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Green Paper on Energy Efficiency

Evaluation report on the public consultation

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Introduction

Overview of the consultation on the Green Paper on Energy Efficiency

The Federal Government's Energy Concept contains ambitious goals for reducing energy consumption and increasing energy efficiency. The achievement of these goals is a central prerequisite to the success of the energy transition and the national climate strategy. In recent years, Germany has made progress in decoupling energy consumption from economic output. The package of measures provided in the National Action Plan on Energy Efficiency (NAPE), which the Federal Government has employed to significantly expand and strengthen efficiency policy, has contributed to this development. However, it is also clear that further efforts are needed to make energy efficiency a key pillar of energy policy. In light of this, the Federal Ministry for Economic Affairs and Energy launched a debate on the medium- to long-term development of energy efficiency policy in summer 2016 with the Green Paper on Energy Efficiency. This debate ran in parallel to the discussion process on Electricity 2030. The fundamental premise of the debate is the three-pronged approach of the energy transition presented in the Green Paper on Energy Efficiency and the Electricity 2030 Discussion Paper: Firstly, the demand for energy must be significantly and sustainably reduced in all sectors wherever this makes economic sense (principle of Efficiency First); secondly, renewable energy must be used directly in the various sectors where possible; thirdly, the demand for energy that then remains is covered by the efficient use of renewable electricity within the context of sector coupling.

The Green Paper intentionally contains hypotheses, analyses and key questions without pre-empting concrete proposals for action. The Green Paper underwent extensive public consultation in various formats in the period from 12 August to 31 October 2016: stakeholders were invited to submit written statements (published at https://www.gruenbuch-energieeffizienz.de/de/stellungnahmen/), a series of dialogue events were hosted and an online consultation was also held. Overall, the consultation was characterised by strong and intensive participation by a broad range of stakeholders, with businesses and associations taking part alongside public bodies, research institutes and private citizens. Valuable views and ideas were put forward for all the topics addressed in the Green Paper – the principle of Efficiency First, the further development of the instruments, EU efficiency policy, sector coupling and the efficiency aspects of digitalisation.

At the end of the consultation period, all statements were evaluated in detail. This Evaluation Report describes views and positions put forward in the consultative process, including an overview of the approaches preferred by the stakeholders with regard to the strategic further development of efficiency policy. The report concludes with a list of concrete policy options on the basis of which the discussion process that was launched with the Green Paper on Energy Efficiency will be continued in a White Paper.

1. Overview of the statements received

Written statements

The consultation on the Green Paper attracted a great deal of interest from associations, the *Länder*, businesses, scientific institutions and private citizens. This is reflected in the large number of written statements – 145 in total – which were submitted on the Green Paper on Energy Efficiency. As some statements submitted represent the views of a group of stakeholders (joint submissions), the written statements reflect the views and positions of roughly 200 contributors.

The majority of the written statements were submitted by associations (55 statements in total), followed by businesses (41 statements) and private citizens (21 statements). Another 23 statements were delivered by other institutions or organisations, including public bodies, such as federal ministries and ministries of eight *Länder*. In addition, five research institutes/universities also used the opportunity to submit a written statement.

Broken down by the sector of the contributing party, contributions from energy associations were most frequent (19 statements), while utility companies, commercial associations, and industrial enterprises and associations submitted 18, 16 and 14 statements respectively. Nine statements were delivered by the buildings sector. Additional statements were submitted, in particular, by the energy services sectors as well as by environmental organisations, consumer and employee associations, and professional representative bodies.

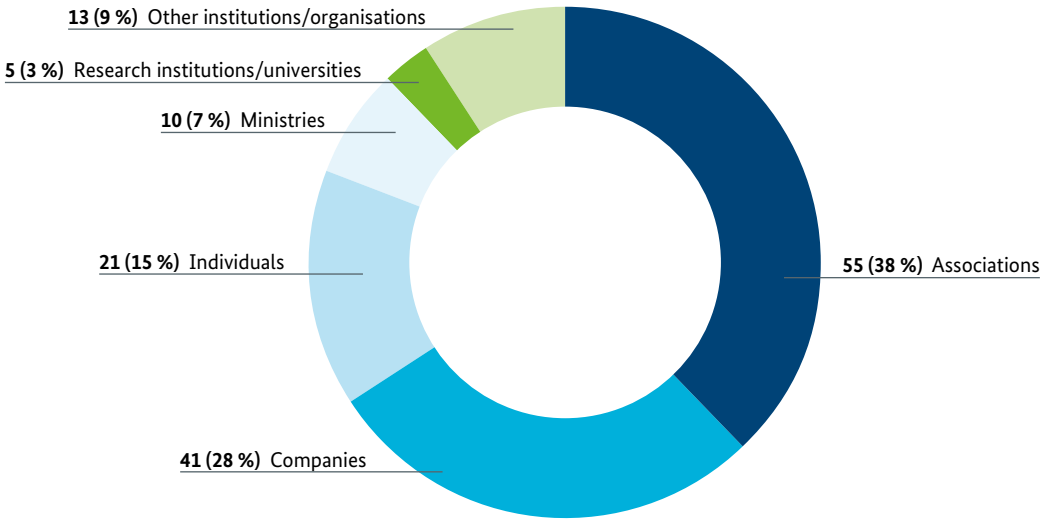
In terms of content, the written statements put emphasis on the topics of Efficiency First, the further development of the set of instruments, and sector coupling. Based on the frequency of comments made on the various topics, the topics of energy efficiency policy at the European level and digitalisation attracted somewhat less interest.

Dialogue events

The second element of the process of consultation involved a discussion on the central aspects of the Green Paper on Energy Efficiency in various event formats, including:

- A joint plenary session of the Energy Transition Platforms on Energy Efficiency and Buildings held on 4 October 2016 in Berlin;
- A dialogue event on 7 October 2016 in Brussels to involve European stakeholders;
- Four regional dialogue events hosted on 29 September 2016 in Dortmund, 6 October 2016 in Hamburg, 11 October 2016 in Stuttgart and 12 October 2016 in Dresden.

Figure 1: Written statements by stakeholder type



Source: BMWi

The dialogue events were public events and over 200 people took part in total. Participants covered the entire gamut of stakeholders, with representatives from associations, businesses, energy agencies, ministries, the political arena and academia, as well as private citizens, contributing to the discussions. Positions and opinions regarding the topics of Efficiency First and the further development of the instruments of energy efficiency policy were particularly diverse and most heavily debated at these events.

