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Accompanying document to the
COMMUNICATION FROM THE COMMISSION
Action Plan for Energy Efficiency: Realising the Potential

IMPACT ASSESSMENT

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COMMISSION STAFF WORKING DOCUMENT

Impact Assessment Report for the Action Plan for Energy Efficiency 2006

EXECUTIVE SUMMARY

The benefits of improving the European Union's energy efficiency include greater competitiveness of the EU economy, greater energy security, reducing harmful emissions, and allowing the EU to fulfil its Kyoto commitments in a cost effective way. Taking up energy efficiency seriously can put the EU firmly on the road to its goal of a sustainable energy future.

To realise 20% energy savings by 2020 would mean a saving of around 390 million tonnes of oil equivalent (hereinafter Mtoe) by 2020. To make this come true a 3.3% annual energy efficiency improvement is necessary. Adopting and implementing the measures proposed in the Action Plan contributes significantly to adding the necessary annual improvement of 1.5% to the assumed annual improvement of 1.8% in the baseline scenario[1] which the Commission uses for its annual estimates on future developments in energy.

To realise the full 20% savings potential, significant investments are necessary. However, cost effective measures are put forward in the Action Plan. Furthermore, many of these investments create greater added value for the EU economy in terms of EU manufacturing, energy, transport and services sector (innovation, research and development) and of job creation than more traditional supply side investments in the energy sector. Investments in energy efficiency are safer financial prospects for the future than many investments on the supply side of the energy chain. Energy efficiency improvements are a no-regret option for the future.

The impact assessment equally indicates that it is likely that the cost effective potential is bigger, as the higher than assumed present oil prices seem to persist for the foreseeable future at least. There is agreement among authoritative energy experts[2] that energy efficiency improvement is the most cost-effective and quickest way to set the global community on the way to a sustainable energy future[3].

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1 PRIMES is the modelling tool developed for the energy forecasts published regularly by the Commission. The version of PRIMES used by the consultants in their study for the Impact Assessment is based on is the same version as the one underlying the Green Paper on Energy Efficiency. The details of the new PRIMES version were unavailable. The new version assumes higher policy induced savings and higher autonomous improvement and is taken as starting point for this paragraph and the Action Plan itself.

2 PRIMES, International Energy Agency, International Panel on Climate Change, Energy Modeling Forum, e.g.

3 Also the Conclusions of the G8 meeting at St Petersburg of 16 July state: 'Energy saved is energy produced and is often a more affordable and environmentally responsible option to meet the growing energy demand … thus strengthening global energy security'. The Conclusions continue by mentioning actions to be undertaken in several areas equally pointed out in the impact assessment process (stringent standards for appliances and tyres, taking tax

An extra effort mobilising all actors to realise a further 1.5% energy efficiency improvement per year, induced by a mix of policies, is thus necessary. The Commission's Action Plan for Energy Efficiency brings forward the actions that are to be realised or initiated in the period 2007-2012. Further actions will be necessary to realise the full 20% by 2020.

The impact assessment provides data which allow for quantification of the effects of the actions proposed. Nonetheless, it should be noted that some uncertainty on the quantitative estimates exists, due the fact that improving energy efficiency is such a wide ranging topic, involving all levels of policy and decision makers[4].

Monetary savings estimated for the EU economy would be around 50 billion euros annually by 2012; this would increase substantially - to more than 100 billion euros[5] - by 2020. This savings estimate reaches 150 billion € per year if oil prices of 70$/barrel were taken as starting point. These savings would have to be reinvested for a large part into options and technologies that generate higher energy efficiency.

The carbon emissions savings estimated if the full 20% savings are realised are: around 780 million tonnes of CO_2.

Security of supply benefits are directly deduced from the Mtoe savings for the EU as a whole[6]. This cannot be extrapolated to mean the same benefit for the individual Member States in the same sense, due to differences in fuel mix and in policy framework.

The impacts of the individual actions proposed in the Action Plan vary considerably on the key indicators chosen, such as savings in Mtoe, cost effectiveness, competitiveness impact and administrative costs. In the impact assessment process the possible overlap between actions has been estimated, but the reinforcing effects of the right mix of policy measures on different actions have not been estimated with as much detail.

The clear conclusion of the impact assessment process is that not one single policy, be it a regulatory, a voluntary approach, or an approach geared towards raising awareness, would be sufficient to reach the potential. The EU can now confidently move from problem and barrier identification to a vigorous pursuit of the solution: a balanced mix of policy options as formulated in the Action Plan.

The most important determining factor in the success of the implementation of the Action Plan is the full engagement of all policy and decision makers to make the step change in energy use necessary to reap the full benefits of improved energy efficiency.

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and financial measures, demonstrate leadership at national level and raise public awareness, and working with International Financing Institutions to broaden the scope of the actions.

4 Decision makers in the framework of this Report are all users of energy, from industry, all levels of authorities to children, who can change their energy behaviour and therefore energy use in the EU as a whole.

5 Reference is 48 USD/barrel net of taxes.

6 No distinction is being made between fossil fuel exporting and importing Member States.

1. PROCEDURAL ISSUES AND CONSULTATION OF STAKEHOLDERS

1.1. Organisation and timing

The Green Paper on Energy Efficiency *'Doing more with less'*[7] (hereinafter the Green Paper) indicated that the Commission would publish an Action Plan for Energy Efficiency in 2006. The Action Plan features on the Commission Legislative Work Programme of 2006 as priority action with the following reference: CLWP 2006/TREN/032.

The Impact Assessment process was steered by an Inter Service Steering Group (hereinafter ISG), lead by DG TREN.

1.2. Consultation and expertise

1.2.1. External expertise

In order to conduct an extensive literature research and fact finding on the ground, it was decided to entrust an outside consultant with the task of providing support to the Directorate General for Energy and Transport in assessing possible areas for actions and their impacts on the economy, environment and society.

Given the outcome of public consultation and further stakeholder feedback on the Green Paper it was decided to focus the Action Plan on these subjects:

1) Information and raising awareness

2) Better financing for energy efficiency

3) Implementation of EU acquis

4) Transport

5) Energy transformation

6) EU energy efficiency actions in international context

The Impact Assessment Guidelines[8] state that "*Broad policy defining papers (like Action Plans) necessitate only broad analysis. Actions identified have to be sufficiently detailed for stakeholders to give their opinion on in subsequent consultation process. Assessment of impacts will necessarily be preliminary and will not provide detailed quantitative data*." The ISG decided nonetheless to ask for as much quantitative analysis as possible in a consultancy phase that had the maximum amount of funding allocated to it for an impact assessment for a legislative action. Given the financial constraints, it also decided not to ask the consultants to assess impacts of any possible actions at international level.

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7 COM (2005) 265 final of 22nd June 2005

8 SEC(2005) 791, page 8

The work of the consulting team[9] started on 2 May 2006. The final report[10] was discussed with the consultants on 11 July 2006 and was delivered on 14 July 2006.

1.2.2. Stakeholder consultation

The Green Paper opened a public consultation period of nine months proposing 25 questions to all interested parties in order to evaluate their opinions regarding energy efficiency and the way forward on realising the cost effective energy savings potential.

The public consultation was concluded on 31 March 2006. 244 contributions came in from a variety of sectors of activity. Furthermore, the participation of the Commission in a large number of conferences and events in several Member States and numerous stakeholders' meetings extended the consultation circle[11].

DG TREN carried out an exhaustive and objective analysis of the public consultation contributions. A methodology was developed which enabled a precise quantitative and qualitative evaluation of the opinions of the stakeholders, taking into account their significance and the sectors they represented.

On 29 May 2006, the Commission issued a staff working document, "Report on the analysis of the public Consultation of the Green Paper on Energy Efficiency"[12], detailing the methodology and thoroughly summarising the findings of the analysis. At the Energy Council of 8 June 2006 the report was presented.

The main findings of the public consultation were:

1) A perceived lack of information – citizens, industry and stakeholders in general are often not familiar with the instruments (technology and other policies) they can use to improve energy efficiency;

2) Respondents indicate that Member States need to go further on implementing and realising the full potential of current legislation. They need to also make full use of local and regional Energy Agencies and should also give a bigger significance to the role of small and medium sized enterprises;

3) A stronger use of fiscal policies is advocated in order to promote and accelerate market uptake of efficient technologies and products, improving efficiency and boosting economic competitiveness;

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9 Consisting of consultants from Atkins Global Ltd and ECN, Energy Research Centre of the Netherlands.

10 Final Report on the Impact Assessment on the Future Action Plan for Energy Efficiency (CLWP: 2006/TREN/032) Anyone interested in receiving a copy of this report can obtain one by writing an email to: tren-energy-efficiency@ec.europa.eu

11 Special reference is made to the Proceedings of the two Amsterdam Forums on Sustainable Energy where the Green Paper and the Action Plan to be were discussed in October 2005 and April 2006. For further information please consult : http://www.senternovem.nl/amsterdamforum/

12 SEC (2006) 693 of 29.05.2006, to be found at http://ec.europa.eu/energy/efficiency/index_en.htm

From additional stakeholders' meetings and interviews conducted for the impact assessment, one strong additional finding was distilled:

4) Enforcement on the ground of EU and national legislation is frequently pointed out as a determining factor for the success of any (energy efficiency) legislation. Because of budget constraints, EU/national/regional/local authorities often have too little human and financial resources at their disposal to ensure this adequately.

As described above, the Commission organised a wide consultation and produced a thorough analysis of the results. The Green Paper was the first real possibility for those active in energy efficiency and interested sectors to voice their opinion via Your Voice in Europe.

2. PROBLEM DEFINITION

On the basis of long standing experience with the development of energy efficiency in the European Union and studies on the subject, the Commission Green Paper identified the problems and the market, institutional and behavioural barriers that need to be overcome. The impact assessment process gave more supporting evidence and slightly different emphases in the problem definition and barriers identification than those identified in the Green Paper.

