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Lot 26: Networked Standby Losses

Final Report Task 8

Policy Options

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The findings presented in this document are results of the research conducted by the IZM consortium and are not to be perceived as the opinion of the European Commission.

Contents

A note on the Wh/h unit:

This recommendation uses the “watt-hours per hour” (Wh/h) unit for when describing power consumption levels. While mathematically equivalent to watts, this unit is used to express average power consumption over time, which must not be exceeded, rather than a strict power threshold level. As such, if the requirement is “12 Wh/h”, then devices could exceed 12 W temporarily as long as that consumption is offset by periods below 12 W. A power threshold of “12 W” in contrast would demand that, at each point in time, the measured power consumption is below 12 W. This additional flexibility is important for networked devices, which may need to periodically increase power consumption so as to maintain network integrity. The Wh/h unit, a measure of average power over time, should not be confused with Wh, a measure of energy.

8 Task 8: Policy Options

The general objective of this task report is to present a clear recommendation to the Commission, concerning which of the several different policy options should be put in place to address networked standby energy consumption. This recommendation is supported by introductory remarks, which lay out the principal arguments in support of this approach.

8.1 Policy Recommendation

8.1.1 Reasoning for policy recommendations

8.1.1.1 Product scope

The principal advantage of maintaining a "horizontal" approach of Commission Regulation (EC) No 1275/2008 is to ensure that new products, which often blur the lines between traditional product categories, are adequately covered. There is a continuing trend among network-connected devices, where more and more of these devices are gaining networking functionality. Anticipating future products, and especially “winners”, i.e. those which will gain considerable market share, is very difficult and risks missing devices with significant aggregate consumption. Nevertheless, "vertical" product-specific implementing measures could specify, where appropriate, a stricter requirement for the networked modes of a particular product.

Conclusion: A horizontal approach is preferable as it would cover those products which may fall into the “gaps” between several existing and future vertical measures.

The product scope of a potential ecodesign implementing measure for networked standby operating conditions could be based on the scope of Commission Regulation (EC) N° 1275/2008, including the distinction between EMC classes for IT equipment. While the product scope of Regulation EC 1275/2008 excludes equipment that is not dependent on energy input from the mains power source, such products should be added to the new regulation as market trends continue to shift towards mobile devices.

Considering sources of power, the regulation should anticipate devices which receive “power over network” such as Power over Ethernet or Power over USB. Though this technology has relatively limited use at present, it is expected to become increasingly common as consumers continue to seek convenience of new features added to an existing system. Also other DC powered devices are principally in scope, should the separate distribution of DC power in homes and offices ever catch on.

While falling within the announced scope of this study, it was not possible to obtain specific market and significant product data for home automation products and "white goods" with network functionality. The conclusions of the study remain nevertheless valid for such products, as they will use similar hardware components as other networked products.

For sensor-type products analysed in this study, it is not always apparent (for the individual product) whether such products have external wake-up capability, or whether in most cases they only maintain the network connection and send their data from time to time on own initiative. In any case, the concepts and power consumption levels are still valid, if the basic definition of networked standby applies (see Task 1).

8.1.1.2 Improvement of power management

At the total, EU level, more than 30 TWh of energy demand per year could be allocated to the issue of network availability. This is considered a substantial consumption of energy, which potentially will increase further. The technology trends and the “always connected” mentality is likely to lead to an increase of such products, which potentially remain in a high “network aware” state all of the time, despite only occasional active use. In particular, new networked hybrid products and feature-enhanced products not covered vertically or by EC 1275/2008 are to be targeted. The study has outlined an accelerating market trend towards medium to high network availability (e.g. complex products, networked services, interoperability). Some product groups meanwhile show suboptimal technical solutions for network availability (e.g. products remain in relatively high power “idle”, or wireless products which constantly shift into active).

The impact and benefit of an ecodesign implementing measure will depend largely on the effective integration of networked standby mode(s) into advanced power management schemes. Power management must not only address networked standby mode(s) with respect to the network interface but the total hardware/software system including data processing and respective operation system.

Some summarised findings of the study:

- Network availability, and therefore networked standby, is a horizontal issue. Due to the technology progress (e.g. hardware and software) and standardized operational principles (e.g. protocols and power management rules) network functions including port reactivation can now be implemented in all products universally.
- Individual configurations and the resulting performance of a product in conjunction with actual services and service requirements (QoS) however may demand specific energy conditions for providing certain functionality.
- The key to energy efficiency is nevertheless advanced power management for all power states (incl. active and low power modes).