Online consultation

Complementing the above, broad use was also made of the instrument of online consultation. Roughly 350 comments on the Green Paper on Energy Efficiency were submitted online. Chapter 5 (digitalisation) received the most comments, followed by chapter 2 (instruments). Hypothesis 4 (further development of the instruments) was the hypothesis that received the most comments by far, followed by hypothesis 13 (opportunities and risks of digitalisation for energy efficiency), hypothesis 14 (shaping the framework conditions for digitalisation) and hypothesis 1 (the principle of Efficiency First). A total of around 24,600 votes were cast across all the topics, with most voting concentrated on hypothesis 1 (the principle of Efficiency First).

2. The Green Paper on Energy Efficiency: opinions and positions

The following section analyses the main opinions and positions regarding the hypotheses put forward in the Green Paper. The information presented refers to the three elements of the process of consultation: written statements and dialogue events (chap. 2.1), as well as the online consultation (chap. 2.2.).

2.1 Evaluation of the written statements and dialogue events

2.1.1 Efficiency First

Hypotheses presented for discussion in the Green Paper:

Hypothesis 1:	**Efficiency First leads to a cost optimisation of the energy transition and strengthens the decarbonisation effect of renewable energies.**
Hypothesis 2:	**The guiding principle of Efficiency First becomes the strategic planning instrument for our energy system.**
Hypothesis 3:	**The creation of a common legal framework for energy efficiency enables the principle of Efficiency First to be anchored in law.**

The hypothesis that energy efficiency must play a bigger role in the delivery of the energy transition was very well received in both the written statements and in the course of the dialogue events. Therefore the principle of Efficiency First is supported in very many statements. For example, one consumer association writes: *"The decisive factor is that the energy transition must be approached more from the demand side and that the actual demand for energy determines the form the energy system takes."* In this context, it is often stressed that a strategy to strengthen energy efficiency must be organised in a way that continues to safeguard security of supply, planning certainty and cost-effectiveness over the entire lifecycle of specific applications. One energy association, for example, states: *"We fully support the Efficiency First premise that 'a unit of energy that can be saved need not be generated, stored or transported' to the extent that the efficiency measures are economically efficient, neutral in terms of the energy source and do not favour a specific technology."* Furthermore, some stakeholders stress that the strengthening of energy efficiency should not weaken commitment to the expansion of renewable energy. Some statements also point out that the goals of energy efficiency and flexibilisation should be pursued with equal priority, stating that the increasing share of renewable energy can only be properly integrated in a more efficient and flexible system.

Implementing the principle of Efficiency First

To implement the principle of Efficiency First, many statements call for the introduction of a standardised target and control indicator to weigh up the "Efficiency" and "Renewable" options, also from an economic perspective. The avoidance costs for the reduction of greenhouse gas emissions are most frequently put forward as the benchmark; alternatively the costs of reducing primary energy consumption are also suggested. In this regard, one commercial association makes the following point: *"The aim must be to make the marginal costs of the various measures and technologies for saving energy and using renewables comparable beyond sectoral boundaries. Two reference values can be used: the costs of primary energy savings or the costs for cutting CO_2."*

As a consequence of applying the principle of Efficiency First, some parties favour a joined-up approach to political instruments that are designed to support energy efficiency and renewables. Looking ahead, the aim would be for example to establish an integrated regulatory framework for auctions for energy conservation and/or energy efficiency and renewable energy. As the statement of one research institute puts it: *"In the market and regulatory design, and with regard to infrastructure measures, demand side measures (consumption reduction and shifting of consumption) and producers should systematically be treated on equal terms from a competition point of view."*

The issue that the public sector must also serve as an example in the application of Efficiency First is also raised. In particular this concerns public sector investment decisions and decisions on the award of contracts. In this regard, one federal ministry writes: *"The energy retrofitting of federal buildings sets a powerful example. In light of this, the energy retrofitting of federal buildings should be stepped up and backed by additional funds, where necessary."*

A number of statements stress that a distinction must be made between the goals of increasing energy efficiency and achieving an absolute reduction in energy consumption. In any event, absolute reductions should not result in adverse effects on economic growth and competitiveness.

Energy efficiency act

Opinions vary with regard to the option of an energy efficiency act. Many statements support the introduction of an energy efficiency act. The key components of such an act should comprise the anchoring of the energy efficiency goals into law and the establishment of the guiding principle of Efficiency First, for instance as a validation clause for planning and approval procedures in the energy sector. In this respect, one employee association writes: *"An energy efficiency act must make energy efficiency policy more reliable and transparent. An act can provide a contextual framework for existing plans, legislation and instruments, and bring these elements together. In particular, the interaction of (sectoral) targets, regulatory law, financial support and, where applicable, a funding mechanism (e.g. the Energy and Climate Fund) can also be regulated in this way."*

Another point which is highlighted is that an energy efficiency act would also have to pursue the goal of removing existing barriers to energy efficiency measures (e.g. in rental law or private use). In addition, some respondents are also in favour of a legal entitlement to support and of the strengthening of official structures.

At the same time, a significant number of the statements received were sceptical of the additional value a new law would have and stressed, in particular, that a legal regulation should not amount to interference with the investment decisions and planning certainty of businesses and private consumers.

Overall, there is broad consensus that the merging of existing specialist statutes in the area of energy efficiency would offer few advantages and should not form part of an energy efficiency act. Within this context, one energy association highlights that: *"The merging of energy efficiency legislation is not always efficient and/or practicable, as the individual action areas (buildings, transport sector, electrical appliances etc.) are too specific to be regulated by an overarching legislative framework. In addition, some areas have their basis in European law. One option for an energy efficiency act that would be more flexible and could potentially offer better prospects for implementation would be an omnibus bill (Artikelgesetz) that specifically targets and removes existing barriers, already addressed in the energy transition platforms, in the individual fields of legislation."*

2.1.2 Further development of the set of instruments

Hypotheses presented for discussion in the Green Paper:

Hypothesis 4:	**The existing instruments of energy efficiency policy have permitted a rise in energy efficiency but must be further developed and supplemented if the long-term objectives are to be reached.**
Hypothesis 5:	**Market solutions and new services will accelerate the increase in energy efficiency and make an important contribution to implementing the energy transition.**

As mentioned earlier, during the consultation process stakeholders took a keen interest in the debate on the further development of the instruments of energy efficiency policy. In this context, it is repeatedly stressed that low energy prices and rebound effects hamper efficiency improvements and reductions in consumption, and therefore make it necessary to develop the instruments further. Beyond the further development of existing approaches, the Green Paper on Energy Efficiency also put forward for discussion the introduction of price measures, quantitative measures and measures under regulatory law as a qualitative supplement to the set of instruments. The opinions presented during the consultation vary in this regard.