2.1. Identification of problems and barriers hampering energy efficiency improvements

a. The European Union is missing out on major savings on its energy expenditure by not undertaking cost-effective energy efficiency measures. More vigorous action would enhance competitiveness of EU economy (Lisbon Strategy) and attenuate the effects of the upward pressure on energy prices for the EU economy.

b. Lack of internalisation of external costs in current tariff and taxation structures further aggravated by the adverse effects of not fully competitive markets, leads to a situation where a strong incentive to use less energy or electricity is missing. Use of price caps for all or for certain categories of consumers (be it on electricity or gas prices or on fuel prices, for instance at gas stations) equally has an adverse effect on the effectiveness of the price signal and thus on the incentive to improve energy efficiency. In all cases they are a subsidy from government budgets (taxpayers' money) to certain customers. This benefits the companies supplying the price capped products, which in turn benefits the EU internal and external electricity and fuel suppliers. On top of that, such price caps do not stimulate more rational use of energy.

c. Inevitable volatility of prices in a liberalizing market can be attenuated effectively by reducing demand. While policy geared towards the supply side is equally necessary, it will only start producing results when most cost effective energy efficiency measures, if pursued, have already made an impact. This awareness is lacking at all policy and decision makers' levels.

d. A vigorous policy pursuing energy efficiency at all relevant policy and decision making levels (EU, national, regional, local, industry and other end-users) will bring important benefits in terms of lowering costs of respecting the Kyoto Protocol and other environmental commitments. This vigorous policy is lacking, partly due to the fact that all decision makers need to be mobilised to develop an effective demand side policy, namely all users of energy, from the energy transformation sector down to the car user/television watcher. On the supply side, action can be more quickly decided as relatively few players are needed to reach investment decisions. On the demand side there is a need for mobilising a large amount of decision makers at the appropriate level.

e. Energy efficiency technologies and services are relatively well developed in the EU. These sectors of the economy would benefit from a real EU push, also in terms of exporting technology to regions with less developed energy services. Research, development and innovation are central to economic development; this would also create more and better jobs in the EU.

f. Divergence of interests – some peoples' short term gains can be other peoples' long term losses (interpretation of shareholders' value, and the split incentive (owner – tenant) issue, for instance pose barriers to taking up the cost effective potential.

g. The income effect (higher income leading to higher energy and electricity consumption) and the rebound effect (energy efficiency gains at same or higher income leading to purchase of products with more options and features and higher energy consumption than the replaced products) lead to higher energy consumption and equally to an increasing mobility and fuel use by different transport modes.

h. Lack of enforcement capabilities at all policy making levels[13], which aggravates the lack of ambition in implementing EU/nationally/regionally or locally decided energy efficiency measures,

i. Financial obstacles, such as a lack of longer term vision on the side of decision makers; insufficient development of the energy services sector; lack of knowledge of existing financing possibilities, plethora of dispersed subsidy schemes at different levels, making it difficult for smaller companies and consumers to assess the financial support possibilities; stop and go subsidy approaches; lack of knowledge about the energy efficiency sector at financial institutions; small scale of some energy efficiency project. A strong perception that tax and other financial incentive instruments are used in a way that does not necessarily promote energy efficiency at EU and at national level, for instance the level at which levies to promote energy efficiency improving measures such as some distributed generation and off-grid generation technologies are imposed, the use of the EU Environmental State Aid Guidelines. The latter are currently undergoing revision

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[13] A preliminary, yet conservative estimate for the Commission services alone would be a requirement of additional staff of 20 officials if a success is to be made of the Action Plan.

j. Lock-in effect of investment decisions made now or in the past, which do not increase energy efficiency, but hamper market transformation towards more rational energy use for a considerable amount of time.

k. The import dependence of the EU is set to grow significantly; this impacts directly on the EU's security of supply position. Energy efficiency improvements will serve to reduce this sharp increase in import dependence. In fact when looking at a relatively short time horizon (i.e. 2020) improved energy efficiency is the most cost effective measure available to reduce this dependency significantly. This is not used sufficiently.

l. Growing global energy use creates an upward pressure on energy.

m. More than a third of the world's population has poor access to primary energy sources (mostly biomass (wood, dung)) and have little or no access to electricity. Not taking up cost effective measures and using our efficient technologies world wide perpetuate the global wealth distribution problems. Economic development without access to energy is impossible; the EU should contribute to achieving this global objective[14].

n. In fact, the claims that our industry is in the lead on energy efficiency technologies and renewable energy, is true at least for some sectors at this point in time. Due to investment and policy decisions made in other parts of the world right now (for instance in China on housing standards, in some American and Asian industries on energy efficiency standards for products), this competitive advantage is already eroding.

These problems, which come down to the underused potential of energy efficiency is detrimental to EU growth and competitiveness, to its energy security and to reaching the EU and global goal of a sustainable energy future.

2.2. Subsidiarity test

All policy and decisions makers can address the fact that not enough cost effective energy efficiency measures are taken. The lack of concerted action from other levels of policy and decision making justify EU action on internal market and environmental grounds. Articles 95 (internal market) and 75 (environment) of the EC Treaty have previously been used in EU regulatory measures aiming at an improvement of energy efficiency.

However, not all of the answers can be given at EU level. The Impact Assessment points out that various policy actions at EU, national, regional, local level and by decision makers are necessary; each have their role to play in realising the potential. It is essential that all these actors are actively involved.

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[14] The global effect of energy efficiency improvements due to technological and regulatory development in the EU has not been estimated, but is significant. EU industry can try to protect its intellectual property rights, which is becoming increasingly hard as our competitors are quickly catching up, but it should even more continue to innovate to maintain the competitive advantage and keep setting the standards (in certain areas) that the wider global community aspires to.

Many of the actions need a mobilisation effort, or a push from the EU level, either by regulatory action, by concluding voluntary agreements with different sectors or by exchanging good practices to empower the different levels of policy and decision makers to make a step change in their approach to energy efficiency.

3. OBJECTIVES

Most of the objectives pursued can be deduced from the problem definition defined above. This was stressed again in the recent Green Paper on Energy 'A European Strategy for Sustainable, Competitive and Secure Energy'[15] of 8 March 2006 (hereinafter the Green Paper on Energy), which reiterated the importance of energy efficiency for the overall objectives of the EU.

The Staff Working Document accompanying the Green Paper on Energy states for instance that an energy efficiency policy stabilising electricity demand over the next 15 to 25 years would greatly enhance the chances of moderate rather than excessive electricity prices. The higher the increase in demand, the more difficult it is likely to be to realise the appropriate investments.[16] In addition, improving energy efficiency and thus stabilising or reducing the growth of electricity demand, could allow for less financial support to electricity from renewable energy sources.

The Presidency Conclusions of the Spring European Council of 23/24 March 2006[17] embraced the analysis of the Green Paper on Energy noting that energy policy has to satisfy the demands of many policy areas.

Further, the Presidency Conclusions state that 'strengthening the EU leadership by adopting an ambitious and realistic Action Plan for Energy Efficiency, bearing in mind the EU energy savings potential of 20% by 2020, as estimated by the Commission, and taking into account measures already implemented by Member States'.

In this respect it is important to mention that the High Level Group on Competitiveness, Energy and the Environment, created at the start of 2006, endorsed the 20% savings potential explicitly in the firs report it adopted during its meeting of the 2nd of June 2006. It states: "A list of priorities for energy efficiency measures contributing to the EU energy saving target of 20 per cent by 2020, according to the relative importance of the energy savings and the duration of the payback periods, should be established at EU level"[18].

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15 http://europa.eu.int/comm/energy/green-paper-energy/index_en.htm

16 SEC(2006)317/2, page 31

17 Part two of the Conclusions Energy Policy for Europe and Annex III containing the indicative list of actions where action on the demand side, especially on transport and housing are the second action mentioned to alleviate the risk of any supply disruptions. Full text can be found at: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/89013.pdf

18 http://ec.europa.eu/enterprise/environment/hlg/doc_06/first_report_02_06_06.pdf

The objective can be summarised in very simple terms: enabling all actors to realise much more of the costs effective energy savings potential by 2020, i.e. to achieve energy savings of 20% of the baseline assumption for 2020[19].

4. POLICY OPTIONS

The following description of policy options gives an overview of the options that all policy making levels have at their disposal. The full extent of the availability of the option does of course depend on the policy level. EU level can take regulatory action, but only national, regional and local level can make a success of such action, depending on national and local circumstances. Apart from the first considered action, all policy options will have to be used to some extent as they complement each other and reinforce the energy savings potential of the individual actions considerably.

4.1. No additional action

This is the scenario, also called the 'Business As Usual (BAU)' scenario as used in the PRIMES model, underlying the Green Paper assessment. The Green Paper notes that the energy efficiency improvement in the EU had come down from 1.4% a year in the early 90ies to some 0.5% in the beginning of this century (2003). Different reasons exist for this poorer performance, like:

- a rather drastic decrease of energy and electricity prices in that period due to different factors,
- the income effect, and
- the rebound effect.

In 2005 the so called 'autonomous' energy efficiency improvement[20] had increased to 0.7%, due mainly to the effect of higher oil prices, especially impacting on demand in the transport sector.

The Green Paper analysis and the impact assessment, based on the Primes model used until May 2006, show that doing nothing extra may realise, at current price levels of around $70 a barrel, a part of the cost-effective potential, comparable to an increase of the autonomous annual improvement from 0.7% in 2005 to 0.8-0.9% by 2020. However, sustained higher prices may also lead to investment and policy decisions favouring seemingly more easy measures oriented on the supply side where far fewer actors are involved in policy and investment decisions.

Doing nothing extra will maybe realise a further 0.1 or 0.2% annual improvement due to higher oil prices, but will certainly fail to realise the remaining possible cost effective savings.

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19 The consultants examine the 20% potential stated in the Green Paper in detail and the studies underlying this potential. Their conclusion is that the 20% is achievable, but requires efforts. They equally conclude that the study by the Wuppertal Institute 'The mid-term potential for demand side energy efficiency in the EU' is the most consistent with the PRIMES scenario.

20 Mainly due to structural change in the economy.

4.2. Public sector leadership

All decision makers expect policy makers to set the framework in which they can make rational choices. If in addition, policy makers were to lead by example, the impact of their regulatory decisions would carry more authority and would contribute significantly to market transformation. This has already been the case for some important policy and investment decisions in other parts of the world.