- The basic improvement strategy is to power down system components or functions which are not actively required by the user (at the moment). Note that the specific aspects of actively-used and passively-used products have been discussed at various occasions in the study.
- The study concludes that it is not required to provide/define an exhaustive list of functions, which are "on" or "off" in certain product states.

8.1.1.3 Technical assessment

If power management were to become mandatory for products to enter into networked, low-power modes, the power down target values, and possibly the power-down sequence as well, should be defined. Some of the arguments about power-down targets and procedures are summarised in the next paragraphs:

- The personal computer, portable computing and mobile devices industry has developed solutions to provide medium network availability at low levels of power consumption. They have introduced power management and interoperability rules that distinguish certain active, idle and sleep states (see Task 4 and 6). The study indicated in that respect the close relationship between "idle" and "networked standby", and the necessity to distinguish both power modes.
- Based on the provided best practices, we could argue that even larger networked services (e.g. data storage capacity of a PC) can be resumed from a 5 W suspend/sleep level in about 10 seconds. This performance is a current benchmark and indicates two things: First, smaller applications should be resumed in shorter time or from lower power levels. Second, larger applications (more memory, complex programs, and/or security features to synchronize) may need longer or more energy to maintain the resume time to application.
- Performance improvement is in that respect strongly related to chip and system level functional integration (incl. processing, memory performance). High-efficiency solutions are mostly VLSI solutions with the respective cost factor, which is estimated to be 2 to 20 Euro per unit.
- High network availability is a feature of customer premises equipment (wide area network interface/gateway) such as home gateways and set-top-boxes with conditional access, as well as local networking and small server equipment with certain quality of service requirements (see scope discussion in Task 1).
- Technical progress already provides highly individualised product configurations. It is possible to integrated CPE functionality in any type of end-user-product. Multiple

network architectures and topologies are possible, where network options offered by a product are not accessed by the user in real-life conditions.

- The market and BAT assessment indicated that most CPE could handle high network availability with 8 W. However, industry stakeholders indicated that certain, more capable products with area network interfaces which are still quite inefficient (e.g. DOCSIS) will require considerably more energy (in the range of 15 W).

- Best not yet available technology (BNAT) is a wild card. For example, using non-volatile memory to save and restore the system state has considerable potential for supporting advanced power management. Although a large variety of non-volatile memory exists, it is still not fulfilling all necessary requirements for high speed read/write access in conjunction with high memory capacity.

- Network technology and interoperability standardization has a great potential for implementing networked standby mode(s). The study concludes that current and future standardization (including codes of conduct) needs to address power management issues and networked standby in particular.

- Standard test procedures for measuring the mode-specific or performance-specific power consumption is still at an early phase of development. Although some activities are in progress (see Task 1), dedicated test standards need to be defined.

8.1.1.4 User interaction and other user-related aspects

The energy-efficient utilisation of products with a functional benefit for the user is the main objective when investigating networked standby in this study. The study concludes that (the partially existing) inefficient technical solutions for providing networked standby mode(s) will lead to a considerable increase in overall energy consumption in the European Union. There are legitimate networked services provided by networked standby mode(s). That said, the study has also argued that, in many cases (specifically in home multimedia network environment), a remote, network-based wakeup is a technical option that provides some convenience service for a high energy price. Against that background, networked standby mode(s) has been evaluated from both perspectives – as part of a problem and as part of a solution (see Task 4).

In conclusion, the user needs transparency with respect to the energy consumption of networked services (networked standby mode(s)). Consumer stakeholder groups have strongly argued that the user needs options to clearly recognize the power state. The user also needs the option to change the power management setting so that the equipment can be put into EC1275/2008 standby or off. Finally, changes to power management settings (whether in the eco-menu or in deeper levels of the menu structure) must be made transparent to the user (e.g. with colour codes, or with exemplary power consumption values) in the case that they are leaving the requirement levels of networked standby. There have been various improvement options described in Task 7 that are linked to user choices and user interface options.

8.1.2 Specific policy recommendations

Based on the study's findings documented in the task reports, the constant stakeholder feedback received, the input from the stakeholder meeting, and the above considerations, the recommendation of the study contractors is as follows. Note the original disclaimer in particular for this part: this is the view and recommendation of the contractors and not of the European Commission. Although parts of this recommendation may be taken up by the Commission for drafting further documents, the Commission is in no way bound to endorse this proposal. It is nevertheless the basis for a valuable feedback round (to the contractors and to the Commission), even if this feedback may not be integrated in the final published study report.

8.1.2.1 Horizontal approach

It is recommended that a horizontal implementing measure be established covering the power management and minimum requirements necessary for efficient networked standby. The main intention is to ensure power management, automatic power down routines and power down targets as broadly as possible.

