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Determining the climate impact of the German government's Integrated Energy and Climate Programme (IEKP) and proposing a plan to continuously monitor its climate impact

Summary

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Determining the climate impact of the German government's Integrated Energy and Climate Programme (IEKP) and proposing a plan to continuously monitor its climate impact

Summary

by

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1 Background and Objectives

In August 2007, key elements for an Integrated Energy and Climate Programme (IEKP) were adopted in the so-called Meseberg Decisions. This programme will contribute towards reducing greenhouse gas emissions in Germany by 40 % by the year 2020. The Meseberg Decisions were implemented in two packages, which mainly contain legislative amendments and support measures. On 5 December 2007 the German cabinet presented a comprehensive package of 14 laws and regulations which the German Bundestag passed on 6 June 2008 (IEKP I). This is in addition to the measures already in place such as the KfW programme (building refurbishment programme to reduce CO_2, the "special energy efficiency programme for SMEs" etc.). A second package with further legislative proposals (IEKP II) was made public on 18 June 2008. Thus essential elements of the Meseberg Decisions of 2007 are already being implemented. Moreover, there are other measures of the Meseberg programme which are relevant in an EU or in an international framework.

What contribution the climate protection instruments enacted under IEKP will really make to this goal must be evaluated on the basis of the concrete design (and in future the concrete implementation), in order to provide policy-makers with decision-making support when further developing climate protection policy. The Integrated Energy and Climate Programme foresees that every two years the federal government should account for the emission reductions achieved thereby and the impacts of the individual measures (programme monitoring). The present research project was conducted in preparation for this objective. Specifically, the project should meet the following goals:

1. To assess how the Meseberg Decisions of August 2007 have been implemented in specific, effective instruments at national or European level (**qualitative evaluation of each instrument and the total package**).
2. To create a **monitoring plan** for comprehensive, regular evaluation of the IEKP measures which enables a periodic comparison with the projections at fixed points in time.

An overview of the most important IEKP measures

M1 – Combined heat and power generation
M2 – Renewable electricity generation
M3 - CO_2 capture, transport, storage (CCS)
M4 – Smart metering of electricity consumption
M7 – Support programmes for climate protection and energy efficiency (excluding buildings)
M8 – Energy-efficient products
M9 – Regulating biogas feed-in to natural gas grids
M10 – Energy Saving Ordinance
M11 – Operating costs of rental accommodation
M12 –Building refurbishment to reduce CO_2
M13 – Energy-efficient modernisation of social infrastructure
M14 – Renewable Energies Heat Act
M15 – Energetic refurbishment of federal buildings
M16 – CO_2 strategy for passenger cars
M17 – Expansion of biofuels
M18 – Reform of vehicle tax on CO_2 basis
M19 – Energy labelling of passenger cars
M26 – Electric mobility: research and demonstration
M20 – Improved steering effect of toll on HGVs
M21 - Aviation
M22 - Shipping
M23 - Fluorinated greenhouse gases (F gases)
M24 – Procurement of energy-efficient products & services

3. To determine how the instruments specified in IEKP, which have been implemented partly at national, and partly at EU level, will affect the emissions of greenhouse gases up to the year 2020 (**quantitative evaluation**). With this end in view, the first version of the monitoring plan should be implemented as an Excel tool which will enable the effects to be updated annually, possibly by simplifications compared with a detailed modelling approach.

2 Qualitative Evaluation of the Instruments of the Integrated Energy and Climate Programme

In the first step, the climate instruments implemented as a result of IEKP were compared with the descriptions listed in IEKP, according to the following criteria:

- Were all the instruments implemented?
- What is the implementation status of the individual instruments?
- Do the implemented instruments meet the IEKP targets and guidelines (comparison of the statutory goals and mechanisms with the IEKP guidelines)? Are the targets completely or only partially met by these instruments?
- Which obstacles impeded or still impede implementation?

Two methods were applied to do this:

- Analysis of the documents and research projects pertaining to IEKP (background papers on IEKP, results from research projects etc.). The results of this evaluation were outlined in an analysis of the qualitative impacts of the measures broken down for each measure.
- Survey (by telephone or face-to-face) of regulated target groups and other relevant actors on the effectiveness of the IEKP mechanisms. A list of institutions to be surveyed and a structured questionnaire were compiled for this purpose.

The following tables summarize the information for five areas: energy sector; buildings; road transport (cars); other modes of transport; others (National Climate Initiative, efficient products, etc):

- The measures are numbered as in IEKP
- Title of the measure

☺ = implemented as planned; 😐 = with gaps; ☹ = obvious deficiencies; *worsened framework conditions

Qualitative assessment of the measures in IEKP (up to the end of 2009)