The EU has taken a leading position on energy efficiency legislation in certain areas. The rate of implementation is, however, not satisfactory. Other EU leading initiatives include actions by several local, regional and national public authorities like Stockholm, Berlin, Copenhagen, Madrid and London city, Denmark central government, who are seen to lead by example and have convinced their constituents that the approach proposed, even when contentious in the beginning, is a reasonable one.

The EU institutions should also adopt a leadership role, for instance in their own public procurement decisions and in their decisions affecting the building stock they occupy.

4.3. Voluntary agreements

Voluntary agreements can take different forms; most of them are between policy makers and industry, for instance. These voluntary agreements would almost always need to be backed up by performance indicators and exchanges of good practice. Examples include:

– Voluntary agreements with industry on energy efficiency improvements or emission limits;

– Voluntary agreements with industry, in exchange for abstention of regulatory intervention;

– Voluntary agreements with industry, backed up by financial incentives or other incentives (recognition for instance);

– With other decision makers – final consumers for instance. The realisation of any expected behavioural change would need to be backed up by incentives, for instance in the form of rebates in shops.

4.4. Market based instruments

Market based instruments are interpreted as instruments that facilitate the functioning of the market towards a situation in which especially the current ineffectiveness of the price signal on the energy market can be to some extent alleviated. They work via price signals towards alleviating market failures, while leaving economic actors the freedom to decide. Examples include:

– Taxes, charges and tradable permits (at EU level in particular in the form of the Energy Tax Directive, EU Emission Trading Scheme and the Directive 99/62/EC

as modified by Directive 2006/38/EC setting common rules on road user charges for heavy good vehicles)

– White certificates at EU level, either through a regulatory or a voluntary approach. This option does imply that the market for white certificates or energy savings obligations needs to be created first and that care should be taken that there are no risks of distortion of the market from the outset. Member States would be given the required freedom to choose the option that suits their national circumstances best;

– Removal of tax reductions for (certain categories) of consumers and of regulated prices and tariffs.

The current high energy prices set new challenges for the use of these instruments and requires, e.g. smart meters to let the price signal work in times of peak demand and to avoid excessive price volatility both upwards and downwards

4.5. Regulatory measures at EU/national/regional/local level

Regulatory measures at all levels of public authority are necessary to some extent to realise the cost effective potential. Among the possibilities can be cited:

– Amending existing EU or national regulatory measure to realise more of the cost effective potential, for instance the potential in the buildings sector as pursued in the Energy Performance of Buildings Directive, in the appliances sector as pursued by the Eco-design Directive, in financing possibilities, in the promotion of energy efficiency improvements in the energy transformation and the transport sector.

– EU/Member States to oblige energy regulators and electricity regulators in particular, that the promotion of a sustainable energy system is their core objective. They should be induced to look beyond price cap regulation towards incentive based regulation. This could be done through EU regulatory measures. They should consider peak shaving, metering and facilitation of decentralised and off-grid power generation with as much priority as improvement of transmission and distribution systems. Average losses on EU grids are among the lowest in the world. However, especially in some Member States where losses are higher than the average in the EU through lack of investment in distribution grids, a push towards more investment in some pieces of infrastructure is warranted.

– EU or Member States could oblige regulators to pursue improvements in transmission and distribution grids, where warranted by cost effectiveness considerations. Some investments, especially in transmission infrastructure, do not necessarily further overall cost effectiveness at EU grid level, as these depend on the promoters' interests and on the implications of derogations granted from the traditional regulatory regime at EU and national level. Research into the improvement of existing technologies and identifying new technologies to reduce losses and increase reliability are very important in increasing the energy efficiency of the grids.

– Voluntary agreements with industry, as exchange for abstention of regulatory intervention, with a clause added that in absence of reaching the agreed commitment a more stringent approach will come into force immediately.

– New EU regulatory measures could be proposed, if insufficient progress is demonstrated on the existing regulatory measures and it is demonstrated that the EU is not taking up the cost effective options available, which in turn hamper EU economic growth.

4.6. Financing options

A large range of financing options can be used to further energy efficiency improvements, among which are cited:

– Adherence to the polluter pays principle (or internalisation of external costs) throughout the energy system through financial support systems or taxation measures, as long as external costs are not fully internalised.

– Innovative financing solutions, such as clearing house financing, Energy Performance Contracting, financing of upfront investments in increased energy efficiency by Energy Service Companies (ESCO's). Especially important for public authorities, small and medium sized enterprises. This could be extended to private home owners considering renovation work at home: a contract with an ESCO that will be responsible for overseeing the whole renovation process, and coordinate all subcontractors. This will take a large part of the stress out of renovation, and will make doing all renovation works at once a more attractive proposition.

– Member States should give the regional and local authorities to which they entrust (a part of) the enforcement on the ground of EU or national regulatory measures the necessary financial and human resources to carry this out in an effective manner.

– Public procurement has a strong effect on market transformation, especially when these public procurement decisions are taken at several levels of authority.

– Streamlining of subsidies, or 'one stop subsidy shops' for SME's and private citizens.

– Impose levies there where they will work towards energy efficiency improvements.

– Visible rebates on appliances in shops to accelerate market transformation to be received when the old product is returned.

– More efficient use of taxation, which ensures that taxpayers' contributions are not used in a way which is counterproductive to the furthering of cost effective energy efficiency.

– Revision of Environmental State Aid guidelines to support energy efficiency.

4.7. Information, training, education activities

Actions to raise awareness on possibilities to save energy are legion. The following are among the possibilities:

– School education, introducing awareness about energy use in curricula.

– Improvement of information on the current labels (inclusion of running costs) and extension of current labelling framework.

– EU Handbook on good practices in energy efficiency improvement at all policy and decision makers' levels to exchange information with EU stamp of approval.

– Training of sales personnel, of installers.

– A EU portal for energy efficiency linking to EU/national/regional/local websites providing good information on energy efficiency initiatives. EU role would be to provide portal, not to check the quality of the websites put forward by national/regional/local authorities.

– Regional and local authority involvement should be more strongly developed in spreading best practices and promoting energy efficiency options close to the citizens, through the existing network of energy agencies, through educational or other information activities.

– Inclusion of energy efficiency in relevant parts of vocational training, especially given the current shortages in skilled personnel.

4.8. Conclusion on policy options

All the policy options that have been retained for further analysis complement each other to some extent. It is clear that for such a wide ranging Action Plan, not one single option can be chosen as the best policy option. The EU cannot rely on EU regulatory measures alone, since mobilisation of all actors is sought. The EU cannot rely on purely voluntary agreements alone, as their track record is patchy. On nearly every single action a mix of policy options is required. Incentives, be they financial or more in the form of raising awareness and exchange of best practices are important complementary policies. This approach has guided the further analysis of the options that are discussed below.

5. ANALYSIS OF IMPACTS

In line with the Impact Assessment Guidelines this impact assessment has been based on a broad analysis. However, the impact assessment process has brought forward as much quantitative analysis as possible considering the limitations in time and funding.

A multi criteria analysis has been carried out for this impact assessment. Multi-criteria analysis (MCA) establishes preferences between options by reference to an explicit set of objectives identified by the decision making body.

The options and their implications and the fact that energy efficiency impacts on many areas led the ISG to decide on the following 24 criteria to be used:

Security of supply, competitiveness, trade and investment flows, innovation and research, cost effectiveness, employment and labour markets, market barriers, macro

economic environment, operating costs and conduct of business, competition in the internal market, government budget, air quality, climate, social inclusion and protection of particular groups, governance participation, good administration, access to justice, media and ethics, administrative costs on business, consumers and households, specific regions or sectors, mobility and the use of energy, public authorities, short time for effect, persistence, monitoring and verification.

5.1. Selection of actions for consideration

I. 160 actions chosen for a quick feasibility and impact check in a first phase.

II. 54 actions were chosen for further assessment on the basis of the non weighted multi criteria approach.

III. 18 priority actions appeared as the ones with the highest likely impact in terms of energy savings; these were assessed against all 24 criteria and against the following 5 major determining criteria which were decided on in the ISG meeting of 28 June 2006:

- Security of supply / Quantified Energy savings in Mtoe
- Cost effectiveness
- Impact on harmful emissions (climate change mitigation)[21]
- Administrative costs on businesses
- Persistence – short term (2007-2012) vs 'long' term (2020) effect

In the Action Plan the Commission made the political assessment of the actions considered to be politically unfeasible due to political or social acceptance problems. This impact assessment report is a reflection of the work carried out throughout the impact assessment process.

5.2. Methodology used for energy savings estimations

Energy savings are expressed in Mtoe of primary energy consumption. For savings on electricity an average conversion efficiency of 40% (multiplication factor of 2.5) has been applied.

The energy savings resulting from the proposed and considered actions are the extra savings with respect to the recent BAU-scenario of the PRIMES modelers for 2005-2030.[22]

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21 Climate change mitigation has a strong relationship to savings of Mtoe, this is therefore not specified under Chapter 6

22 The main assumptions underlying the PRIMES BAU scenario are GDP-growth of 2.0% per year and oil prices that decrease from 54$_{2000}$/bbl in 2005 to 48$_{2000}$/bbl in 2020, stable coal prices and 20% higher gas prices. Total primary energy consumption increases from 1740 to 1885 Mtoe in 2020 and total electricity consumption increases from about 3180 in 2005 to 4000 TWh in 2020.

The estimation of energy savings per action start with the technical potential, i.e. the ultimate savings if all existing energy systems (or energetic behavior) of energy users were replaced at once by a more energy efficient version. In reality it is not possible to fully realize this potential in 2020, due to physical and societal restrictions as shown below.