It is recommended to maintain the horizontal approach and scope of Commission Regulation (EC) N° 1275/2008, including the distinction between EMC classes for IT equipment. It is recommended to differentiate specific energy requirements primarily between:

- High Network Availability (HiNA) equipment,
- Non-HiNA equipment.

HiNA equipment is characterized by its main networking functionality, which requires millisecond response time and the near-instant resume of applications. As an orientation for the scope for HiNA equipment it is recommended to consider the Customer Premises Equipment (CPE) definition in the current Broadband Equipment Code of Conduct Version 4.0 published February 2011.

According to this definition, the consumer end-user CPE comprises:

- Home Gateways
- Simple Broadband Access Devices

- Home Network Infrastructure Devices
- Other Home Network Devices

Further equipment not covered by this Code of Conduct may also qualify for HiNA. Professional network equipment (see Task 1) is recommended to be out of scope.

With respect to the non-HiNA equipment scope, it is recommended not to distinguish product-specific energy requirements based on a specific product category (vertical approach) but on the actual “resume time to application”. This means, that due to different configurations and respective technical performance, one product may be required to conform to MeNA requirements while another product within the same product category may be required to conform to LoNA.

8.1.2.2 Two tiers of requirements

So far, not all products with network capability have power management. In order to make the transition manageable for industry, yet maintain a clear reduction goal also with respect to future products, a two tiered implementation is proposed. Tier 1 of the networked standby implementing measure could possibly be aligned in timing with Tier 2 of the EC 1275/2008 regulation (year 2013), which will require power management in all products covered, with auto power down to a standby or off state (unless technical considerations, such as a “live” network connection, prevent this).

Tier 1 would therefore concentrate on establishing the power management for networked products with a power down sequence, which effectively is allowed to stay in networked standby, rather than powering down to standby or off.

Tier 2 would then enforce stricter levels of power thresholds for the networked standby states, corresponding to levels, which are already now achieved by many products, but not all product types.

8.1.2.3 Tier 1 requirements

Tier 1 of the regulation is suggested to enter into force in 2013, in parallel with the introduction of Tier 2 of the EC 1275/2008. At this stage, power management would be required for all products falling within the scope of the regulation.

It is recommended that products offering networked standby modes (i.e. reactivation over one or more network connections), are excluded from the requirement of EC 1275/2008 to power down into a standby or off mode. Instead, it will be allowed to remain in a defined networked standby mode, potentially for an unlimited duration, so long as it achieves the power consumption levels detailed below. The threshold for power consumption in networked standby modes will depend on the classification of Network Availability and respective resume time to application.

The power consumption values are defined in “Wh/h” to indicate that fluctuations in power draw above the threshold value are temporarily permitted. See Section 8.1.2.6 for more details. The recommended threshold values are targeted at products which are currently less energy efficient. Industry should be encouraged to continue the improvement of energy performance and implement even more ambitious power management schemes.

It is recommended that a power-down sequence be required to be activated by default when the equipment remains “idle” (e.g. the system stops executing any type of instruction or applications) for a defined period of time. In order to allow for convenience of use, the default setting requirements for LoNA has two phases with a total of 40 minutes, twice as long as for HiNA and MeNA. This two phase approach is similar to the energy budget option outlined in Task 7. It is intended to foster the implementation of active power management while providing flexibility and convenience in the use of the equipment.

HiNA equipment requirements:

- Default delay time 20 minutes
- Power down target ≤ 12 Wh/h
- Resume time to application < 1 second

MeNA equipment requirements:

- Default delay time 20 minutes
- Power down target ≤ 6 Wh/h
- Resume time to application ≤ 15 seconds

LoNA equipment requirements (in two phases):

- Phase 1: Default delay time 20 minutes
- Phase 1: Power down target not specified, value should however be clearly lower than idle mode power consumption (consider 12 W as orientation)
- Phase 2: Default delay time 20 minutes after start of phase 1
- Phase 2: Power down target ≤ 3 Wh/h

The proposed power-down routine and targets for Tier 1 (2013) are summarised in Table 8-1.

Table 8-1: Tier 1 (2013) power-down targets

Tier 1 (2013)	Scope	Resume Time	Power Down Target	Default Delay Time
Mandatory	HiNA	< 1 second	12 Wh/h	20 Min.
Mandatory	MeNA	15 seconds	6 Wh/h	20 Min.
Mandatory	LoNA (Phase 1)	no requirement	< idle	20 Min.
Mandatory	LoNA (Phase 2)	no requirement	3 Wh/h	20 Min.

