkeley Lab developed a baseline typology and assessed the complexity and robustness of each type of baseline vis-à-vis potential future emissions limits and/or emissions trading schemes. The LBNL researchers found that only a statutorily established future target baseline and an ex-post reconstructed baseline were robust enough to be considered as a basis for granting credits for early actions. Of these two baseline types, the future target baseline is the easiest to construct; the ex-post reconstructed baseline is accurate because actual emissions are known and reductions can be verified by a third party, but it can be more complex and costly.

Table 2 : Typology and Qualitative Assessment of Baselines for Estimating Entity-Wide GHG Savings

Type of Baseline[a]	Calculation Method	Complexity[b]	Robustness[c]	Notes
Absolute: Static				
Fixed Base Year	Frozen base year absolute emissions projected into future	Low	Low	Used by the California Climate Action Registry
Fixed Multiyear Average	Multiyear average absolute emissions projected into future	Low	Low	Eliminates savings for all years used to construct the multiyear baseline
Future Target	Absolute emissions projected as a straight line between base year and future target	Low	Low/High	Robustness will be low with an arbitrary target and high if there is a national target
Historical Trend	Absolute emissions projected as a straight line based on historical trends	Low	Low	Will need to establish how many years are needed to constitute a trend
Intensity: Dynamic				
Fixed Base Year	Frozen base year intensity multiplied by actual production	Low	Low	Could be more complex and robust if structural changes are included
Fixed Multiyear Average	Multiyear average intensity multiplied by actual production	Low	Low	
Arbitrary Rate of Decline	Intensity declining at an arbitrary rate multiplied by actual production	Low	Low	Rates of decline may need to be negotiated.
Historical Trend - Entity	Entity historical intensity rate multiplied by actual production	Low	Mid	
Historical Trend - Industry	Industry-wide historical intensity rate multiplied by actual production	Low/High	Mid	Complexity is a function of the availability of regularly updated data on historical trends
Expert Judgment	Intensity rate decline based on expert judgment regarding industry multiplied by actual production	High	Mid	Expert judgment may be contested
Reconstructed: Dynamic				
Ex-Post Project-Based	Verified GHG emissions reduction project savings are added to actual GHG emissions trends to reconstruct the baseline	Mid/High	High	Project savings will need to be verified. Used by the Baseline Protection Initiative in Canada

3 The BESS Baseline approach

Although the BESS project as such does not impose any formal requirements in the baseline approach , (i.e there will be no trading of credits), the BESS industrial energy efficiency baseline definition will follow the same criteria that are recommended for simplified baseline and monitoring methodology for small scale CDM project activity categories (UNFCCC Recommendations on Baseline and Monitoring Methodologies, Meth Panel, Draft) as well as the recommendation from the LBNL-report 53027 “Evaluation of Metrics and Baselines for Tracking Greenhouse Gas Emissions Trends” where *established future target baseline* was found robust enough and the easiest to construct.

The principle of additionality does not allow to take into account the measures that can be assumed to take place in a BAU scenario, e.g. a development based on normal business/profitability driven decisions. The BAU will have to be defined according to the above. A combination of top-down data (sector restructuring, energy price scenarios) and bottom-up data for individual industries (planned equipment replacements, foreseen process shifts etc) will be the basis for these baselines, expressed in specific energy consumption (SEC) or Energy Efficiency Index (EEI) for a future time series.

The purpose is to have a target line against which the bottom-up BESS benchmarking figures are measured against.

Alternatively a baseline definition can also be based on an expected energy efficiency improvement target (percentage), and use this as a target line against which the benchmarking figures are measured against.

The indicative model on the following page illustrate how the bechmarking scheme from the BESS project can be used to set a starting point (average from 5-10 years of historic data), and use the baselines to make one or more indicators that expresses deviation between actual figures (SEC) and the BAU scenario, alternatively the fixed % scenario.

The table and graphics on the next page illustrate in simple terms how a ***established future target baseline*** can be constructed.

Clearly, this methodology will serve the purpose of the BESS benchmarking by establishing a new benchmark class (future), enabling the individual SMEs to benchmark their performance also against their own defined targets in the near future.

However, an individual SME’s baseline is of limited value for any other than the SME itself, as is the case for the benchmarking. In order to get sector level data, it is necessary to study the sectoral energy efficiency potential. Such sectoral potential studies exist, however only for a rather limited number of sectors and definitely not in all countries.

With a more sectoral approach, also involving data on sectoral energy efficiency potentials, the benefit for the purpose of monitoring the implementation of the proposed directive on energy end-use efficiency and energy services would be more significant.

Energy Efficiency Baseline for a specific Dairy

Year	Actual (kWh/tonne)	Baseline -1%	Baseline BAU	Measure taken	Est.Effect
1998	0,9900				
1999	0,9700				
2000	0,9800				
2001	0,9600				
2002	0,9300			New oil-fired boilers installed	-3 %
2003	0,9200				
2004	0,9300				
2005	0,9200	**0,95000**	**0,95000**	Average 1998-2005 defined as starting point	
2006	0,9100	0,94050	0,95000		
2007		0,93110	0,95000		
2008		0,92178	0,95000		
2009		0,91257	0,80750	Hybrid Heat pumps replacing oil for base load	-15 %
2010		0,90344	0,80750		
2011		0,89441	0,80750		
2012		0,88546	0,80750		
2013		0,87661	0,75098	Capacity optimisation (sector restructuring)	-7 %
2014		0,86784	0,75098		
2015		0,85916	0,75098		
2016		0,85057	0,75098		
2017		0,84207	0,71343	Natural gas available, replace oil biolers for peak	-5 %
2018		0,83364	0,71343		
2019		0,82531	0,71343		
2020		0,81706	0,71343