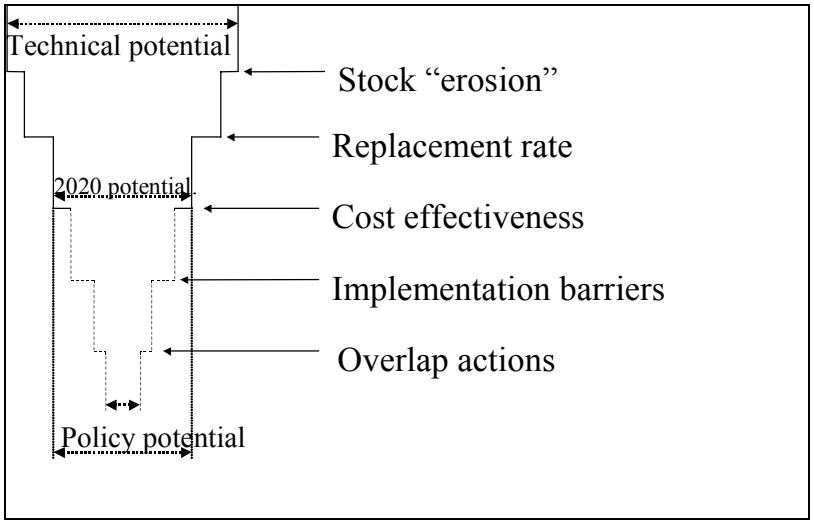

Figure 5.1: From technical savings potential to policy savings per action

The policy induced savings that can be realized are dependent on a number of other factors. Cost-effectiveness can be defined as the pay-back time that is usually applied by users, depending on the user or investor this can vary from 1, 2, 3, 5 to 8 years.

However, it is also possible to apply a lifecycle cost approach where energy (cost) savings during the life time are compared with the initial investment in more efficient systems. This suggests that the pay-back time of the investment can be equal to the technical lifetime of the saving measure. This is an extended definition of cost effectiveness. In this impact assessment a compromise between the two has been used to estimate the energy savings.

Implementation barriers regard lack of knowledge on saving options, lack of incentive to choose the more efficient system, etc. Only in the case of respect of standards or other stringent obligations full implementation can be assumed. Other restrictions regard the split-incentive issue for landlords and tenant, lack of space, lack of financing, etc. Due to these restrictions part of the saving potential will not be realized.

Overlap between various actions is considered in Chapter 6.3 and regards interaction between the saving effects of actions. Some actions and policy options also have a reinforcing effect. An example of the first mentioned issue is that electricity savings will save less primary fuels when the conversion efficiency of power plants increases. An example of the second issue is the (extension of the) EPBD-directive on standards and certificates for buildings that will overlap with the effect of a white certificate scheme that focuses on buildings too. An example of reinforcement is school education and public sector leadership accelerating market transformation.

The overlap and reinforcement factors can be influenced by EU-policy or national policy measures. E.g. financial support can increase the cost-effectiveness for the energy users. Labels can overcome the information deficit for consumers wanting to buy efficient appliances. However, it is not clear at this moment what national savings policy will look like, as national action plans under the Energy Services Directive have still to be formulated.

Due to these uncertainties it is not possible to provide a point estimate of savings to be realized with each action. It is only possible to give a margin or a maximum that implicitly assumes full implementation of EU-policy measures in combination with all needed supporting policy measures of all policy and decision makers. The assessment does not estimate the additional savings that can be realized when different policy options reinforce each other. For this reason, it would seem that only subtraction of potential is the result, this would be the wrong interpretation of the impact assessment process.

5.3. Approach to scoring and assessing of the options

A relatively simple seven point scoring scheme was adopted as shown by Table 5.1 for this assessment. The low definition of this scoring protocol reflects the 'broad-brush' approach of this assessment and readers should not assume that a score of +3 is three times more beneficial than a score of +1.

Each option is supported by a reference sheet – see summary in Chapter 6 - comprising the detail of the policy action, the estimated energy savings and then the criterion assessment for each action and the scoring narrative leading to a score.

All supporting sheets and reference material for the assessment of the 18 options selected are provided in the Final Report. For the 54 options screened the supporting information is equally provided in the Final Report.

A standard feature of multi-criteria analysis is the performance matrix, or consequence table, in which each row describes an option and each column describes the performance of the options against each criterion. Summary information is presented in this matrix format under Chapter 6.

All options were assessed in terms of a literature search, experience and consultations in the framework of the Green Paper and the impact assessment process.

6. COMPARING THE OPTIONS

6.1. Introduction

The options are examined on a purely technical basis and do not include any further political consideration as to their acceptance. Therefore, this analysis does not prejudge the political choices made by establishing the Action Plan itself. An overview of the scoring of all the 54 actions identified in the second stage of this impact assessment and a savings estimate expressed in Mtoe for those, are given in the Final Report.

Table 6.1: Summary table of the impact assessment findings for the 18 policy options assessed more in depth[23]

Option Reference	Option Description	Potential Energy Savings (Mtoe)	Criteria Score (Major Criteria)	Criteria Score (All Criteria)
1	EU to develop scheme recognising retailers providing information on energy efficiency by allowing public recognition through logo or certification scheme.	**6**	**5**	**20**
2	EU to encourage Member States to include energy efficiency training and information in national education curriculum for primary and secondary schools as part of sustainability awareness.	**10**	**9**	**21**
3	EU to include running costs in Energy Efficiency Product Listing / labelling or equivalent consumer information	**18**	**8**	**28**
4	EU/MS to extend EPBD to include smaller buildings (<1000 m2), inspection requirements to smaller installations and higher minimum standards for public buildings	**80**	**5**	**18**
5	EU to adapt appliance label regulation as to regular updating of the label system, in order to stimulate the marketing of ever more efficient appliances, and extend the system to other devices.	**2**	**4**	**14**
4a	EU/MS to extend the concept of white certificate schemes, after evaluation of present national schemes, to all EU-countries and implement obligations on energy suppliers to provide energy efficiency	**60**	**3**	**19**
6	EU/MS to set up regulation and/or incentives to increase the average conversion efficiency per fuel type, by installing new plants with best available technology (BAT)	**20**	**5**	**15**
7	EU/MS to promote/require regulatory change towards facilitation of penetration of "off-grid" power generation – many obstacles to be removed through different measures	**16**	**7**	**31**
8	EU/MS to promote/require regulatory change towards facilitation of penetration of "grid-connected" CHP, via different measures	**14**	**8**	**33**
9	EU to introduce new CEN STANDARD to regulate district heating systems	**2**	**6**	**28**
10	EU to incentivise the use of intermediaries for small energy efficiency loans etc, for example by extending access to ECB or (through Energy Services Directive obligation) MS capital as a revolving fund for "soft loans"	**13**	**8**	**27**
11	EU/MS to increase policy support for ESCOs through (1) dissemination of their activities, (2) the development of EU wide	**<6**	**4**	**13**

[23] Options 13b and 13c (in red) are not put forward in the Action Plan as they are politically contentious.

Option Reference	Option Description	Potential Energy Savings (Mtoe)	Criteria Score (Major Criteria)	Criteria Score (All Criteria)
	quality standards for ESCO projects, (3) standardised project monitoring and verification schemes, (4) model contracts and (5) improve access to (private) financial sources (e.g. cooperation with private banks). These measures could be combined with providing low-interest loans to ESCO projects			
12	EU to incentivise production of energy efficient products through favourable taxation rate in Member States	**15**	**4**	**12**
13	EU/MS to make driving costs more km depending. For instance the car or road tax can be made variable. Finally area and congestion charges used for traffic management also have a km reduction effect.	**3 to 15**	**8**	**13**
13a	EU to: 1) Set maximum CO_2 emission standards for different type of cars (absolute, related to specific performance properties, or related to the mean value of all cars sold by one company). 2) Make more stringent agreement with car and truck producers after 2008-2009.	**28**	**4**	**12**
13b	EU/MS to restrict unnecessary power of car engines by technical devices like maximum speed limiters and/or limitation of maximum acceleration. Or limit the maximum power related to the vehicle weight (or maximum load) for new cars and trucks.	**11**	**2**	**5**
13c	EU/MS to decrease fuel use by making fuel more expensive. By making the differences between countries less, the incentive of buying cheap fuel across the boarder will decrease. Secondly a lower car tax can be introduced when an efficient car is bought or a financial penalty, which make the buying of a less efficient (second hand) car much more expensive. Thirdly a bigger difference in road tax related to the fuel consumption of a car can be introduced. Even a km charge can be fuel economy dependent.	**22**	**10**	**17**
14	An EU broad policy for labelling fuel efficient tyres or minimum performance requirements for tyres, tyre pressure indicators (dashboard tyre pressure sensors mandatory on cars and freight vehicles, valve pressure indicators compulsory on existing vehicles tyres from 2010) and free facilities at service stations.	**15**	**6**	**11**

The aggregate primary savings potential for fully implemented policy options in the year 2020 are between 341 and 353 Mtoe below the baseline projection of 1885 Mtoe in 2020. Overlap and interaction effects are described in Chapter 6.3.

6.2. Summary of the main findings on the 18 actions screened more in-depth

This section provides an overview of the impact assessment outcome for the 18 actions selected for more in-depth assessment, focusing especially on the estimated Mtoe savings, on cost-effectiveness and competitiveness impact and administrative costs of the actions. As described in Chapter 5.1 the interpretation of cost

effectiveness depends on the time allowed as pay back time. The full findings and the references used can be found in the Final Report.

Action 1:	**Development of an EU scheme recognising retailers providing information on energy efficiency by allowing public recognition through logo or certification scheme**

Subcategory: Voluntary Agreements with suppliers, esp. appliance/vehicle retailers

Estimated savings: 6 Mtoe. There is evidence that retailers influence consumer behaviour through highlighting information via staff and brand confidence, when supported by campaigns. The impact of sales staff in influencing consumer choice is hard to quantify, and consumers tend to underestimate their influence. Studies surveying consumers shows that sales staff were ranked more useful than all other sources of information when it came to purchasing cars. This action is indirect; it creates a basis for energy savings in combination with other policy measures The action would contribute to and enhance the level of savings achieved by successful energy labelling information, eg, Energy Star, white goods labelling, car labelling.