8.1.2.4 Tier 2 requirements

Tier 2 of the regulation would come into effect three years after the introduction of Tier 1, potentially entering into force in 2016. Tier 2 defines more challenging minimum requirements including shorter resume times to application, default delay times, and power down target values, which could require inter-market collaboration and standardization efforts for some product groups to a larger extent than what is seen at present.

Current trends in technology, and specifically the BATs identified in the course of this study, show that these stricter values are possible even for larger, full-featured products that require fast resume time to application.

HiNA equipment requirements:

- Default delay time 10 minutes
- Power down target ≤ 8 Wh/h
- Resume time to application < 1 second

MeNA equipment requirements:

- Default delay time 10 minutes
- Power down target ≤ 4 Wh/h
- Resume time to application ≤ 10 seconds

LoNA equipment requirements (in two phases):

- Phase 1: Default delay time 10 minutes
- Phase 1: Power down target not specified, value should however be clearly lower than idle mode power consumption (consider 8 W as orientation)
- Phase 2: Default delay time 10 minutes after start of phase 1
- Phase 2: Power down target ≤ 2 Wh/h

The proposed power-down targets for Tier 2 (2016) are summarised in Table 8-2.

Table 8-2: Tier 2 (2016) power-down targets

Tier 2 (2016)	Scope	Resume Time	Power Down Target	Default Delay Time
Mandatory	HiNA	< 1 second	8 Wh/h	10 Min.
Mandatory	MeNA	10 seconds	4 Wh/h	10 Min.
Mandatory	LoNA (Phase 1)	no requirement	< idle	10 Min.
Mandatory	LoNA (Phase 2)	no requirement	2 Wh/h	10 Min.

8.1.2.5 Information disclosure and user options

It is recommended that manufacturers disclose the following information in the user manual:

- Mandatory: the power consumption values and functionality of different modes in the settings and configuration as shipped (out of the box),
- Not mandatory but recommended: Additional information on possible power consumption for optional settings.

It is recommended that policy measures also include the following requirements:

- Users should – except where this is inappropriate for the intended use – have the possibility to activate a standby or off mode conforming to EC 1275/2008.
- Even though products are allowed to stay in networked standby indefinitely, users should be able to change power management settings so that after a predefined time networked standby mode ends and the power down sequence of EC 1275/2008 is entered.
- Products offering at least one networked standby mode and featuring a setup menu of some kind should offer one top-level menu for eco-settings. These settings should in particular offer access to disabling unneeded interfaces or hardware modules, and to return to “EuP conforming” settings, if changes have been made.

8.1.2.6 Test procedure for measuring power consumption

If a regulation specifies a specific level of energy consumption, then it must also include at least a rudimentary explanation of the conditions under which energy consumption should be measured. While an international standard for such measurements is a desirable, long-term goal, it is also a long process, which would likely not be complete before the implementation of any regulation (see Task 1). As such, some form of “simplified measurement” is required in the interim, between the implementation of the regulation and the creation of an international standard.

This simplified measurement should be based on the product as it is delivered “out-of-the-box” and following any initial (necessary) configuration required by the user. Such a measurement would not include later changes/options to the configuration of the device nor later changes to the hardware configuration, including the addition or removal of network interfaces.

A simplified procedure could therefore progress along the following steps:

- Remove from packaging and connect to power source (mains, battery, power-over-network)
- Basic configuration, until network interface is known to work
- Record pre-settings of power management
- If applicable, additionally wait until battery fully charged (fast or standard charging should not be active during measurements)
- Put device under test into networked standby mode(s), if manually possible, else wait beyond the maximum delay times
- Trigger external wake-up and measure resume time to application (check at least once that external wake-up is possible)
- Measure power and timing profile without link or active network connection (cf. CoC Broadband for Equipment; see additional comment below)
- Compare power down sequence (levels and timing) with requirements
- Check documentation, user interface and other potential generic requirements
- Requirements for measurement equipment, ambient conditions etc. should be as defined in the new "standby" measurement standard.

If a simplified procedure as outlined above would not be used, then for each network interface kept active a controlled network environment would be needed. This would have to ensure defined times of activity, no activity and possible duty cycles. Through this, reproducibility could be achieved and false wakeups could be avoided. This approach would however mean massive testing capabilities for the various network types.

In addition to the data acquisition procedure a pass / fail procedure (verification) needs to be defined, regarding dealing with measurement uncertainty, and potential sequence of more than one test device for borderline cases. This part would principally be aligned with the existing EC 1275/2008 approach.

8.1.2.7 Additional options and recommendations

Self-regulation pursuant to Annex VIII of the Ecodesign Directive 2009/125/EC appears to be no option, as the large number of manufacturers from very different sectors placing on the market products with networked standby operating conditions makes it difficult to fulfil the requirements for self-regulation. In fact, to date no initiative for self-regulation was suggested by operators.