No.	Title	Original estimate IEKP [Mt CO2 in 2020]	qualitative estimate	Monitoring recommended? (yes/no)
	Energy sector			
M1	Combined Heat and Power Act	19.9	☺ / 😐*	Yes (with CHP Act)
M2	Expansion of renewable energies in electricity sector	50	☺ ☺	No: AGEE Stat /Erf.bericht*
M3	Low-carbon power station technologies (CCS)	13	☹	Yes
M4	Smart metering of electricity consumption	3.4	☹	Yes
M5	Clean power station technologies	7.4 (3 BK-KW)	😐	Yes
M9	Regulating biogas feed-in to natural gas grids	18 (nachrichtlich)	☺	Yes (doubling counting issue)
	Buildings			
M10	Energy Saving Ordinance	approx. 13.0*	😐	Yes
M11	Operating costs in rental accommodation	-	😐 ☹	Not at present
M12	Building refurbishment programme to reduce CO_2	approx. 13.3	☺ ☺	Yes
M13	Energy-efficient modernisation of social infrastructure	approx. 1.9	☺	Yes
M14	Renewable Energies Heat Act (EEWärmeG)	approx. 17.0	😐	Yes
M15	Energetic refurbishment federal buildings	approx. 0.4	😐	Yes
	Road transport and other transport modes			
M16	CO_2 strategy for passenger cars	17.0	☹	Yes
M17	Expansion of biofuels	11.9	😐	Yes
M18	Reform of vehicle tax on CO_2 basis	3.1	☹	Yes
M19	Energy consumption labelling of passenger cars	3.5	☹	Yes
M20	Improved steering effect of toll on HGVs	0.5	☺	Yes
M26	Electric mobility	1.3	☺	No (qualit. monitoring)
M21	Aviation	2.9	Not yet enforced	Yes
M22	Shipping	0	☹ ☹	No
	Support programmes, efficient products, others			
M7	Support programme climate/energy efficiency (excl. buildings)	10 (only energy efficiency fund)	☺	Yes
M8	Energy-efficient products/eco-design	8.2	😐	Yes
M23	Reduction of fluorinated greenhouse gas emissions	18	☺	Yes
M24	Procurement of energy-efficient products and services	-	☺	Yes

* AGEE Stat/Erfahrungsbericht: Statistics from the Working Group on Renewables. Evaluation Report of the German Renewable Energy Law

- Original quantitative estimate within IEKP.
- Qualitative assessment of the extent to which the quantification will be achieved
- A recommendation on whether to include the measure in quantitative monitoring. Non-inclusion does not imply that the effects of the measure will not be recorded. In some cases, especially for renewable energies in the electricity sector, there are sufficient, reliable sources from which the relevant information can be retrieved.

The outcome for the five areas is mixed: It appears that the current quantitative estimates will be met or exceeded for the energy sector (primarily due to the effects of the Renewable Energies Act, the CHP Act and the biogas feed-in regulation), support programmes and efficient products, whereas more cuts will have to be made in road transport and the other transport modes from today's perspective. The balance sheet is mixed as far as buildings are concerned.

The qualitative analyses are presented for each measure in the first report with detailed recommendations for further improvements to the implementation process.

3 IEKP Monitoring Plan

The aim of the monitoring plan is to regularly examine and update the ex ante evaluation of the measures, as well as to increasingly turn the ex ante evaluation into an ex post one based on the effects achieved. When formulating such a monitoring plan, it is important that the effects of individual measures must be portrayed. This excludes top-down monitoring based on energy efficiency indicators, as these indicators often cannot be depicted for individual measures, but can only evaluate package solutions. However, this method is well suited to compensating for overlapping effects, since these do represent the total effects of a bundle of measures. Combining indicators with the monitoring tool can therefore considerably improve the consistency of the results.

One main requirement of the monitoring concept is that it should be designed as a balance sheet which can be updated annually. The following two kinds of parameters should feature in this kind of balance as variable input parameters:

- Drivers from the framework data set which can be updated annually
- Drivers from parametrising the individual measures which can be updated annually (e.g. subsidies actually spent on building refurbishment, affected number of newly registered cars etc.).

These drivers are usually connected with specific aggregated indicators resulting from the detailed modelling calculations. In a series of cases, energy savings or CO_2/GHG savings can be directly determined on a regular basis from more detailed evaluations. In the monitoring tool, these specific indicators are fixed in order to be able to simply

extrapolate them. They may need to be readjusted every few years using the detailed models.

For the monitoring and the individual instruments it has to be specified:

- What information is required for the evaluation of the individual instruments?
- Whether this information is regularly available or how it can be ascertained?
- Who is/should be responsible for collecting the information and how the flow of information can be ensured for updates?
- What synergy effects can be achieved with other reporting obligations (projection report, national inventory report etc.)?
- How the required data and information should be evaluated?
- How the impacts of the various measures can be allocated, with which measures there are overlapping effects and which method is suitable to correct for these overlapping effects?

The objective is to develop a simplified – in comparison to the modelling instruments used - monitoring tool based on Excel which can be updated for several years with sufficient accuracy and which can be "recalibrated" using more detailed modelling calculations.

Definition of a monitoring concept

Three questions can be asked when defining a monitoring concept for IEKP:

i. Which GHG reduction has already been achieved in a specific historical year through the existing measures? (**pure ex post monitoring**)

ii. What is the position relative to the target of the original ex ante estimate? (**comparison of ex post evaluation and ex ante estimate**)

iii. How does the ex ante estimate have to be adjusted (i.e. which measures have to be augmented or introduced in order to return to the originally targeted objective of 40 % GHG savings in 2020? (**rolling monitoring**)

Because of the effects of measures in the future (i.e. investments made in a historical year under one measures have impacts in the future) and the comparison with the ex ante evaluation, rolling monitoring seems to be the most suitable method (an ex ante prediction is gradually overwritten with historical figures, followed by a readjustment of the ex ante prediction), but all three approaches can be justified. The database constructed in Excel and described in the third report makes it possible to answer all three questions for both GHG avoidance and cost efficiency.

The third question requires close cooperation with the policy scenarios/projection reporting projects under which for example Germany reports to the European Union and the UNFCCC (framework data and projected development of the specific parameters). This also means that the ex ante prediction – in contrast to the annually applied monitoring[1] – cannot be readjusted every year. Between readjustments, the drivers and the specific indicators have to be extrapolated from the original forecast set.