Competitiveness impact: Having a more motivated and knowledgeable work force will positively enhance EU commerce competitiveness. There are no significant effect on cross border investment flows . Energy costs per unit are important to EU firms (eg for energy intensive industry, when facing competitors with lower energy and transport costs outside EU). Energy efficiency savings from informed procurement decisions will have a positive impact, the low scoring reflects the understatement of awareness actions that complement other actions with more directly attributable benefit.

Cost-effectiveness: There is little information, in scientific studies or reports on trials, to suggest any positive or negative effects in economic terms and ultimately this will be determined by market forces. Reasonable to expect costs of adding additional energy efficiency training to existing staff training will be minimal compared with potential increase in sales. There are good examples of energy labelling magazines for distributors/retail shops of major household appliances and various informational pamphlets. This is an example of a low cost measure. For retailers, the results imply that they can increase sales and profit by offering a range of products that includes a significant share of A-labelled products. To realize these benefits, however, careful training of their sales staff is fundamental for successful communication of the added value of an energy efficient product to the consumer at the point of sale. It is probable that SMEs will find it difficult to release people for training. Many staff employed in the retail sector are part time based covering peak purchase periods including weekends. Part time staff have high turnover and ongoing training burden. This can be compensated in future by making (part) of the required training obligatory in vocational training for the profession.

Administrative costs: If there are additional requirements for a business to conform or be part of an certification system then this will have an additional overhead costs and place greater pressure on functions in the sector that are already struggling to cope.

Behavioural change: There is potential for consumers to make a more informed choice in the purchase of goods. Labelling schemes have proved effective in influencing consumer choice; it is logical to assume that more informed trained sales force will reinforce this.

Action 2:	**EU to encourage Member States to include energy efficiency training and information in national education curricula for primary and secondary schools as part of sustainability awareness**

Subcategory: voluntary agreements with national education boards.

Estimated savings: Around 10 Mtoe. UK experience from the Energy Matters programme cite among the benefits: lower fuel bills (40% of respondents) and that 76% of parents changed their behaviour to save energy and 54% installed energy saving light bulbs. Less than half the current stock of domestic appliances would be due for replacement by 2010, although most tungsten lamps would be replaced at least once, and those in high-use fittings probably every year. However, by 2020, practically all of today's stock would have been replaced. Estimates for the economic potential for the existing housing stock are around 17-21% for 2010 and 28-32% for 2020. In practice, not quite all of this is achievable, particularly for 2010, because of the time required to make the transition from today's market conditions. The main constraint is the time required to build up the capacity of the supply side, whether it be on production of goods or overcoming skills shortages in the installation industries.

Competitiveness impact/ innovation and research: Educating our next generation will provide greater efficiency immediately and is likely to provide a positive stimulus to students in taking up higher education pathways towards sustainable energy use/technology development. No direct evidence for this; however likely effect. This could alleviate existing skills shortages.

Cost-effectiveness: Quantified references to energy savings being directly attributed to costed educational programmes are rare. TREN quoted savings attributed to education in Brasil of 0.01 US$/kWh compared to training at 0.02 US$/kWh and other programmes of over 13 US$/kWh. Other reports suggested cost effectiveness of 0.034 and 0.038 $/kWh for appliance standards and utility demand side management (DSM) in year 2000 in the US and the 2005 IEA paper cited several studies reporting a cost effectiveness of around 0.03$/kWh for DSM programmes. An analysis of funding and savings for energy efficiency programmes 2000 to 2004 in California found an average cost of 0.0295 $/kWh for DSM programmes. Taking the available evidence as energy efficiency programmes are cheaper than energy supplied and that energy savings from education are cheaper than DSM programmes; then educational programmes score a positive high of +3. Analysis suggests that influence of children in the home is as effective as professional energy services.

Government budget: A major obstacle to activities in schools and education has been identified as a lack of funding and resources. Therefore improved implementation will require additional resources which will require additional funding. This is a medium negative as EU support under the Socrates Programme and similar, focuses on supporting actions only. In many countries Energy Agencies are funded by other

means to deliver educational services although they may lack the specific knowledge to integrate with national curriculum requirements on a longer term basis.

Administrative costs: No direct effect on businesses or SME's.

Behavioural change: Using energy educated school children and students as vectors of change in households has been reported as a successful strategy in positively changing behaviour (e.g. heating control, purchasing energy efficient light bulbs, etc.) resulting in reductions in energy bills. Significant short term positive effect reported with no detriment to environment when households have probably been targeted by DSM programmes already.

Action 3:	**Increased information on appliance running costs**

Subcategory: Voluntary agreement with manufacturers

Estimated savings: 18 Mtoe. From the Australian NAEEP programme there is evidence to demonstrate decreases in energy consumption of 1 to 6% and increases in energy efficiency of 1.4 - 3.6% across the use of 5 main appliances during the period 1993-2001. It has been estimated if labelling had not been introduced, the annual electricity consumption of all new appliances (of the types labelled) in 1992 would have been about 11% higher than it was, and the total household electricity consumption in Australia would have been about 1.6% higher. Projections from the Swiss E2000 energy label (which were granted only to appliances which met targets of power consumption in different modes of operation, linked to running costs) also estimated savings of approximately 1% of Switzerland's overall electricity consumption.

Competitiveness impact: Increased consumer/workforce awareness will positively enhance EU competitiveness, however no direct link to increased trade. No significant effect on cross border investment flows. No identifiable negative effects. Some countries may be concerned that publicly funded/administered eco-labeling information such as running costs may create de facto barriers to competitive market access because they display national and common EU environmental preferences, however harmonization mitigates this. Consumer organisations are likely to support action as competition will bring reduced running costs, improved quality and increased choice to consumers. If all EU manufacturers and retailers will have to comply, there will be no effect on intra-European Union trade. There is expected to be no effect on trade with non-EU countries.

Cost-effectiveness: Using only energy savings as a benefit (that is allocating no monetary value to the environmental benefits), the NAEEEP is projected to deliver almost 4.2 billion Australian dollars to the community (after the projected $2.6 billion costs are deducted from the $6.8 billion energy savings at 10 % discount rate by 2018). This experience suggests that such schemes to increase awareness of running costs/energy efficiency are cost effective. Savings can be achieved at a negative cost to society. The extra costs of more efficient appliances are offset by savings in running costs over the life of the appliance. No effect expected on availability or cost of inputs, access to finance or investment cycle. Action will promote the most efficient technologies available over inefficient technologies.

Administrative costs: There is an increased requirement for manufacturer to provide information which should be readily available.

Action 4:	**EU/MS to extend EPBD to include smaller buildings (<1000 m2), inspection requirements to smaller installations and higher minimum standards for public buildings**

Subcategory: Amended EU legislation accompanied by financial incentives

Estimated savings: According to the MURE-Database the technical savings potential of the existing EPBD was 3465 PJ (83 Mtoe) in 2010, assuming a start in 2002. Given a later start in 2009, but 2020 as end year, provides 1.5 times energy savings or 125 Mtoe. This could be doubled if smaller buildings are included. Thus, the extended EPBD action leads to an extra technical savings potential of 125 Mtoe. However, only 90% of existing stock is considered as part of the extended EPBD. Renovation of (privately owned) dwellings is often done part by part, circumventing the ">25%" obligation in the current EPBD-directive. Without proper incentives from national policy measures this part of the savings potential will not be realised. Therefore the policy savings are estimated at 80 Mtoe only, but could increase if easy access to energy service companies (ESCO) would also be considered for owners of private dwellings. There is overlap with EU-wide implementation of white certificate schemes (action 4a). The EPBD extension to smaller buildings will mainly affect the energy use for space heating/cooling and water heating (about 85% of residential energy consumption in EU-15 (Ademe 2005)). Natural gas and oil are the main energy sources for these purposes. Savings on these fuels have a positive impact on security of supply.

Competitiveness impact: The saving activities regard households, where competitiveness is not relevant, and small business where energy costs are rather low compared to total production costs. The action stimulates production in the European construction and refurbishment sector, where there is hardly competition of non-EU rivals. Overall competitiveness is not an issue.

Cost-effectiveness: Investments on energy saving measures on the one hand and benefits for avoided energy expenditure on the other hand, determine to a large extent the cost effectiveness of this action. If the investor and the beneficiary are the same (f.i. homeowners), energy saving are cost effective or even beneficiary (assuming that administration costs are not included or recuperated over a longer period of time as the ESCO is the sole contractor and will have to pay for the administrative costs of managing the subcontractors). If the ESCO sector does not develop in line with the cost effective potential it can realise, due to policy decisions, profits will not automatically return toward the initial investor. The action will enlarge construction expenditure with 1-3% which is a significant incentive for this sector. Extra economic activity can lead to scarcity of resources such as materials or labour. Calculating energy-use, labelling and proposing improvements are executed by external specialist. However, cooperation of the owners and occupants is needed to some extent. Moreover, they have to decide on necessary investments in energy savings at renovation. Within the existing EPBD directive, administration was limited to large buildings.

Administrative costs: If EPBD is extended to small buildings, administration will form a higher burden on these energy users, unless the ESCO option is fully used.

Action 4a:	**EU-wide implementation of white certificate schemes**

Subcategory: New EU legislation

Estimated savings: 60 Mtoe. White certificates could cover half of natural gas (165 Mtoe) and 70% of electricity use in EU-15 (136 Mtoe) or 505 Mtoe in primary energy. Introduction of white certificates can potentially increase energy-efficiency with 15%, saving 76 Mtoe in 2020 (based on free of costs for society). If this saving will actually be accomplished depends to a high extent on energy saving obligations set by the national governments. These obligations define the price of certificates and, indirectly, the incentive and efforts to save energy. It is assumed that EU-wide white certificate schemes are used as the main policy instrument to realise the savings mentioned in the Energy Services Directive (ESD). Assuming that the ESD-average of 1% of base year energy use is realised for 2009-2020, this leads to about 12% savings on 2020 energy consumption under white certificates schemes or 60 Mtoe. However, due to the non-obligatory ESD-savings total policy savings can be lower than 60 Mtoe. A great part of this savings potential overlaps with that of the (extended) EPBD (action 4), because both actions focus on buildings. White certificates could become the main instrument to reach ESD-savings, meaning this action could overlap with many other actions.