Supplementing the set of instruments

Many stakeholders see the introduction of new instrument categories as vital and strongly support this approach. Against this backdrop, attention is drawn to the possibility of strengthening pricing incentives to improve energy efficiency – such as in the form of a CO_2 tax, for instance. As an alternative to the CO_2 tax, other stakeholders are in favour of strengthening quantitative measures with the

extension of emissions trading to other sectors. The reasons cited for the use of these instruments include, in particular, the technological neutrality of the steering effect, the reduction of price swings, the need to establish a stable framework for investment in efficiency, and the general goal of internalising external costs. Similarly, many stakeholders point out that carbon pricing is the most effective way to guarantee the equal treatment of energy sources in the market and thereby to create fair conditions of competition for the integration of renewables. In a joint statement a number of energy utilities stress that: *"Instead of a blanket tax scheme for energy sources, the carbon pricing approach should be pursued further and improved upon. The possibility of including other sectors in the European emissions trading system (ETS) should be examined; where appropriate, energy taxes could also be aligned more strongly to CO_2 emissions."*

The use of fiscal incentives to promote the energy retrofitting of buildings is thought to offer significant potential, and many stakeholders believe a fresh attempt should be made to bring this about. As one energy association writes in its statement: *"The further development of this mix of measures was already initiated with the National Action Plan on Energy Efficiency (NAPE). However, the proposed and potentially effective instrument of fiscal incentives to promote the energy retrofitting of buildings has been ignored so far. This has the potential to stimulate considerable investment in energy efficiency, particularly in owner-occupied housing."* Other approaches, such as the greater use of energy management systems in the SME sector, for instance, or the strengthening of competitive elements along the lines of the already launched STEP up! programme are also mentioned.

The idea of supplementing the set of instruments with regulatory measures – such as in the buildings sector, for appliances, or with regard to fleet consumption – also proved quite popular in some statements, albeit less so than carbon pricing approaches. For example, one environmental organisation calls for *"regulatory law to address both the existing building stock and new buildings if we are to reach our climate goals."*

At the same time, a number of other stakeholders are sceptical of new policy instruments, stating that improvements in energy efficiency are in principle also feasible even if energy prices are low. The need to avoid the overregulation of market activity, any weakening of competitiveness and negative distributional effects on individual segments of the population is also highlighted. In addition, industrial associations and enterprises emphasise that it is essential to avoid regulatory duplication with the European emissions trading system. As one commercial association says in its statement: *"For energy-intensive industries like steel, low energy prices are a decisive factor in staying competitive. Changes to the energy and electricity tax or the introduction of new levies are just as burdensome in this respect as a quota system and thereby the increased cost of energy consumption from the obligation to hold allowances."*

Overall, there is a tendency to favour approaches which, like the price and quantitative measures, enable improvements in efficiency and absolute reductions in consumption while guaranteeing the economic viability and technological neutrality of efficiency investments. Many statements also consider the further development of the set of instruments to be a fundamental prerequisite for a sector coupling design that serves the energy transition (see Section 2.4).

Continued development of existing approaches

In the course of the dialogue events, and in many written statements, there is a clear opinion that the current mix of instruments – summarised in the National Action Plan on Energy Efficiency as the "Provide support – Demand action – Supply information" triad – would appear to be appropriate in principle. At the same time, however, existing approaches can and must be optimised further, such as in the area of energy management systems. In addition, it is repeatedly argued that a broad and user-specific range of support programmes to increase energy efficiency already exists, but that potential recipients of support find it challenging to identify the offers that fit their particular profile. Therefore, the complexity and administrative burden should be reduced – e. g. by introducing a one-stop-shop – and the support programmes and public awareness campaigns of the various bodies should be better aligned with one another and communicated.

Further to this, many stakeholders emphasise the need for additional stimuli to support the sustainable development of the energy services market. As already discussed in the context of an energy efficiency act in Section 2.1, this should generally involve the removal of legal barriers, such as in procurement law and tenancy law. In addition, contributors feel that the quality of energy advisory services, in particular, but also the quality of the implementation of efficiency measures needs further improvement. Specific measures

put forward include a skills initiative or better licensing criteria for energy consultants.

2.1.3 Energy efficiency policy at a European level

Hypotheses presented for discussion in the Green Paper:

Hypothesis 6: **An effective energy saving policy at a European level works best with clear targets.**

Hypothesis 7: **The greater use of EU Community instruments supports and strengthens the national energy efficiency instruments.**

With regard to the European framework for energy efficiency policy, the majority of the written statements submitted support a binding European energy efficiency target. The number of stakeholders in favour of raising the EU target to at least 30% for 2030 are also in the majority. At the same time, it is repeatedly argued that the national implementation of existing EU requirements can be improved through effective market monitoring and enforcement. Many stakeholders are also in favour of retaining the annual saving obligations set out in the European Energy Efficiency Directive (Art. 7). In this context, Member States should continue to be able to choose the implementation measures. As one environmental organisation comments: *"Article 7, a core provision of the Efficiency Directive, must be extended after 2020. This ensures commitment with regard to the targets and planning certainty for effective implementation in the Member States."* Within this context, individual stakeholders are also in favour of assessing the introduction of an efficiency obligation scheme in Germany.

Of the European measures, however, the Ecodesign Directive is most frequently cited as a positive example, also at the dialogue events. Many statements advocate the strengthening of regulations for products (top-runner approach). One research institute, for example, recommends that: *"The Ecodesign Directive should be extended to other technologies and the highest efficiency categories should become standard for all technologies as quickly as possible."* Only relatively few respondents are categorically against the greater use of European measures. As one commercial association, for example, puts it: *"The current use of EU instruments, such as for the labelling requirement, is sufficient. One-to-one implementation suffices without additional national measures."* On the other hand, during the course of the dialogue events it was repeatedly stated that, at the EU level, it is often only possible to play to the level of the lowest common denominator, so that individual Member States and regions can and must play a pioneering role.