There are two basic methods for the ex post evaluation of cost efficiency (see first question above: What has been achieved so far?): (ia) Cut off in the last historical year: This has the advantage of not requiring any predictions for the framework data such as e.g. energy prices. The (differential) investments effected in the past few years within the scope of the measures are converted to annuities and cut off in the last historical year. The disadvantage here is that this does not capture all the effects of investments already made. (ib) The investments are also recorded up to the last historical year and their effects in the future are calculated. To do so, the future energy savings due to already existing measures have to be determined. This requires, e.g. projections of framework data such as energy prices. It is therefore proposed to limit the first question about the pure ex post evaluation to the cut-off in one historical year despite the underestimation of what has already been achieved (Variant ia).

Basic structure

The outputs of the monitoring plan are environmental effects (energy savings, CO_2/GHG savings) and (differential) investments (from which the costs of reducing CO_2/GHG can then be calculated).

The following standardized basic equations form the foundation of this kind of simplified illustration (this may be more complex for specific measures):

(1)

Energy saving (in year t) = activity indicator (in year t) x specific indicator energy

The different final energy sources have to be distinguished (fuels, transport fuels, electricity, district heat).

1 At present it is planned to conduct the IEKP monitoring every two years. This would fit in well with how often the ex ante projections are done.

(2)

CO_2 saving (in year t) = activity indicator (in year t) x specific emission avoidance factor CO_2[2]

or

GHG saving (in year t) = activity indicator (in year t) x specific emission avoidance factor GHG[2]

(3)

(Differential) investments = activity indicator x specific (differential) investments

The specific indicators have to be fixed for each measure and should be valid for 2-3 years. This does not mean that they have to remain constant for this length of time, but that they are predefined using a fixed function. The activity indicators allow the effects to be extrapolated.

These equations are described for each specific IEKP measure in detail in the second working report.

Limits of the monitoring system and their methodological implications

IEKP is a national energy and climate policy instrument. It formulates targets in a national context; whether these targets have been achieved has to be measured and the monitoring system designed accordingly. A series of limits has to be considered when designing the monitoring system for the IEKP to make it possible to adequately and consistently collect and evaluate data and parametrise the assessment routines on the one hand and, on the other hand, to interpret the monitoring results. This has to be done, among other things, with a view to the obligations undertaken internationally as well as the longer term perspective. Two aspects are of particular relevance with regard to these system limits:

- The implications of the EU Emissions Trading Scheme as an instrument for controlling the amount of greenhouse gas emissions (observation of regulatory system limit);
- the question of taking into account greenhouse gas emissions in the process chains for the relevant reduction measures (observation of process chain-oriented system limit).

A pragmatic approach is adopted for monitoring the IEKP:

- Upstream process chains are not taken into consideration as a rule - with two exceptions (supply of power and supply of biofuels);

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2 Net balance perspective (especially important for Measure 1 CHP or Measure 2 Renewable power)

- the upstream process chain emissions which can be allocated to power generation (i.e. only the emissions of the respective power stations) are taken into account as a lump sum for each specific measure;
- the upstream process chain emissions for biofuels are generalized based on average values in the relevant literature and shown “as information only”.

With the exception of the two cases mentioned, it is otherwise assumed that the upstream process chains of the various measures are either not of a significant magnitude, or cancel each other out.

Reference development

CO_2 and energy savings result due to comparison with a reference case, e.g. an old appliance, a conventional appliance or an inefficient new appliance. This reference development has to be made explicit. The following table gives an overview of the respective references for the individual measures. The reference can be made using a static before/after comparison (e.g. a new standard compared with the market or the stock before the standard was introduced) or dynamically by regarding a reference development because developments towards improved appliances usually tend to happen even before introduction of the measure (triggered either autonomously or by previous policy measures).

Generally, the method of a reference development turns up in the ex ante evaluation of measures which coined terms like “without measures scenario”, “with measures scenario” and “with further measures scenario”. However, these terms cannot simply be directly transferred to an ex post or a rolling monitoring. This is due to the fact that **monitoring should be based on empirical data to the greatest extent possible and build on estimates as little as possible,** whereas an ex ante evaluation is forced to operate with assumptions. This means that real data take on a much more important role when monitoring the IEKP and specifying the form of the reference development whereas ex ante evaluations can manage with well founded assumptions.

Type of reference developement for the different IEKP measures

No.	Title of measure	Reference development	
		before/ after	**dynamic**
1	Combined heat and power	X	(X)
2	Renewable electricity generation	X	(X)
3	Capture, transport and storage of CO_2 (CCS)	X	(X)
4	Smart metering for electricity consumption		X
7	Support programme climate/energy efficiency (excl. buildings)	X	(X)
8	Energy efficient products	X	X
9	Feed-in regulation for biogas in natural gas grids	X	
10	Energy saving ordinance	X	
11	Operating costs in rental accommodation	X	
12	Building refurbishment programme to reduce CO_2	X	
13	Energy-efficient modernisation of social infrastructure	X	
14	Renewable Energies Heat Act		
15	Energetic refurbishment of federal buildings	X	
16, 18 19	CO_2 strategy for cars, reform of vehicle tax on CO_2 basis, ordinance on the energy consumption labelling of passenger cars		X
17	Expansion of biofuels	X	
20	Increased steering effect of toll on HGVs	(X)	X
21	Aviation in EU ETS		X
23	F gases		X
24	Procurement of energy-efficient products and services	X	
26	Electric mobility: research and demonstration	X	

Cost efficiency of the IEKP measures

The question of evaluating the IEKP measures in terms of costs first has to clarify what exactly is meant by costs or savings due to the measures and which questions can be answered within the scope of monitoring.