Competitiveness/innovation and research: The action aims at internal energy saving and doesn't have an impact on competitiveness. Since energy suppliers act mostly within Europe there is no impact on the competitive position of EU firms. It has a small positive effect on research for energy saving measures. Energy suppliers will invest in innovative energy saving solutions. It will also stimulate innovation on service products. Service companies and energy suppliers will find innovative ways to save energy.

Cost-effectiveness: Although the system helps to achieve savings in the most cost-effective way it also brings additional costs with it, e.g. administration costs which are transferred to the end-users of grid supplied energy. It is expected that the costs will not exceed the benefits as energy suppliers can partly turn into sellers of energy efficiency services. The profit which is taken from this can compensate a part of the decrease in sold energy. For end-users this action can provide better access to finance. Energy savings become a new "product" that can be sold with profit because of the white certificate system.

Administrative costs: For suppliers the action forces them to do new tasks. Administration costs are signifiicant, because of the necessary monitoring and certification.

Action 5:	**Regular revision and extension of the EU labelling schemes**

Subcategory: Amended EU legislation accompanied by incentives for consumers

Estimated savings: 2 Mtoe. According to the white good producers 34 TWh or 7 Mtoe primary energy savings for appliances have been achieved since 1995. It is assumed that more than half or 4 Mtoe is due to labelling, the remaining part is due to structural technical improvements. The effect of the present labelling system will increase further in time, even without strengthening the system. For some appliances further savings ask for totally new concepts (e.g. ultrasonic washing machines); for other appliances further savings ask for more costly techniques and stand-by losses are already treated in many cases (Eco-design provides a framework for this). Therefore it is assumed that extra savings due to updated labels are equal to 30% of already realised energy savings, or more than 1 Mtoe. However, the label system can be extended to other fields, such as ventilation, etc.). This can increase the savings potential to about 2 Mtoe. Furthermore, accompaniment by incentives such as visible rebates for consumers will accelerate market transformation.

Competitiveness/innovation: EU-appliance label regulation regards the products of both EU and Non-EU companies. The more efficient appliances can meet appliance regulation in other parts of the world. So there is no real impact on competitiveness of EU-companies. In principle this action will greatly stimulate innovation within the appliance industry. However, if not enough incentives are provided for a fast market transformation, manufacturers cannot recover their R&D-investments timely to invest in still more efficient devices.

Cost-effectiveness: In the past more efficient appliances have been extremely cost-effective. However, due to exhaustion of the "easy" saving potential for some appliances and higher R&D-costs the cost-effectiveness will decrease, but remain quite positive. Precise quantifications are impossible to give. The action changes the efficiency of appliances but not the market for (new) appliances itself. Therefore no impact, unless accompanied by incentives to accelerate market transformation.

Administrative costs: Regulation on appliances labelling exists so expanding the labels will not change administrative costs significantly, unless running costs are included (see Action 3).

Action 6:	**Highly efficient new generation capacity (excluding RES)**

Subcategory: Amended EU legislation or MS legislation / regulation / incentives / demonstration.

Average efficiency of electricity supply can be increased by changing the fuel mix from coal and nuclear to gas. However, this can conflict with the policy to increase security of supply or with internal market rules. Therefore the action aims at increasing conversion efficiency per fuel type, e.g. all gas based electricity production. EU-legislation (i.e. IPPC-directive) is adapted in such a way that the minimum demands on conversion efficiency in national license procedures for new power stations are harmonised. The minimum demands are based on regularly executed benchmarks on power plants of the same fuel type worldwide. The minimum demands take account of other legislation, e.g. SO2 and NOx, in order not to harm other objectives. The action also entails a Demonstration-program to support implementation of highly efficient power plants.

Estimated savings: 20 Mtoe. Input for total electricity generation in the EU-25 in 2020 is 850 Mtoe (PRIMES-baseline), of which 56% fossil fuel or 470 Mtoe. With 50% replacement/extension of total capacity for 2007-2020 an input of 235 Mtoe is at stake. New coal- and gas-fired plants, with on average 4%-point higher efficiency in 2020 than BAU, lead to 9% lower input or 20 Mtoe technical savings potential. Given future fuel prices lying between that of PRIMES-BAU and present higher levels, investments in higher conversion efficiency are cost-effective. Improved legislation could deliver policy savings of 20 Mtoe.

Competitiveness impact/innovation and research: With world energy prices at present high levels the extra investments in new power plants with higher efficiency are cost-effective, therefore they decrease electricity costs for end-users (given proper market functioning) and thus increase competitiveness of EU-companies. Moreover, it will strengthen the position of power plant suppliers in the world market. Higher conversion efficiencies stimulate innovation to a great extent, thus enabling further future efficiency increases and lower costs. The action influences the investment decisions of the producers, possibly at the cost of their return on investments and shareholder value. However, given investment decisions necessary to deliver on policy goals of competitiveness and sustainability, these investments could benefit the shareholder value significantly.

Administrative costs: The procedures are the same for conventional and high efficiency power plants, which means that there will be no extra administrative costs involved.

Action 7:	**"Off-grid" CHP and other power generation**

Subcategory: Amended EU legislation – MS legislation / regulation – incentives / awareness

Estimated savings: 16 Mtoe. High efficiency CHP and other forms of off grid applications such as renewable electricity applications, will give primary energy savings of at least 10% compared to separate production. Much of the potential off-grid CHP plant will be small scale micro-generation. This option needs a shift in regulatory approaches and in public procurement decisions to promote development and market up-take.

Competitiveness impacts: Small CHP plants, e.g. using by-products such as bark and sawdust as fuel, have made small factories almost self-sufficient in energy and improved their overall competitiveness. However, in some cases the competitiveness of other industries using the same raw materials (e.g. paper and other forest-based industries) could be negatively affected. This possible negative can be compensated by accelerating through R&D policy, the move towards 2nd generation options being used to the full. If in the future micro-generation becomes "must-have" technology (as condensing boilers are today and no longer the expensive alternative to conventional boilers) for domestic energy supply there will be a need to develop a supply chain to support demand.

Cost-effectiveness: The cost effectiveness of CHP is reasonably good but each case has to be considered on its merits. Capital costs have been falling and there has been a

steady increase in efficiency of energy conversion so local co-generation offers benefits over distant and often less efficient power generation. The promotion and/or regulation of micro-CHP would require some financial support by national and/or local government to ensure that help is properly directed. This would mainly be in the form of administrative support for regulatory, information dissemination, training and awareness activities. The cost of this would be relatively small compared in the context of the gains resulting from an increased uptake of CHP. Obviously there will be a need for increased funding if this action would be accelerated further and would extend to the provision of fiscal benefits. Energy savings and grid stability are a major motivation in the installation of many distributed off-grid generation systems. Supporting their implementation by promoting new regulations will impact positively on the investment cycle. The promotional activities taken under this action should include a positive attempt to remove barriers and administrative burden. Significant barriers remain to be overcome before the micro-generation market really takes off; the technology is not yet commercially proven and the general public is unaware that micro-generation is a potential energy supply option for the home. The proposed promotion of CHP, which should include awareness actions, should help significantly to overcome these barriers. The barriers affecting the uptake of larger scale CHP are less severe.

Solutions to existing barriers: Provided that

Action 8:	**Promotion of grid-connected CHP**

Subcategory: EU/MS to promote/require regulatory change towards facilitation of penetration of "grid-connected" CHP, via different measures

Estimated savings: 14 Mtoe. High efficiency CHP will give primary energy savings of at least 10% compared to separate production: new commercial developments and the upgrade of industrial plants provide the best scope for CHP; there is also the possibility of converting heat only boiler houses to CHP plants and to make use of heat currently rejected from power plants. There will be some stock effect according to the future uptake of CHP. The replacement rate of plant and machinery will be high as industry and commerce strive to maintain competitiveness.

Competitiveness impacts/innovation: CHP can be used with almost any fuel source. In reality, because combined cycle gas turbines offer significant efficiency gains over other plant, natural gas has been the fuel of choice. However, there are already security of supply concerns with natural gas. Where CHP can be coupled with other fuel sources such as landfill gas, sewage gas or biomass, it is clearly of benefit to environmental and security of supply aims. CHP plants can also be operated on wood wastes, coal, peat, municipal waste or other secure fuels. However, in some cases the competitiveness of other industries using the same raw materials (e.g. paper and other forest-based industries) could be negatively affected. This possible negative can be compensated by accelerating through R&D policy, the move towards 2nd generation options being used to the full. While grid connected CHP plants can be centrally dispatched, they can also be operated independently in the event of a disruption to central systems. With CHP there are avoided transmission and distribution losses, which otherwise amount to about 30% of the cost of delivered electricity. On-site power eliminates service disruptions caused by grid damage or adjustments to

overloads, and provides the power quality needed in many industrial applications. Grid-connected CHP plant is a proven technology which produces around 10% of Europe's electricity and heat requirements and has a significant growth potential. This will lead to an improved environment and greater economic competitiveness. The successful implementation of a programme to promote all scale CHP should be underpinned by an active Innovation and Research programme to support the demonstration and use of innovative ideas. Regulation, in addition to soft awareness initiatives, may be needed to encourage commitment by industry to implement new and developing technologies on a commercial scale. There is a greater range of proprietary equipment available on the market than previously as new technologies become proven and as a result costs have declined sharply in recent years. The equipment suppliers have a vested interest in supporting research activities because the investment costs, as well as the fuel/electricity cost differential, are significant drivers in developing a cost effective CHP market.

Cost-effectiveness: The cost-effectiveness of CHP facilities are more site specific than for other Distributed Generation projects because of the need to find customers with a need for heat. On-site production avoids transmission and distribution costs and therefore generates less (financial) losses than grid connected CHP (see also action 7). From an investment point of view it is generally easier to find sites for RES and other decentralised generation than for a large central power plant and such units can be brought online much more quickly. Capital exposure and risk is reduced and unnecessary capital expenditure avoided by matching capacity increase with local demand growth. Therefore measure should reduce burdens on investors and developers.

Administrative costs: Provided that the promotional activities taken under this action include a positive attempt to remove barriers and administrative burdens then administrative costs on business are practically zero.