In response to the question as to which instruments used in Germany would be particularly suitable for transfer to the EU level so as to stimulate energy savings throughout Europe, the energy efficiency networks approach was cited on several occasions. The Federal Government made this a priority topic of its G7 presidency as early as 2016. According to one commercial association, energy efficiency networks are *"an effective and market-oriented 'bottom-up' instrument, allowing industry to be the decision-makers with their knowledge and expertise"*. In addition, the importance of loan support from the KfW, Germany's state-owned development bank, is also repeatedly mentioned. According to one energy utility, loan support from the KfW is *"one of the most successful instruments"* and can *"encourage additional investment in efficiency technologies, particularly in countries with a weakened banking and credit system"*.

2.1.4 Sector coupling

Hypotheses presented for discussion in the Green Paper:

Hypothesis 8: **The decarbonisation of the sectors of private households, trade, commerce and services, industry and transport requires the use of electricity from CO_2-free, renewable sources.**

Hypothesis 9: **For sector coupling, primarily those technologies are used which efficiently convert electricity into heat, cooling or propulsion and therefore which replace as large an amount of fossil fuels as possible with the smallest amount of renewable power.**

Hypothesis 10: Sector coupling offers cost-effective flexibility on the demand side to balance out the fluctuating supply of power from renewable energies.

Hypothesis 11: Each sector makes an appropriate contribution to the costs of decarbonisation

The central role of sector coupling in the energy transition is confirmed by many consultation participants in the written statements, with sector coupling considered as necessary to move the energy transition forward as effectively and economically as possible. As one commercial association highlights: *"Sector coupling signals the central challenge of an integrated and comprehensive energy transition."*

The primary objective of sector coupling, namely the decarbonisation of the heating and transport sectors – i.e. the substitution of fossil fuels with the efficient use of renewable electricity – is also confirmed by the majority of the statements that deal with sector coupling. Similarly, the need for sector coupling to also complement and support the other decarbonisation options of the energy transition triad – increased energy efficiency and the direct use of other renewable energy sources – is also confirmed.

Many participants in the consultation stress the importance of using energy-efficient technologies, particularly in sector coupling, in order to keep the necessary quantities of electricity, and thereby the costs for the energy system, to a minimum. They underline the key role of energy efficiency in sector coupling and are in favour of giving greater attention to energy efficiency in the design of the framework conditions (Efficiency First). In their view, the reduction of the total costs of the energy transition for the economy and final consumers' requirements with regard to the energy system are central criteria in the implementation of sector coupling. As a matter of principle, the most cost-effective option of avoiding CO_2 should be used for the individual field of application.

Framework conditions to support sector coupling

A great many stakeholders are in favour of improving the framework conditions for the efficient use of electricity from renewable sources in the heating and transport sectors. Technological neutrality, the costs of the use of electricity, and energy- and cost-efficiency should play a central role when developing the instruments to promote sector coupling. In this regard, one industry association writes: *"Also in the course of the further development of sector coupling overall, it is essential to opt for an attractive, technology-neutral, efficiency-based and cost-effective approach that leaves market forces dictate solutions and is not prematurely committed solely to individual technologies determined by the state."*

In the course of the debate on the issue of sector coupling, stakeholders at the dialogue events most frequently commented that the energy transition should not only be understood to mean an electricity transition but that the focus should also be on the heating and transport sectors. Following this principle, many participants advocate a broader debate on the topic of sector coupling and the discussion of different technologies, stating that the entire energy chain needs to be considered – from generation (including the expansion of RES electricity generation), distribution and storage (including the electricity, heating and gas infrastructure) through to the final use (including product efficiency) of energy. Existing structures (e.g. the infrastructure) and requirements (e.g. user needs, security of supply) should be considered when assessing the various design options and developed further where appropriate. Wherever lock-in effects occur that are not compatible with the goals of the Energy Concept, the aim should be to overcome these effects and support alternatives.

The decarbonisation options and technologies that are used in the various areas of application should be the result of fair competition between the technologies. Individual rules, such as privileges or exemptions for certain applications, are seen to lack transparency and hamper efforts to optimise the energy system. While some of the feedback from specialist associations describes the need for specific support for individual technologies, the majority of consultation participants are critical of individual areas receiving

a privileged status. As one commercial association writes: *"Instead of special rules to incentivise the use of individual technologies, [...] what we need is more confidence in the innovative capacity of the market."*

In both the statements and at the dialogue events, the participants in the consultation proposed numerous ways to promote sector coupling. These are primarily approaches that improve the competitive conditions of sector coupling technologies compared with technologies that use fossil fuels. They say that in the various use cases, all technologies should have the same market access and a level playing field. Any state support of specific technologies should be explicit and provided through transparent programmes, and not be hidden in privileges with regard to surcharges, fees or taxes.

A review of the system of state-induced price components (levies, surcharges and taxes) which currently applies in the energy sector is cited in many statements as central to improving the competitive conditions for sector coupling. One commercial association writes: *"The reform of surcharges and levies is an important building block towards improving the competitive conditions between renewable electricity and fossil fuels and ensuring the economic viability of sector coupling measures."* At the dialogue events also, participants were in favour of harmonising the existing taxes and levies for all sources of energy, balancing out price differences, and factoring in actual costs in order to establish a level playing field for all energy sources and technologies. At the dialogue events, reference was frequently made to a carbon tax as an overarching instrument that would support sector coupling with renewable electricity. The relief of renewable electricity from the tax and levy burden, and own consumption of locally produced electricity were hotly debated issues.

In a system without privileges, appropriate pricing incentives are a central element of technological neutrality. Essentially, stakeholders decide which technology and which use of energy is optimal for them on the basis of the price signals for electricity and fuel. To ensure that such decisions result in a low-cost and sustainable energy system from the point of view of the economy, distortions from price components should be removed and external costs should be internalised, e. g. through carbon pricing. Many participants in the consultation believe this would make renewable electricity more attractive and provide incentives for the efficient use of energy. In addition, this approach can ensure that the various sectors make an appropriate contribution to the costs of the energy transition, as demanded by several participants in the consultation.