Costs can be expressed in three different ways and thus three different questions can be answered:

(i) **What costs for conventional energy sources are avoided due to the IEKP measures?** In particular, how many fossil imports are avoided? This question does not consider the (differential) investments for the measures. These are therefore gross savings. This question does not take into account transfer flows within the country such as taxes on energy or prices for CO_2 emission rights, at least not for the avoided imports. Although the investments for measures are not included, this parameter does **indicate the investments which could be available each year for measures due to the saved energy costs (here including taxes).**

(ii) **How high are the net costs/savings for the final user?** These are the costs/savings for the final user after taking into account investments spent on the measures and saved conventional energy. In other words this is the integral of the cost-avoidance graph. These are therefore the net costs/savings for the final user. In this context, the taxes or prices for CO_2 certificates have to be considered depending on the final user's perspective, i.e. whether the tax on energy represents a cost signal or not. The final user makes decisions based on this cost signal. Also important is the question of which interest rate is applied to the capital used. The interest rate here can mirror the final user's estimate of the risk involved or express barriers to avoidance technologies. This may result in high interest rates **(final user perspective with barriers)**. However, it can also assume that risk and barriers can be lessened via suitable measures. This results in much lower interest rates **(final user perspective without barriers)**.

(iii) **How high are the net costs/savings for the national economy?** These are the costs/savings for the economy after considering the investments in the measures, the saved conventional energy and transfer flows due to taxes etc. Due to lowering the spending on conventional energy sources and due to the investments, shifts in the national economy are triggered with winners and losers and the question of the overall net gain or loss. These net wins/losses for the national economy are usually lower than for (ii) but much depends on, e.g. how investments are made and how the gains from the energy saved are recirculated in the economy. Complex macroeconomic models have to be used to answer these questions as in, e.g. Jochem et al. (2008). This cannot be handled as part of a regular monitoring process using a simplified Excel tool.

To sum up, it can be concluded that monitoring can answer question (ii) about the net costs/savings for the final user and that this makes most sense from the final user's perspective without barriers because it can be assumed that barriers will be removed by the IEKP measures or that complementary measures will be taken to remove remaining barriers since otherwise the package of measures would not take optimal effect.

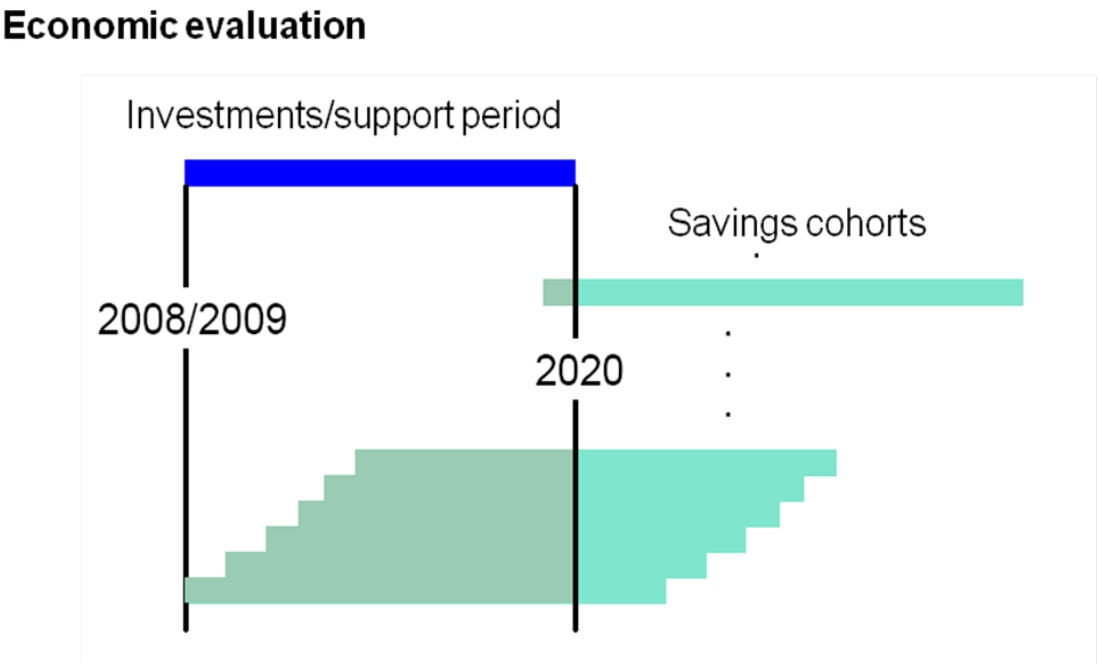
This approach of economically assessing measures thus closely follows that used in ISI/FZ Jülich/Öko-Institut/Ziesing (2008) and KlimaInvest 2020 (Jochem et al., 2008[3]).

The specific CO_2 avoidance costs or energy saving costs are the main indicator for the economic evaluation. More precisely, these are the specific net avoidance costs or specific energy saving costs based on the net present value (i. e. taking into account

3 http://www.kliminvest.de/download.html

the annualized investment and the saved CO_2/energy costs[4]). CO_2 costs from emissions trading are of course also indirectly included in the energy costs. As a rule the investments and running costs are differential costs, i.e. compared to a reference development (e.g. for CHP, the additional costs of the CHP plant compared to a conventional one). In individual cases, e.g. when increasing the rate of building refurbishment, a full cost approach might have to be considered if the measures alter reinvestment cycles (see Appendix on Measure 10).

Cohort model for the economic evaluation



Source: ISI/FZ Jülich/Öko-Institut/Ziesing (2008)

The costs are calculated for the year 2020 and aggregated for 2008 to 2020 (average values can be calculated from the latter). The fact that some investments will have an effect even after 2020 is accounted for by annualizing the investments and, similar to the energy/ CO_2/GHG savings, cutting them off in 2020.