Action 9:	**New CEN standards to regulate (district) heating/cooling systems**

Subcategory: Commission and industry and MS to lead harmonisation effort on adoption of CEN standards, possibly to be incorporated in EU legislation. There is no single CEN standard applicable to District Heating (DH) systems and, arguably, it is not appropriate, or indeed possible, to develop such a single DH standard. This is because DH systems consist of many components i.e., boilers and burners, pumps, network infrastructure (i.e. the pipes of which there are many types and designs), substations, local pipe work and internal building systems to deliver heat to end users. The operation of all these items must be supported with accurate metering and control systems. There are separate standards for all these items but this action 9 recognises the need for DH to be considered holistically by, for example, consolidation into a single "best practice performance standard". This action is only one of many actions that could be taken to promote good quality DH; financial or regulatory incentives could also be envisaged.

Estimated savings: 2 Mtoe. Current Fuel Input for DH is 14,918 ktoe. A new standard could give 20% savings = 2938 ktoe. Some large DH systems have been rehabilitated and are based on modern technology; there are clearly diminishing returns for DH

operators as the DH infrastructure is improved. There is a lack of funding to support investment programmes

Competitiveness impacts/innovation: The major components of a DH system (boiler plant, distribution network - pre-insulated pipes, sub-stations, flow and temperature controls, heat meters, etc) are generally sourced from within the EU. Regulation will require increased metering and controls, the components of which could be supplied by non-EU rivals. However, much of the rehabilitation work necessary in some of the new Member States after the collapse of the command economy has now been completed. A new DH "performance standard" will promote better control of systems which, in turn, will promote innovation and research into both supply and end use efficiency and control, including building standards. Disconnections are the main threat for DH - i.e. customers switching to gas so that the same DH overheads have to be met by fewer and poorer end users thus jeopardising the future commercial viability of the DH plant. This occurs when gas is priced at an artificially low level, e.g. when the DH operator pays the same price for gas as domestic users, in cases where cross subsidisation has not been fully abandoned.

Cost-effectiveness: The market (industry) will take measures to ensure that their actions are cost effective. Plant and equipment which is designed and specified to good engineering standards is more likely to attract finance.

Behavioural change: If 'wasted' heat has to be paid for by individuals then their behaviour will change to ensure that their bills are acceptable. However, they need meter readings and controls to enable them to take conservation action. Consumers will need education to use energy efficiently; this activity would be complimentary to this action. Disconnections have to be discouraged by improving performance of DH.

Action 10:	**Rearrange existing financing mechanisms, including focused organization of clearinghouse-type financing**

Subcategory: Improving access to finance for (smaller scale) energy efficiency projects by extending good practice across the EU.

Estimated savings: 13 Mtoe. Assuming success rates of the UK Carbon Trust scheme can reproduced, it is unlikely that soft loans would lead to more than 10% of the (typically) 30% low cost projects being implemented.

Competitiveness impacts/innovation: This action will improve the market for otherwise marginal energy efficient products. It would thus stimulate a "home market" which would ultimately benefit EU players when exporting, particularly if energy prices would continue to rise or be sustained at present levels. State Aid issues are a major consideration in the UK, for instance. The Carbon Trust model is allowable only for SMEs, when all companies could benefit. Larger Loans could be extended with bigger savings, but these would risk falling foul of competitiveness measures. Additionally the scheme has been of disproportionate benefit to the manufacturers of green hardware, who have been encouraged to use it as part of their marketing. This has effectively made green manufacturers (be they from the EU or elsewhere) more competitive than others. Innovation would be a logical outcome of this action, whether in terms of new products or of innovative financing mechanisms.

As ever, the challenge will be identifying the cut-off between qualifying and non-qualifying technologies, and observing that energy efficiency is always a second consideration in equipment designed to achieve a different function.

Cost-effectiveness: Providing low interest loans do not have to be particularly expensive for the institution setting it up. Arguably administration of the scheme could be a major cost consideration, unless clear and unambiguous guidelines can be readily achieved. Experience shows that this is not insurmountable, particularly if suppliers or ESCO's own marketing expenditure can be leveraged. CT Loans are £10-100k zero interest loans with a three to five year payback, based on energy saving. A typical loan of 60k paying back in 4 years thus saves £15k/yr worth of energy. The cost to CT of this is the equivalent interest payable on the outstanding debt over the period ie approximately £12k (plus the cost of administration). CT believes this to be cost effective. Default rates have been very low, but it is important to remember that these are unsecured loans, so are unlikely to be recovered in the event of business failure. For this reason CT undertake stringent credit checks before issuing these loans. This action provides business with options, and thus must be welcome. The benefit is received disproportionately by SMEs, which is a particularly attractive side effect. This option value is of benefit to businesses. Suitable intermediaries may not be in existence in some Member States, and this service will be a new offering for others. If ESCOs are selected as intermediaries then a new market can potentially be reached. This measure improves the availability of equipment, as it offers an alternative financing stream.

Administrative costs: Recipient businesses in the CT scheme need to subject themselves to credit checks similar to those undertaken for an equivalent loan by a commercial bank. This has not generally been deemed onerous, and complaint rates have been very low, usually only arising when applicants are turned down on the basis of credit checking. Unlike commercial banks (who could increase the lending rate for apparently risky loans) the CT scheme is "digital" (yes or no).

Action 11:	**Increasing the use of energy performance or service contracting financing types (ESCO's)**

Subcategory: Alternative financing measures / access to financing

Estimated savings: Around 6 Mtoe. It is estimated that promoting ESCO type projects can lead to 1% additional energy savings in the private sector. Total energy use in BAU by 2020 for private sectors (Final Energy Demand) is: industry (382 Mtoe) + services (181 Mtoe) = 563 Mtoe. With ESCO's contributing approx. 1% extra savings, the savings potential is < 6 Mtoe. This equals to 0,3% of total primary energy consumption (1885 Mtoe) in 2020.

Competitiveness impacts: Additional energy efficiency projects lead to lower energy costs. However, ESCO's will not focus on the large energy intensive companies that serve the world market, where energy efficiency is important for competitiveness. Therefore the effect on competitiveness of energy users is small. Higher investments in energy efficiency projects will be beneficial for manufacturers of EE equipment, but not necessarily of EU-based firms only.

Cost effectiveness: The start up costs of ESCO type projects may be high before any result is achieved. E.g. high transaction costs for contractual arrangements, the need to carry out detailed energy audits. These costs are made by the ESCOs and should somehow be covered, especially through somewhat longer contractual arrangement with ESCO, for it to be able to recuperate its costs. The ESCO's clients will in the end pay these costs in the form of a longer contractual arrangement with the ESCO. For some (mainly smaller) projects, these costs might not compensate for the energy cost reduction and for these projects conventional financing (own capital or loans) may be more cost-effective. This option will directly affect the cost of energy inputs. ESCO projects have relatively large transaction costs (especially as this is not the firm's core business), but could be reduced by e.g. standardised contracts. However, ESCO projects may be an easier way of getting access to finance. Accreditation/introduction of standardised monitoring and verification procedures present a burden on the ESCO's. However, energy users save much time and effort by working with ESCO's instead of getting information, or more costly financing, etc. themselves. Administrative burden is decreased on SME's, private home owners. This applies also to public authorities. The Berliner Energie Agentur has achieved high energy savings in the building stock for public authorities at net benefit for authorities.

Action 12:	**Producer pays less tax for producing energy efficient goods (US model)**

Subcategory: Access to financing

Estimated savings: 15 MToe.

Competitiveness impacts: A change in incentivisation for producing energy efficient products increases competition within the EU, providing that it is uniformly applied, will give the EU MS a competitive advantage over non EU countries. No evidence exists that it provokes cross border investment flows. Implementation of such a supplier taxation regime is not straight forward in a market in which multinationals are major players. It is anticipated that the most equitable means of levying the taxation is against the national Limited Company in the country of manufacture. Thus Nissan would receive this beneficial fiscal incentive in the same way as a 'true' EU domiciled company like Peugeot. Any alternative interpretation could be deemed anti-competitive. This option would make the EU an attractive manufacturing base, while not necessarily advantaging EU players. Care would need to be taken in implementation to avoid 'Transfer pricing' issues, for example when defining local content vs. assembly operations

Cost effectiveness: Research studies show that the time when people are more likely to invest in energy efficiency is when purchasing and moving into a new home. The stamp duty paid for the majority of house transactions provides an opportunity for rebates, or a fund for grants to encourage owners to put energy efficiency at the top of their priorities in initial alterations and renovation of their homes. Clearly some tax cuts can encourage both the supply and demand side (as with the stamp duty example). Direct supply side fiscal tools for example corporation tax breaks, or exemptions from indirect taxes are relatively cost effective in that they do not cost much to implement. It is easier to directly tax a small number of manufacturers at source than a large number of consumers.

Action 13:	Road pricing

Subcategory: Financial measures/taxation. EU/MS/regional or local authorities to make driving costs more km depending. For instance the car or road tax can be made variable[24]. Also area and congestion charges used for traffic management have a km reduction effect.

Estimated savings: 3 -15 Mtoe. Estimated saving < 1% (only freight) to 4% (all vehicles) of road transport consumption. Up to 10% is mentioned in literature. Local savings due to an area tax can be 10-20%. The effect is related to the level of additional costs. For the USA a study says that a complete flexible insurance premium would mean a mean level of 6 ¢/mile (about 10 eurocent/km). This could result in a travel reduction effect of 10% (based on 1991 figures). In the EU the level of fuel costs is already higher; so the relative increase will be lower. It should be mentioned that the minimum tax level in the EU for gasoline is 0.359 euro/l and for diesel is 0.302 euro/l (about 1.5 - 3 eurocent/km). This is about half of total governmental income from cars (incl. VAT). Another reference suggests that making the road tax and part of registrations tax flexible by 2008 would have a CO_2 reduction effect in 2020 of 6%. But this is with frequent km-use bills and mobi meters. Publications mention that not only the level is important, but also how often users have to pay specific km-related bills (how stronger the relation is between trip and bill, how stronger the energy savings).