When it comes to addressing how the price elements imposed by the state should be restructured, the views of the participants in the consultation are divided. Measures proposed include fair competitive conditions between the sectors on the basis of consistent carbon pricing, the extension of emissions trading to other sectors, the extension of the assessment basis for the EEG surcharge, the reduction of electricity tax, partly in combination with a simultaneous increase in energy taxes, and dynamic individual price components.

The participants in the consultation also put forward a variety of suggestions with regard to other (additional) instruments. The suggestions range from the continued development of regulatory requirements (aside from the Ecodesign Directive, CO_2 standards of passenger cars are cited as an additional technology-neutral instrument) to funding measures and the improvement of information and advice. Many written statements and several participants in the dialogue events point out that sector coupling technologies should be improved further and prepared for the market through the promotion of research and development. Some stakeholders, however, are explicitly against the introduction of new support instruments or regulatory requirements. Overall, the regulatory framework should be organised in such a way that business models can be developed for technologies that are economically efficient.

Various stakeholders also see the need for a greater focus on the infrastructure required for sector coupling, citing, inter alia, the expansion and further development of heat networks and the supply infrastructure needed for electricity-based mobility (e. g. heat networks, charging stations, distribution grids, and potentially also bunkers for power-to-gas products).

Sector coupling and flexibility

A great many participants in the consultation point out that many sector coupling technologies can also be flexible consumers and can therefore contribute to the provision of flexibility for the electricity market. In this way, sector coupling can both increase the efficient use of renewable energy in the heating and transport sectors and also support the integration of renewables in the electricity market by tapping into flexibility potential. According to the participants,

sector coupling constitutes the efficient use of renewable electricity with the goal of replacing fossil fuels, and not primarily the provision of flexibility. To ensure that relevant lock-in effects do not result in the long-term inefficient use of electricity and an over-large energy system, it is also essential to ensure balanced incentives for the efficient use of electricity in this context. As one environmental organisation puts it: *"Sector coupling should not be about using 'excess' electricity for other sectors but about seeing whether electricity can cover this reduced consumption better and more efficiently once efficiency potential has been fully exploited in the particular field of application."*

It is important to improve upon the system of levies, surcharges and taxes, and open up competition between flexibility options to various users also with a mind to unlocking the potential of sector coupling to provide flexibility in a cost-effective manner. Price incentives and the removal of regulatory barriers then allow consumers to offer flexibility in the electricity market 2.0.

The issue of sector coupling and flexibility is also addressed by trends 1 and 2 in the Electricity 2030 process launched by the Federal Ministry for Economic Affairs and Energy. Specific suggestions for flexibilisation have particularly been put forward, and will be discussed, in this context.

2.1.5 Digitalisation

Hypotheses presented for discussion in the Green Paper:

Hypothesis 12: **Digitalisation opens up new possibilities for added value services and efficiency services.**

Hypothesis 13: **Digitalisation and the use of renewable energies alter the cost structure of energy generation – a long-term efficiency strategy must take this into consideration.**

Hypothesis 14: **Digitalisation contributes to balancing the demand for energy with decentralised and volatile generation of energy.**

In many written statements and in the discussions held during the dialogue events, digitalisation is considered a central factor to the successful implementation of the energy transition. For example, innovative businesses are already benefitting in money and energy terms from digital energy management services or optimised energy-using products and services. In general, a number of participants stress that digitalisation boosts the energy services market and offers new ways of capturing and evaluating actual energy consumption at all times, as well as ways to measure the energy efficiency improvements achieved and to link incentives to these energy and carbon savings. It is also pointed out that the decentralized control of energy consumers and producers can facilitate the energy transition and enable greater flexibility and efficiency.

A central line of discussion in the context of the effects of digitalisation on the energy services market focussed on new business models, comprising, for example, flat-rate models for electricity purchases or the use of services instead of the purchase of products. Participants found that digitalisation, and the opportunities it offers to remotely control and optimise a large number of small installations in a cost-effective manner, can give rise to new services and offerings. For example, customers would no longer need to make individual large investments in new heating systems, for instance. Instead they could pay a monthly fee for a service, such as "21 degrees room temperature", to the

owner and operator. The establishment of these digital business models decouples motivation for energy saving from the user. Other new business models included self-learning, and optionally self-optimising, smart home systems (e.g. a thermostat that learns). Further to this, the participants highlight the potential of decentralised contract and billing models, such as for the direct settlement of generation and consumption without the need for an intermediary (e.g. models based on blockchain approaches).

Digitalisation: opportunities and risks for energy efficiency

Overall, in the course of the consultation process it was argued that digitalisation presents both opportunities (e.g. through new added-value services, support approaches and marketing models) and risks (e.g. flat-rate or similar offerings for electricity purchases) for energy efficiency, and that the widespread use of IT ("Internet of things"") and continuous on-grid systems results in considerable additional electricity consumption. As one industrial association states: *"With new services based, for example, on continuous consumption metering, digitalisation offers valuable contributions to the continued improvement of energy efficiency, particularly also in the heating sector (buildings). This also presents new ways to better gauge the energy efficiency improvements actually achieved (e.g. with the "Energy Savings Meter" project) and to align the amount of funding more to the energy and carbon savings achieved as a result of such measures [...]."* On the other hand one environmental organisation stresses that: *"Despite all the advantages, it is, however, important to remember that digitalisation is a means, not an end."*

The distribution of smart meters, for example, was discussed at length as this is considered a key prerequisite for diverse digital services given that smart meters provide up-to-date energy consumption data. Many statements stress that digital instrumentation and control technology supports the development of new digital services and an electricity market geared towards efficiency and flexibility. Furthermore, digitalisation facilitates marketing models that can unlock energy efficiency potential in a flexible, decentralised and customised manner. However, it is also noted that digitalisation should not be considered an end in itself; instead, the costs and benefits of new technologies need to be assessed carefully.

Above all, participants in the consultation see most opportunities for digitalisation in the heating sector as this is where particularly large energy efficiency potential is expected. In addition, it is also stressed that digitalisation not only enables control and optimisation but also automation. While in their statements some respondents are in favour of harnessing small areas of potential also in private households (enabled by increasing consumption transparency using digital electricity and heat meters and digital saving services based on this information), other participants in the consultation are of the opinion that professional users primarily offer the greatest potential. In particular it is argued that the specific benefits of digitalisation are not yet to be had in the private household sector and that digital energy service offerings for private households are still quite rare.