Three cost components have to be discussed in detail:

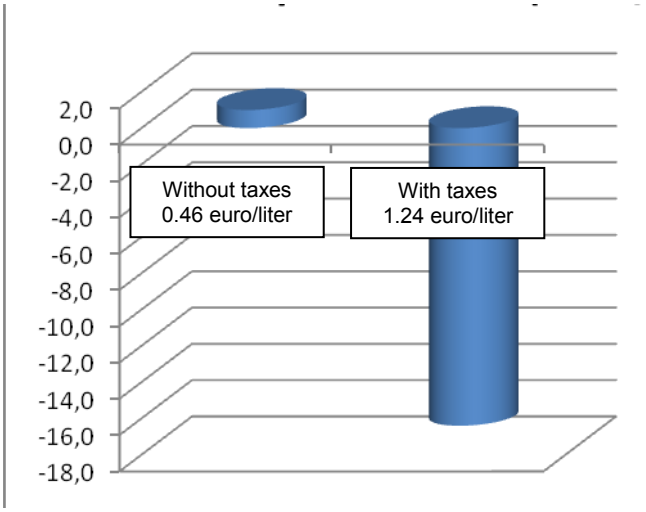
- **Programme costs:** These are the costs resulting from carrying out measures (e.g. the administrative costs of conducting the programme but not investment subsidies: these are already accounted for in the investment). ISI/FZ Jülich/Öko-Institut/Ziesing

4 The actual energy prices have to be applied for the historical years, but in real prices, i.e. based on a specific year. This reference year might have to be rebased over time. The method used for rebasing still has to be defined. For the future, data have to, e.g. be taken from the policy scenarios framework set. .

(2008) were able to demonstrate that these programme costs constitute a minor contribution.

- **Taxes:** The above cited final user perspective could suggest that energy costs without taxes should be applied (for final users such as private households which are not able to pass taxes on). The argument is that these saved taxes are actually withdrawn from the national economy to start with but then spent again at a different point. Apart from the fact that this approach is not able to substitute a macroeconomic model, this also results in erroneous conclusions since only the presence of the taxes in the first place actually leads to a savings measure being profitable at all. This becomes blatantly obvious when looking at motor fuels. For the final user, including the tax saving is essential since otherwise the investment decision would not be made. This is shown in the (hypothetical) example of an energy-efficient car, evaluated once with taxes (1.24 euro/litre) and once without (0.46 euro/litre). Without including the taxes, there would be no net saving made over the lifespan of the measure; it would not be economic.
- **CO_2 costs from emission trading:** Emission allowances make energy more expensive, at least at one point in the process chain – namely the final user. Industry or the energy sector pass on these costs more or less completely – depending on the competitive context. Similar to the taxes, the costs for emission allowances are purely transfer costs in the national economy to start with, but they may influence final users to choose climate-friendly technologies. For this reason, it is essential to consider them for the question about whether measures are cost-efficient or not.

Net saving (Euro/GJ) of an energy-efficient car with 2000 euro differential costs with and without taxes



Measure-specific sets are used as the basis for discounting which have already been discussed in ISI/FZ Jülich/Öko-Institut/Ziesing (2008) and KlimaInvest 2020 (Jochem et al., 2008). The second report presents these for specific measures. It may have to be discussed whether interest rates should be reduced for a longer time horizon. The justification for this is that already implemented measures such as building refurbishments

which have an effect far into the future should not be devalued too strongly due to the interest rate and no longer be economic for the end user.

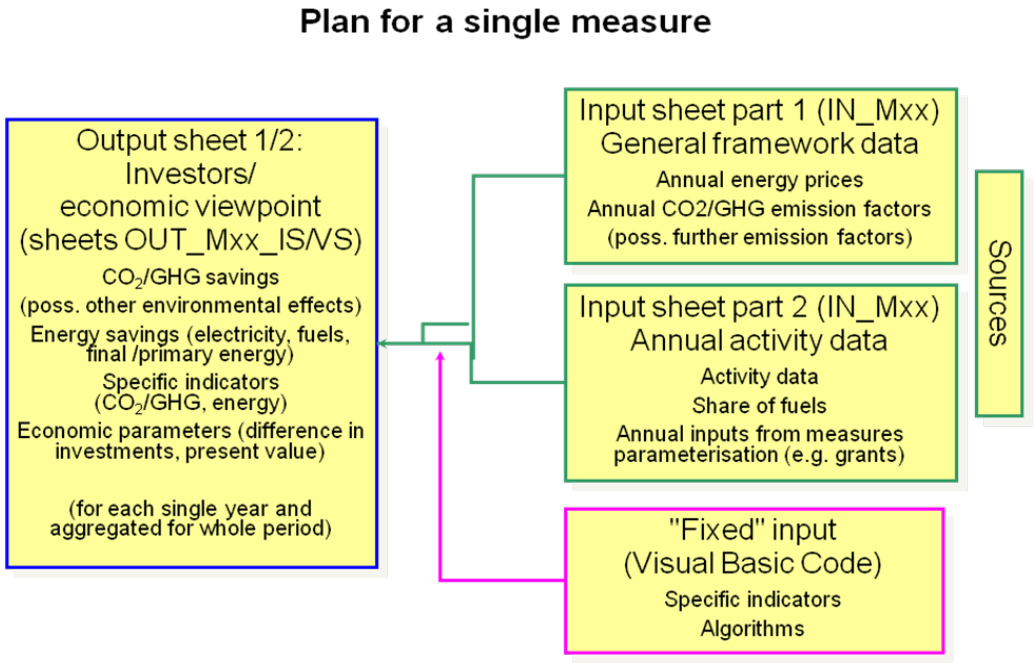
This simple economic evaluation has its limits because, on the one hand, macroeconomic changes are not taken into account. On the other hand, other criteria are included in a comprehensive analysis such as, e.g. the toll on HGVs, which was not introduced only for climate reasons, but also in order to counter road congestion. The example of the Renewable Energies Act should also be mentioned here with its objective of sustainability and energy independence.