Competitiveness impacts: Competitiveness of transporters in EU is not influenced as road transport does not compete world wide. Production of on-board units combined with GPS might stimulate industry. The use of the Galileo satellite navigation system can be interesting in this field. Increase in transport costs can lead to efficiency improvements in logistics.

Cost-effectiveness: Because it regards a shift between taxes for vehicle owners overall costs for the sector do not change (but there is a shift in cost to vehicles driving more km). If the tax level is calculated once a year, the km measurement cost are low € 5 - € 10/y. If the tax level is calculated frequently by using electronic in car equipment (mobi meters), at investment cost of € 100 - € 150/car (excl. mounting), costs are higher. Mobility reduction is normally very cost effective; but additional public transport also has costs. The London area tax has an overall positive financial effect.

Administrative costs: No effect expected.

Behavioural change: More use of public transport.

Action 13a:	**EU to 1) set maximum CO_2 emission standards for different type of cars (absolute, related to specific performance properties, or related to the mean value of all cars sold by one company); 2) negotiate more stringent agreement with car and truck producers**

[24] The 2005 Commission's proposal introducing a CO_2 element in passenger car taxes is a step in this direction (COM(2005) 261: Proposal for a Council Directive on passenger car related taxes).

	after 2008-2009

Subcategory: New EU-legislation and/or more forceful voluntary agreements, accompanied by incentives and by more penalising measures in case of non-respect of voluntary commitments.

Estimated savings: 28 Mtoe. If the level would be 120 g CO_2/km, the effect might be 14% additional saving to the voluntary agreements. If for other vehicles an effect of 5% could be reached, the energy saving will be 28 Mtoe in 2020 (and 33 Mtoe in 2025). The CO_2 emission standard will lead to a substantial reduction in energy use of the transportation sector; depending of the chosen level of 10-30% in 2020. A commission of the European Parliament considers that it is necessary to reduce CO_2 emissions in the medium term more drastically than proposed in the Green Paper (for example, to attain a maximum threshold between 100 and 80 g/km CO_2 by 2020); furthermore in 1996 it was already considered, that 2010 was the deadline for achieving a maximum average emission limit of 120 g/km CO_2 (EP Resolution on the Green Paper on Energy Efficiency[25].

Competitiveness/innovation impacts: Improved efficiency will increase commercial viability. In 2003 the European automobile industry (ACEA) was with 163 g/km already more efficient than JAMA 172 g/km and KAMA 179 g/km. Strong impulse for new technology development and use of better materials. It will give a strong impulse for new technology development and use of better materials.

Cost effectiveness: ACEA and JAMA claim in 2003 that – although the technological potential to achieve 120 g CO_2/km by 2012 is available – the associated costs would be prohibitive. Market distortions and negative effects on the European economy would also be substantial. They believe that equivalent reductions could be achieved in a more cost-efficient manner by using an integrated approach involving the automotive industry and other actors. ACEA nevertheless gave a first indication that a further reduction of 5 % between 2008 and 2012 (equal to a target of about 133 g CO_2/km) could be feasible by improvements in vehicle technologies. According to other studies most options are cost effective if the fuel taxes are taken into account. But without fuel taxes most options are not cost effective. Authoritative independent estimates place the mean extra consumer price for 120 g/km at around 2500 €/car. So the cost effectiveness depends on the chosen level.

Administrative costs: Car producers will have to match with the standard. This will result in additional administrative costs.

Action 13b:	**Vehicle Limitations (engine downsizing or speed limitations)**

Subcategory: EU regulatory action or voluntary agreement

Car speed, car power and car weight are still increasing. Most new cars have a maximum speed of 180-200 km/h, 40% higher than allowed is most EU countries. This results in an inefficient gearbox too. Heavy vehicles already have a speed limiter.

[25] Reference to Resolution on website EP

Estimated savings: 11 Mtoe. Engine downsizing combined with a better gearbox is reported to enable a reduction in energy of with 10%. The saving potential in 2020 is at least 11 Mtoe (increasing to 17 Mtoe in 2025).

Competitiveness impacts: Improved efficiency will increase commercial viability. The action would provide a strong impulse for new technology development and use of better materials.

Cost effectiveness: The engine will be more complex but other part of the car can be made lighter, leading to an overall positive impact.

Administrative costs: A small positive effect can be expected on business operating costs. No additional administrative costs.

Action 13c:	**Increased fuel tax and financial incentives for buying efficient vehicles**

Subcategory: Tax measures.

1) EU and/or Member States could decrease fuel use by making fuel more expensive. By harmonising to some extent the differences in fuel prices between Member States, the incentive of buying cheap fuel across the boarder will decrease.

2) A lower car tax could be introduced when an efficient car is bought or a financial penalty introduced which make the buying of a less efficient (second hand) car much more expensive.

3) A bigger difference in road tax related to the fuel consumption of a car could be introduced, or a fuel economy dependent km charge. Harmonisation (upwards) of tax levels in all EU-countries would close the gap between them (possibly compensated by lowering other car taxes). It could also be stimulated by new EU regulatory action on stimulating the buying of efficient cars. Each Member State may choose their own approach as long as targets for shifts are realised.

Estimated savings: 15 Mtoe. The short term effect of a substantial change induced by the mix of measures described can be 12 Mtoe. If also truck diesel prices were increased this might rise to 15 Mtoe. A car park effect of 4% might increase the effect to 22 Mtoe.

Competitiveness impacts: Improved efficiency will increase commercial viability. It provides an impulse for new fuel-efficient technology development.

Cost effectiveness: Low positive, as the sector will gain from the realised energy savings and not suffer from outside EU competition.

Government budget: The source of the budget is substantially changed. Because the effects of the changes are influenced by the reaction of the citizens, this can result in less tax income.

Administrative costs: No effect on operating or administrative costs of business is expected.

Action 14:	**More energy efficient tyres, by reducing rolling resistance**

Subcategory: EU regulatory action or voluntary agreements and awareness campaigns to the public. Good information system on fuel efficiency of different tyres, maybe more stringent demands for tyres in directive 2001/43/EC.

Estimated savings: 15 Mtoe. The saving by fuel-efficient tyres at the right pressure is estimated for light duty vehicles at 5% (4-6.5%). For trucks it is somewhat lower (4%). The potential energy saving is 15 Mtoe. The Tyre and Rubber manufactures sees 5 energy saving options related to tyres of light-duty vehicles: 1) tyre sizing by the car producer; 2) tyre design (3-4%); 3) tyre inflation pressure maintenance (1-2,5% if always on the right pressure) by good tyre pressure facilities at tank stations and by well informed drivers and road pavement roughness (3-7% increase if road surface is not smooth).

Competitiveness impacts: The main tyre producers are global companies, so know how, which is build up in Europe, is directly used in other countries. But positive effects might occur through innovation in tyre production and in pressure indicators.

Cost effectiveness: The additional costs and the gain of fuel saving are in the same range (so it depends on the situation). Measures taken by car producers might be cost effective. Especially the positive by-effect on road safety makes this a cost effective action as better tyre pressure is positive for road safety.

Administrative costs: There will be some administrative burden on tyre manufacturers.

6.3. Overall assessment and assessment of interaction or overlap between the considered actions

From the above it will be evident that the impact of the various options differs in terms of energy savings they can deliver, their cost-effectiveness, their impact on competitiveness and administrative costs and other effects. It is not possible to establish a definitive ranking of priorities, but nonetheless the following general conclusions should be noted.

For each action on the priority-list the savings potential has been estimated. This saving figure is valid for situations where the chosen action is applied in isolation of other actions.

However, in the Action Plan a large part, or even all, of these actions will be present. This will probably cause interaction, meaning that the sum of the savings potentials of two separate actions is not the same as the combined savings effect. Often this implies an overlap, where the combination provides fewer saving than the two actions apart. However, in some cases two actions reinforce each other's effect (e.g. a combination of labels/information and subsidy/incentive to implement efficient appliances).

In case of interacting actions in the Action Plan care must be taken in calculating the total savings of all actions. The overall savings effect will be lower than the sum of all actions taken separately.

For example, a preliminary analysis shows that Option 4 (extension of the Energy Performance of Buildings Directive) strongly overlaps and interacts with Option 4a (EU wide use of white certificates). It equally shows that Option 2 (Integration of energy efficiency in national school curricula) positively impacts on other awareness raising actions which aim at accelerating the rate of market transformation, such as labeling. Option 3 (inclusion of running costs on labels) and option 14 (labeling of tyres) provide for a reinforcing combination with a number of other actions.

Taking into account the separate policy options overlap the gross estimated aggregate energy savings potential estimate reduces by 26% to 262 Mtoe in year 2020.

This is approximately a 14% potential energy saving on the year 2020 projected primary energy consumption of 1885 Mtoe. However, this does not take fully into account the reinforcement effects of different policy options, especially the positive effects of incentives and enforcement of decisions. In addition Time and budgetary constraint did not allow for a detailed assessment of the reinforcement effects.

The assessment of the possible savings of the 54 options considered during the second phase of the impact assessment process is given in the Final Report. If these were all added up, they would generate savings of some 700 Mtoe. It has to be noted, however, that the overlap between the 54 actions are necessarily much higher than between the 18 actions considered for more in depth analysis, and that implementation barriers are equally higher for many of these actions.

Any of the actions identified in the Action Plan that will be put on the Commission Legislative Work Programme, will be subject to a separate impact assessment.

7. MONITORING AND EVALUATION

The monitoring and evaluation capabilities of public authorities will depend to a large extent on the human and financial resources that can be attributed to these tasks at EU, national, regional and local level. These depend in turn on the final decisions by the College, when these actions are put forward to the co-legislators. They will also depend on the decisions of the co-legislators on the proposals that will be put forward by the Commission during the Action Plan period, which runs from 2007 until 2013.

The Commission will monitor, review and update the Action Plan *inter alia* via the mandatory national Energy Efficiency Action Plans, required under Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC), of which the first are due by July 2007. In addition it will continue monitoring Member States progress and assisting them in implementing existing and new EU regulatory measures, and take any necessary measures at its disposal in cases of infringements.