Framework conditions for digitalisation that serves the energy transition

Numerous participants in the consultation are of the opinion that an energy industry framework, such as for balancing, measuring and market processes, enables the use of digital systems and that a level playing field should be established for all businesses in this context. The general perception is that interfaces and protocols are required for a common communication infrastructure. Common standards, to be developed by central authorities, in the sense of a single "lingua electronica" are needed to this end. Participants claim this is the only way to make the broad range of individual systems and one-off solutions useful and compatible in a way that serves the entire system, and in this way establish them as a business model. On the other hand, no consensus is reached as to whether state institutions should develop and define the standards and the framework of a "lingua electronica" or whether this should be the responsibility of other central players, such as (national, European or international) standardisation organisations, for instance.

Another important line of discussion in the contributions to the consultation process focussed on the area of IT security and the resilience of digital systems and infrastructures, as well as the aspects of (user) trust, data protection and data security. The opinion is often voiced that high data protection standards and data security are the basis for trust and acceptance, and are therefore essential for the development of workable business models and techniques that customers accept. In addition, the importance of data transparency, responsibility and sovereignty when handling data is also underlined. It is a widely shared opinion

that IT security and data protection are key prerequisites for the acceptance and operability of digital systems. For example, one consumer association writes: *"From a consumer's perspective, it is important that standards guarantee a high degree of data protection and data security. In addition, smart home and other digital systems must be interoperable."* At the same time, it is pointed out that this challenge applies to all digital systems and not solely to the area of energy and energy efficiency. IT security and data protection are a necessary, though not sufficient, condition for the successful digitalisation of energy.

In addition, many written statements and stakeholders during the dialogue events stress that the customer benefit must be at the forefront of digitalisation. In particular, the cost-benefit ratio is cited as a central factor in opting for or against a digitalisation product or service. In this context, one energy agency, for example, comments that: *"...With regard to the marketability of new services, it is important to bear in mind that the technical feasibility/availability of a service alone is not an adequate criterion for its prospects of success on the market. Rather, the customer focus, i.e. the primacy of the specific customer benefit, should be emphasised."* In addition, it is also argued that consumers should be allowed to participate more so they can benefit from the opportunities presented by the new energy system (e.g. being involved as "prosumers").

2.1.6 Summary: hypotheses and stakeholder sentiment

The table below provides an overview of the degree of support which the stakeholders expressed in both their written statements and at the dialogue events for the hypotheses presented in the Green Paper on Energy Efficiency. Strong support is found for the establishment of a common legal framework, the need for the further development of the instruments of efficiency policy, and the potential of digitalisation. The rankings in the table below, however, are only a simplified reflection of sentiment with regard to the hypotheses. This naturally cannot fully reproduce the variety of topics and the nuanced arguments of the various stakeholders.

Figure 2: Sentiment for and against the hypotheses presented in the Green Paper on Energy Efficiency

Hypothesis		Support (1 = low, 5 = high)
1.	Efficiency First leads to a cost optimisation of the energy transition and strengthens the decarbonisation effect of renewable energies.	**4**
2.	The guiding principle of Efficiency First becomes the strategic planning instrument for our energy system.	**3**
3.	The creation of a common legal framework for energy efficiency enables the principle of Efficiency First to be anchored in law.	**4**
4.	The existing instruments of energy efficiency policy have permitted a rise in energy efficiency but must be further developed and supplemented if the long-term objectives are to be reached.	**4**
5.	Market solutions and new services will accelerate the increase in energy efficiency and make an important contribution to implementing the energy transition.	**3**
6.	An effective energy saving policy at a European level works best with clear targets.	**4**
7.	The greater use of EU Community instruments supports and strengthens the national energy efficiency instruments.	**3**
8.	The decarbonisation of the sectors of private households, trade, commerce and services, industry and transport requires the use of electricity from CO_2-free, renewable sources.	**4**
9.	For sector coupling, primarily those technologies are used which efficiently convert electricity into heat, cooling or propulsion and therefore which replace as large an amount of fossil fuels as possible with the smallest amount of renewable power.	**3**
10.	Sector coupling offers cost-effective flexibility on the demand side to balance out the fluctuating supply of power from renewable energies.	**4**
11.	Each sector makes an appropriate contribution to the costs of decarbonisation.	**3**
12.	Digitalisation opens up new possibilities for added value services and efficiency services.	**5**
13.	Digitalisation and the use of renewable energies alter the cost structure of energy generation – a long-term efficiency strategy must take this into consideration.	**3**
14.	Digitalisation contributes to balancing the demand for energy with a decentralised and volatile generation of energy.	**4**

2.2 Evaluation of the online consultation

The consultation on the Green Paper on Energy Efficiency was complemented by an interactive online consultation. At www.gruenbuch-energieeffizienz.de all members of the public had the opportunity to assess the hypotheses in the Green Paper and enter their own comments. Roughly 24,600 assessments (averaging around 1,750 assessments per hypothesis) and roughly 350 comments were submitted in total. It can therefore be concluded that the online consultation was also very well received, even though the results cannot be interpreted as representative of the entire population. The following sentiment can be gauged from the online consultation:

In the online assessment, hypotheses 8 (sector coupling as a decarbonisation option), 6 (EU goals), 9 (energy-efficient sector coupling) and 7 (EU instruments) received the highest percentage of support. Proportionally, least support went to hypotheses 12 (digitalisation invigorates the energy services market), 13 (opportunities/risks of digitalisation for energy efficiency), 4 (further development of the instruments), 3 (efficiency act worthwhile), 14 (shaping the framework for digitalisation) and 5 (promotion of the energy services market).

Thematic summary of the comments

A summary of topics which were frequently commented upon is provided below. Alongside support for the principle of Efficiency First, the comments also contain opposing opinions: for example the benefit of energy efficiency is questioned, with respondents stating that electricity from renewable sources can be used in unlimited quantities, and therefore energy efficiency should not be a primary goal of energy policy. Opinions are divided when it comes to price control instruments, but there is consensus on the need to ensure fair burden-sharing and to prevent an excessive burden on low-earners if such approaches are pursued. The

online comments also contained feedback that subsidies for fossil fuels should be abolished.