4 Implementing the plan in a monitoring tool for the Integrated Energy and Climate Programme

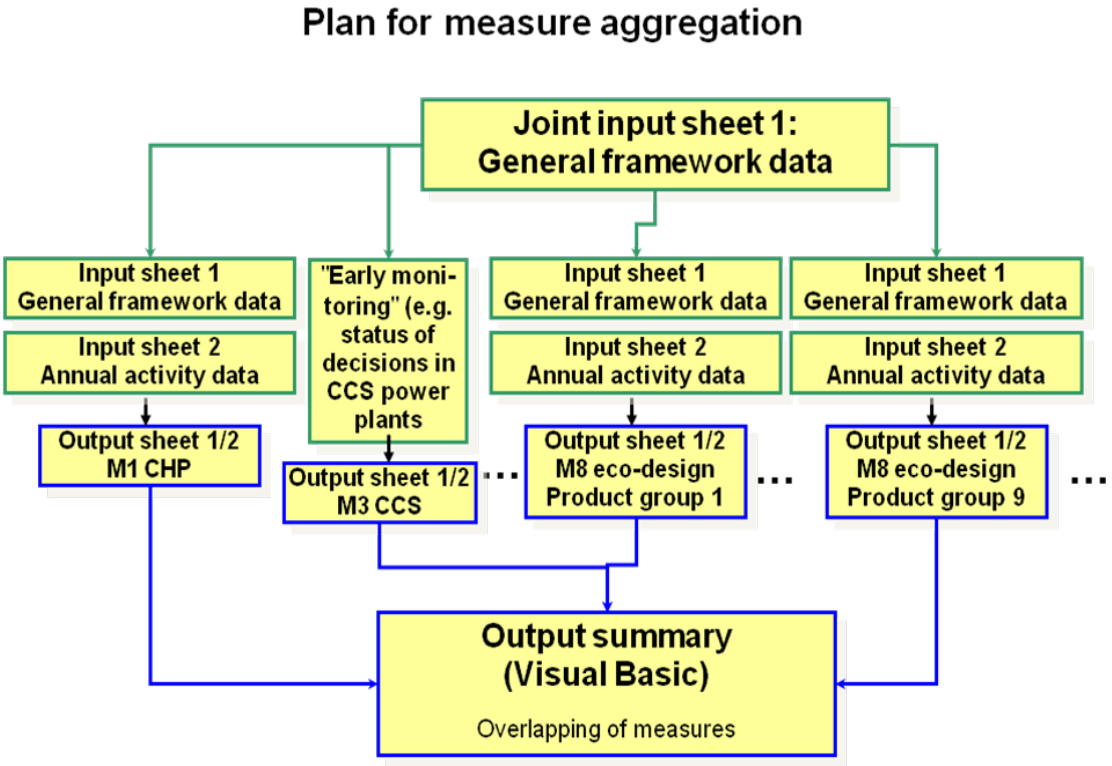
The monitoring plan developed for the individual measures of the IEKP was described in the reports on Work Packages 1 and 2. In the third step, a pilot version was developed in an Excel tool.

The Excel tool enables a comparison with the ex ante projections. This tool is so constructed that, for each measure depicted, the specific indicators are "hard wired" as a rule, while the general framework data and the activity indicators from the available sources can be annually updated if necessary (input sheets 1 and 2; both summarised in one Excel sheet per measure). The output sheet then summarises the energy and CO_2 savings as well as the economic evaluation.

Input and output sheet for one measure



Joint output sheet and summary of the results in the Excel tool



Notes: for measures 3 (CCS) or 26 (electric mobility), for example, it is not possible to quantify at an early stage, but only to identify in which stage certain plants are. The quantitative contribution of this action to reducing GHG is low in this early phase. Therefore they are shown differently in the chart, taking measure 3 as an example.

In principle, two variations are possible for the output sheet (represented in the chart as output sheets 1 and 2): They present the economic and the investors' perspective which includes an expectation of higher profits to cover possible risks. In the course of the discussion about the AP2 report, it was decided that the main focus should be on the economic perspective. However, the chart shows that it is possible to switch from one perspective to the other, using the Excel tool, by adjusting the assumed interest rates.

These three sheets for each measure are fed from a common input sheet (as part of a summary tool) with the general framework data and then for their part make a summary of the most important output indicators. In this context the question of overlapping should be discussed, although this issue was already considered to a certain extent in the discussion of the single measures.

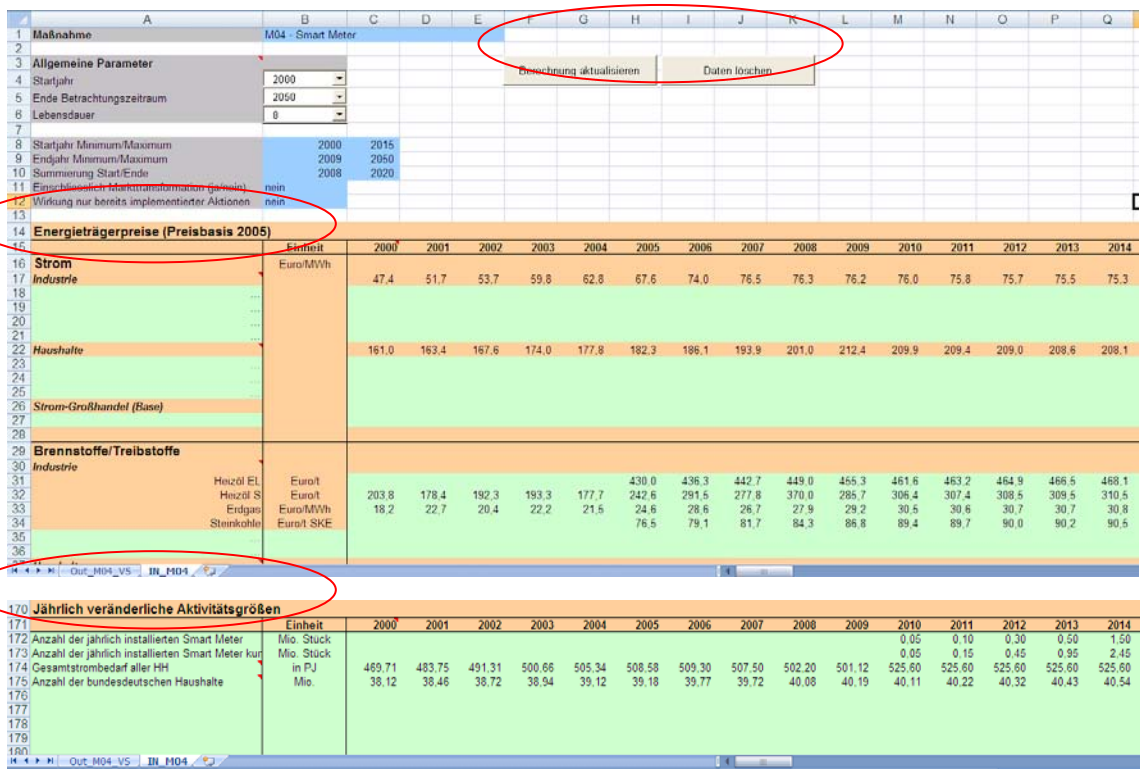
In addition, differently structured monitoring sheets should be designed for measures such as CCS (measure) which primarily track the decision status of the plants ("early

monitoring"). An overview of how such an early monitoring system could function for these kinds of measures is given in AP2.

The following page shows two screen shots which illustrate the functionalities of the database.

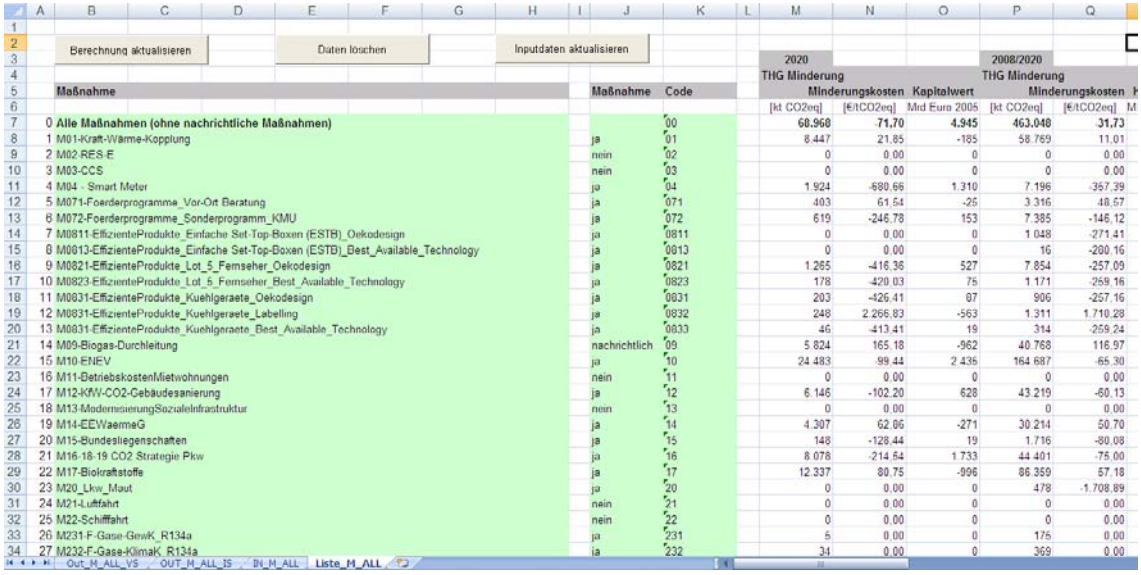
The Excel tool, in conjunction with the methodology developed in AP2, provides a tool-kit which enables a regular assessment of the IEKP actions and an estimate of the overall progress made in IEKP.