There is criticism of insufficient compliance with the Energy Saving Ordinance. Respondents state that this applies to new buildings as well, but in particular to the modernisation of existing buildings where enormous potential for energy saving has been wasted. Irrespective of the challenges with regard to enforcement, respondents stated that numerous – and sometimes quite complex – regulations were already in place. Rather than adding new ordinances or laws, the aim should be to streamline the current set of regulations. Furthermore, it was added that far more should be invested in energy efficiency education and awareness-raising.

Several comments state that, depending on how sector coupling is organised, it might not be energy- or cost-effective. The decentralised supply of energy from renewable sources is put forward as an alternative approach. Another point of criticism is that virtually no attention is paid to CHP plants in the Green Paper.

With regard to flexibility options in the face of a high percentage of renewables in the electricity mix, the need for storage capacities is highlighted, as energy consumers (public citizens) cannot arbitrarily gear their consumption to the availability of electricity. In addition, respondents stress that flexibility must also be demanded of industry, and not only of private citizens, and state that the role of industry is not sufficiently addressed in the Green Paper.

As regards the digitalisation of the energy supply in the home (smart home, smart meter), respondents' main source of criticism is that satisfactory solutions are not yet available to address the challenges surrounding data protection and IT security (creation of user profiles, access to information on user's private life, illicit use and sabotage). Respondents repeatedly call for the installation of smart meters to be on a voluntarily basis. Around one half of comments concerning digitalisation are critical of the current regulatory framework for the rollout of smart meters.

3. Policy options for a White Paper on Energy Efficiency

Based on the evaluation of the consultation process on the Green Paper on Energy Efficiency described in this report, the Federal Ministry for Economic Affairs and Energy sees the following policy options which will be addressed in a White Paper, and therefore in a medium- to long-term energy efficiency strategy. The central principles are put forward by the three-pronged approach of the energy transition as presented in the Green Paper on Energy Efficiency and the Electricity 2030 Discussion Paper (see box).

The energy transition: a three-pronged approach

Principles for the efficient use of electricity: Electricity is a valuable and scarce commodity. Macro-economic and micro-economic cost efficiency must be considered in the triad of energy efficiency, the direct use of renewable energy, and the use of electricity derived from renewable sources. The following principles can be identified for this triad:

First: The demand for energy must be significantly and permanently reduced in all sectors: Efficiency First! Germany has set itself ambitious climate goals. It follows that the use of fossil fuels in the form of oil, coal and gas will be reduced to a minimum. The fastest and direct route to achieving these goals is to reduce our energy consumption by investing in efficiency technologies. Renewables will cover the remaining energy needs to the greatest extent.

Second: Direct use of renewable energy. Technologies such as solar thermal, geothermal or biomass use renewable energy directly without converting it into electricity. Solar thermal and geothermal technologies are used particularly for heating and air conditioning in buildings and for warm water supply. If the use of such technologies is not feasible for economic or other reasons, renewable electricity is used. Biomass plays an important role particularly in industry (e.g. in production processes) and in the transport sector (e.g. aviation). This is also true of solid biomass for existing buildings. Biomass is a universal yet scarce source of energy. Therefore it is specifically used wherever it is not feasible to use solar thermal or geothermal technologies and wind and solar power.

Third: Renewable electricity is used efficiently for the heating, transport and industry sectors (sector coupling). The energy needs that remain for economic or other reasons despite efficiency measures and the direct use of renewable energy are covered by wind and sun - primarily in technologies that replace a large amount of fossil fuels with a small amount of electricity (such as in heat pumps and electric vehicles) or convert the electricity to other forms of energy, such as hydrogen (power-to-gas).

Policy options for Efficiency First:

1. **Enshrine the principle of Efficiency First:** To enshrine the principle of Efficiency First, the set of rules on energy policy must be systematically examined for potential to improve energy efficiency and to identify existing barriers and disincentives, and adapted where this contributes to a low-cost, secure and environmentally friendly energy supply overall. In this context, it is important to examine whether the set of rules which currently focuses heavily on the supply side needs to be supplemented with demand side elements. This can also make a key contribution to strengthening the market for energy services. Beyond the ongoing consolidation of the Energy Conservation Act, the Energy Saving Ordinance and the Renewable Energies Heat Act, an energy efficiency act with binding goals on the basis of the Energy Concept, guiding principles and the removal of legal barriers, could create a suitable framework. The intention is not to simply merge specialist statutes and intervene in the investment decisions of private consumers and businesses.

2. **Lay methodological foundations:** The operationalisation of the principle of Efficiency First calls for appropriate methodological foundations. In particular, standardised assessment criteria are required to assess and weigh up the options "efficiency/savings" and "addition of new generation, storage and grid capacities" from an economic perspective. Planning and control processes in the energy transition should have a more solid economic foundation on this basis.

3. **Strengthen the exemplary role of the public sector:** The public sector sets an example in the implementation of the principle of Efficiency First. In this regard, there is still conflict with the principle of economic efficiency enshrined in the budget regulations of the Federal Government and the *Länder*. To move forward on this, potential for efficiency improvements, inter alia, in federally owned properties should be harnessed more systematically than before – for example in the course of the implementation of roadmaps for energy upgrades – with use also made of contracting services where this makes business sense. In addition, talks should also be held with the *Länder*.

4. **Coordinate support frameworks for efficiency and renewables:** The long-term goal is a well-coordinated and compatible framework for efficiency and renewables. On completion of the pilot phase of the auction-based model for efficiency measures, an assessment will be conducted to determine whether the current support frameworks for efficiency and renewables can be harmonised and transformed into an interrelated support approach. Initial steps towards the closer dovetailing of existing support programmes are being prepared within the framework of the support strategy of the Federal Ministry for Economic Affairs and Energy (see option for action 5).

Policy options for the further development of the set of instruments:

5. **Develop the set of efficiency instruments further:** National and European targets to reduce energy consumption can only be reached by continued improvements in energy efficiency. Therefore the efficiency instruments and measures must be developed further. A reliable framework that ensures the sustainable reduction in demand for energy and consistency with energy policy regulations for the generation and demand side and the energy infrastructure is of paramount importance. Against the backdrop of the evaluation of the consultation, price measures or quantitative measures appear appropriate and will therefore be examined by the Federal Ministry for Economic Affairs and Energy.