Functionalities for a single measure (input sheet)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Maßnahme	M04 - Smart Meter															
2																	
3	Allgemeine Parameter																
4	Startjahr	2000															
5	Ende Betrachtungszeitraum	2050															
6	Lebensdauer	8															
7																	
8	Startjahr Minimum/Maximum	2000	2015														
9	Endjahr Minimum/Maximum	2009	2050														
10	Summierung Start/Ende	2008	2020														
11	Einschließlich Marktdiffusionsinformation (ja/nein)	nein															
12	Wirkung nur bereits implementierter Aktionen	nein															
13																	
14	**Energieträgerpreise (Preisbasis 2005)**																
15		Einheit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
16	**Strom**	Euro/MWh															
17	*Industrie*		47,4	51,7	53,7	59,8	62,8	67,6	74,0	76,5	76,3	76,2	76,0	75,8	75,7	75,5	75,3
18	...																
19	...																
20	...																
21	...																
22	*Haushalte*		161,0	163,4	167,6	174,0	177,8	182,3	186,1	193,9	201,0	212,4	209,9	209,4	209,0	208,6	208,1
23	...																
24	...																
25	...																
26	*Strom-Großhandel (Base)*																
27																	
28																	
29	**Brennstoffe/Treibstoffe**																
30	*Industrie*																
31	Heizöl EL	Euro/t						430,0	436,3	442,7	449,0	455,3	461,6	463,2	464,9	466,5	468,1
32	Heizöl S	Euro/t	203,8	178,4	192,3	193,3	177,7	242,6	291,5	277,8	370,0	285,7	306,4	307,4	308,5	309,5	310,5
33	Erdgas	Euro/MWh	18,2	22,7	20,4	22,2	21,5	24,6	28,6	26,7	27,9	29,2	30,5	30,6	30,7	30,7	30,8
34	Steinkohle	Euro/t SKE						76,5	79,1	81,7	84,3	86,8	89,4	89,7	90,0	90,2	90,5
35	...																
36	...																
170	**Jährlich veränderliche Aktivitätsgrößen**																
171		Einheit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
172	Anzahl der jährlich installierten Smart Meter	Mio. Stück											0,05	0,10	0,30	0,50	1,50
173	Anzahl der jährlich installierten Smart Meter kur	Mio. Stück											0,05	0,15	0,45	0,95	2,45
174	Gesamtstrombedarf aller HH	in PJ	469,71	483,75	491,31	500,66	505,34	508,58	509,30	507,50	502,20	501,12	525,60	525,60	525,60	525,60	525,60
175	Anzahl der bundesdeutschen Haushalte	Mio.	38,12	38,46	38,72	38,94	39,12	39,18	39,77	39,72	40,08	40,19	40,11	40,22	40,32	40,43	40,54
176																	
177																	
178																	
179																	
180																	

Assessment table in the summary tool



Berechnung aktualisieren | Daten löschen | Inputdaten aktualisieren

	Maßnahme	Maßnahme	Code	2020 THG Minderung Minderungskosten [kt CO2eq]	[€/tCO2eq]	Kapitalwert Mrd Euro 2005	2008/2020 THG Minderung Minderungskosten [kt CO2eq]	[€/tCO2eq]
0	**Alle Maßnahmen (ohne nachrichtliche Maßnahmen)**		00	**68.968**	**71,70**	**4.945**	**463.048**	**31,73**
1	M01-Kraft-Wärme-Kopplung	ja	01	8.447	21,85	-185	58.769	11,01
2	M02-RES-E	nein	02	0	0,00	0	0	0,00
3	M03-CCS	nein	03	0	0,00	0	0	0,00
4	M04 - Smart Meter	ja	04	1.924	-680,66	1.310	7.196	-357,39
5	M071-Foerderprogramme_Vor-Ort Beratung	ja	071	403	61,54	-25	3.316	48,57
6	M072-Foerderprogramme_Sonderprogramm_KMU	ja	072	619	-246,78	153	7.385	-146,12
7	M0811-EffizienteProdukte_Einfache Set-Top-Boxen (ESTB)_Oekodesign	ja	0811	0	0,00	0	1.048	-271,41
8	M0813-EffizienteProdukte_Einfache Set-Top-Boxen (ESTB)_Best_Available_Technology	ja	0813	0	0,00	0	16	-280,16
9	M0821-EffizienteProdukte_Lot_5_Fernseher_Oekodesign	ja	0821	1.265	-416,36	527	7.854	-257,09
10	M0823-EffizienteProdukte_Lot_5_Fernseher_Best_Available_Technology	ja	0823	178	-420,03	75	1.171	-259,16
11	M0831-EffizienteProdukte_Kuehlgeraete_Oekodesign	ja	0831	203	-426,41	87	906	-257,16
12	M0832-EffizienteProdukte_Kuehlgeraete_Labelling	ja	0832	248	2.266,83	-563	1.311	1.710,28
13	M0833-EffizienteProdukte_Kuehlgeraete_Best_Available_Technology	ja	0833	46	-413,41	19	314	-259,24
14	M09-Biogas-Durchleitung	nachrichtlich	09	5.824	165,18	-962	40.768	116,97
15	M10-ENEV	ja	10	24.483	99,44	2.435	164.687	-65,30
16	M11-BetriebskostenMietwohnungen	nein	11	0	0,00	0	0	0,00
17	M12-KfW-CO2-Gebäudesanierung	ja	12	6.146	-102,20	628	43.219	-60,13
18	M13-ModernisierungSozialeInfrastruktur	nein	13	0	0,00	0	0	0,00
19	M14-EEWaermeG	ja	14	4.307	62,06	-271	30.214	50,70
20	M15-Bundesliegenschaften	ja	15	148	-128,44	19	1.716	-80,08
21	M16-18-19 CO2 Strategie Pkw	ja	16	8.078	-214,54	1.733	44.401	-75,00
22	M17-Biokraftstoffe	ja	17	12.337	80,75	-996	86.359	57,18
23	M20_Lkw_Maut	ja	20	0	0,00	0	478	-1.708,89
24	M21-Luftfahrt	nein	21	0	0,00	0	0	0,00
25	M22-Schifffahrt	nein	22	0	0,00	0	0	0,00
26	M231-F-Gase-GewK_R134a	ja	231	5	0,00	0	175	0,00
27	M232-F-Gase-KlimaK_R134a	ja	232	34	0,00	0	369	0,00

Out_M_ALL_VS | OUT_M_ALL_IS | IN_M_ALL | Liste_M_ALL

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