   Further to this, the existing set of efficiency instruments must be made more effective. The range of support offerings and processes must be better integrated and more result- and recipient-oriented. The Federal Ministry for Economic Affairs and Energy is already making preparations for such a support strategy. In addition, advisory services and investment support measures must be even more closely interlinked and knowledge and expertise in businesses strengthened by the establishment of energy management systems. Furthermore, the aim must be to strengthen competitive elements in the promotion of efficiency.

6. **Develop advisory services further:** The availability of reliable information is key for consumers to have the tools to make the right choice when it comes to worthwhile and effective efficiency measures. A wide range of advisory services is already available in Germany to this end. The challenge for further optimisation lies in communicating the goals and content of the advice more clearly and in increasing the transparency of the advisory service provided. The Federal Ministry for Economic Affairs and Energy will present an advisory strategy to this end.

7. **Enable tax incentives for building modernisation:** Tax incentives can be a way to provide very targeted and effective additional stimulus to encourage the necessary increase in building energy upgrades. The Federal Government already pursued this approach within the framework of the National Action Plan on Energy Efficiency, but a consensus could not be reached with the *Länder*. In principle the introduction of tax incentives is still desirable. At the same time, however, uncertainty surrounding the future form funding policy will take can fuel a wait-and-see attitude among investors and therefore be counterproductive. Therefore, we need a strong and reliable understanding between the Federal Government and the *Länder* before making another attempt to introduce fiscal incentives for energy upgrades on buildings.

Policy options for energy efficiency policy at the European level:

8. **Move forward with energy efficiency at the EU level:** Efficiency goals and instruments at the European level strongly influence national energy efficiency policy. This is both desirable and makes sense given that a climate-friendly, secure and affordable supply of energy needs a strong European framework. Therefore in current negotiations on the legislative package for the 2020–2030 decade ("Clean Energy for All Europeans"), the Federal Government will work towards the stronger expansion of the market for energy services across Europe and the creation of equal conditions of competition for energy consumers in all EU countries. To this end, we support a binding EU energy efficiency target of 30% for 2030 and ambitious updates to central efficiency regulations in the EU.

Policy options for sector coupling:

9. **Identify the scope for sector coupling, tap potential for energy efficiency and the direct use of renewables:** Sector coupling is a necessary instrument on our path to a largely decarbonised supply of energy. At the same time, the triad of the energy transition makes it clear that a cost-optimised energy system unlocks potential for energy efficiency and also uses renewable energy directly in addition to sector coupling. Particularly in the heating and transport sectors, therefore, we must significantly redouble our efforts to use renewables directly, such as in the context of solar thermal and geothermal.

10. **Set price signals, encourage market-driven sector coupling:** In today's regulatory framework, the efficient use of renewable electricity in the transport, buildings and industry sector is not economically viable in many cases due to state-induced price components (taxes, levies and surcharges). To be able to draw on the efficient use of renewable electricity in the various fields of application as an option to reduce greenhouse gas emissions, the existing system of state-induced price components must be reformed. The goal must be to set price signals specifically so as to enable efficient sector coupling and therefore, in particular, the market-driven reduction of CO_2 without lock-in effects. CO_2 control benchmarks and incentives for energy efficiency must be explicitly taken into account in this context.

11. **Overcome barriers to sector coupling:** Existing instruments must be examined to check whether they contain barriers to sector coupling and how any such barriers can be reduced. In addition, the established programmes to support energy research and development (e. g. the Sixth Energy Research Programme) at the interface of the sectors (e. g. the transport sector) and energy-related support programmes (Market Incentive Programme, CO_2 Building Modernisation Programme, Industry Efficiency Programmes) need to be refined in order to be able to provide incentive for innovation, unlock potential cost reduction potential and bring modern technologies faster to the market. Complementing this, quality standards should be set wherever necessary.

12. **Utilise energy infrastructures for sector coupling:** The provision and continued development of the inter-regional and local energy infrastructure is a key prerequisite for functioning sector coupling. This should be supported by programmes and demonstration projects, such as for cost-effective and easily implemented options for the development of the charging infrastructure or efficient heat networks that use renewable energy. The optimisation of existing infrastructures (e. g. gas grids and storage systems, heat networks) and the construction of new infrastructures must be compared, assessed and, where practicable, ultimately interlinked. Regulatory and planning requirements currently in place must be refined to ensure the target-oriented design of sector coupling.

13. **Move sector coupling and flexibility forward together:** The central sector coupling technologies are also flexible consumers and can contribute to covering the flexibility needs of the electricity market. They must be able to compete with other flexibility options on an equal footing in the electricity market 2.0. This helps prevent lock-in effects that could lead to the long-term inefficient use of electricity.

Policy options for digitalisation:

14. **Guarantee data protection and IT security:** High data protection standards and the secure and stable operation of the IT infrastructure are central prerequisites to building trust and confidence among energy consumers and to the development of marketable business models.

This requires early networking and collaboration between all stakeholders involved – manufacturers and service providers, consumers and users, and policy-makers and authorities. The Federal Government will work towards a higher level of IT security and data protection, particularly in the form of a safeguarded, multi-level "emergency mode" system which preserves the most important basic functions even in the event of system failure and/or guarantees security through manual control capabilities.

15. **Optimise digital systems:** In the energy market, digital instrumentation and control technologies can provide key functions for the efficient organisation of an energy system characterised by decentralised and volatile generation, storage and consumption systems. Communication standards and interfaces – essentially a common "lingua electronica" – are required to unlock this potential. The Federal Government must also promote the framework needed for the development of standards and compatible interfaces. To support such action through preparatory measures, approaches are in place in the field of energy research, for instance. Following this, the Federal Government will discuss the steps to be introduced to allow different systems to communicate with one another interoperably in the sense of a "lingua electronica". For example, protection profiles, measurement protocols and communication standards for smart meter gateways, which interoperable processes and services can build on, will need to be developed further.

16. **Support new energy services:** Being able to drill down and capture energy usage information as far as the machine or appliance level presents enormous potential for the development of new services and business models using evaluation and control algorithms. The deeper a service can clearly identify and control the energy usage and costs of individual process steps in a production process and/or an appliance, the greater the incentive for systemic efficiency measures. Experience from the current Energy Savings Meter pilot programme and the development of Industry 4.0 technologies, in particular, should be used to decide to what extent the market rollout of new energy efficiency services can be supported and how to make stronger use of the connection between support and individually recorded energy savings on the basis of digital technologies.

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