Nevertheless, a further improvement of overall energy efficiency could be achieved in the field of customer premises equipment, if the service provided would coordinate the power management of the equipment on the end-user-side with the service up-date profiles on the provider side. One improvement option in Task 7 is the utilisation of timers in conjunction with service updates. Against that background, it is recommended to develop a Code of Conduct for network and content provider services that specifies the power management in conjunction with remote, networked services (i.e. EPG).

For some product groups, integration of the energy consumption in networked standby mode into a Typical Energy Consumption (TEC) could be considered in order to exploit improvement potential beyond "minimum" ecodesign requirements. Although TEC approaches offer the best way to balance between all modes of a product (at least for a single, average user profile) this is not viewed as a replacement for an implementing measure, but possibly as a complimentary approach for a limited number of products (e.g. imaging equipment and small networking services).

A dedicated energy labelling measure for networked standby conditions is not considered to be an effective approach for realising energy efficiency improvement potentials, as the absolute energy consumption and energy savings per product related to such conditions is often comparatively small, and therefore may not be an important purchasing criterion. Integration into other labels would, however, encourage improvements beyond the minimum requirements. But again, a separate new label is not proposed.

8.2 Impact Analysis

8.2.1 Changes to base data

Following the feedback received and the discussions in the stakeholder meeting, a few localised changes have been made to the base data assumptions. Therefore the 2010 "base case" and the 2020 "business as usual" scenario data are slightly different in the Task 8 policy analysis compared to the Task 5 base case assessment.

<u>Game Consoles</u>

For 2010 LoNA is still considered as the dominant case. Active mode duration is assumed to be 2 hours, idle mode is also assumed to be 2 hours and the remainder of the day is spent in LowP4 with a slow reactivation possibility at 12 W. The 12 W were proposed by industry stakeholders (or 11 W in the actual proposal). 1.4 hours of idle per day were also brought up in the feedback, but for now not entered into the calculation as this is sufficiently close to the current 2 hours.

For 2020, MeNA is considered the dominant use, even though not all game consoles are moving in the direction of becoming part-time multi-functional media centres. To consider this mix of "media centre" and "gaming only" characteristics, the idle time has been reduced from 12 to 6 hours per day (compared to the original MeNA base case). The remainder of the day is again apportioned to LowP4 with a 20% reduction forecast resulting in 9.6 W on average. Note that the game consoles covered are already capable of media centre functionalities (such as HD video), and this trend may increase, even though other types of game consoles do not follow this trend.

<u>Home Gateways</u>

A general adjustment of the power consumption values for active, idle, and LowP1 mode was necessary as the study had not sufficiently considered the ongoing trend towards high-speed broadband network access technology including FTTH, DOCSIS 3.0, and LTE. According to the current "CoC Broadband Equipment power consumption targets for Home Gateways" this increase in symmetric bandwidth is not leading to a continuous reduction in power consumption (20% reduction in the previous forecast) but rather to an increase in some cases. In the midterm, technical progress will compensate this currently negative development. In conclusion, the assumed improvement in Task 5 has been adjusted for this product group. In the new 2020 business-as-usual scenario we assume the same power consumption level for active (12 W) and idle (11 W) as in the 2010 base case. No changes in the use case have been made.

Complex Set-Top Boxes

Due to increased functionality of average complex set top boxes the value for idle mode has been modified to 15 W. This higher power consumption considers integrated storage capacity as a standard feature, and assumes that the storage remains powered up in idle. No changes were made to the use patterns.

8.2.2 Scenario types

Four simplified scenarios have been developed for comparison with the 2010 base case and are explained in Table 8-3.

Table 8-3: Scenario designations

Short scenario name	Scenario description
"2010" or "2010 BC" Base Case	Synonymous for the 2010 base case, including the modifications explained above
"2020 BAU" Business as Usual	2020 projection, which includes a general 20% improvement of average power consumption levels for all product groups and all modes
"2020 BAU+20%" BAU without general improvement assumption	A 2020 projection without the general 20% improvement in power consumption. Since use patterns and product numbers are unchanged this is not yet a worst case scenario, but serves as an indication for a worst case possibility, if no action were taken.
"2020 Tier 1" Only tier 1 considered	A simplified policy effect scenario, by assuming that all 2020 products achieve tier 1 requirements or better. The basis is "2020 BAU" not "2020 BAU+20%".
"2020 Tier 2" Tier 2 considered for all products	A simplified policy effect scenario, by assuming that all 2020 products achieve tier 2 requirements or better. The basis is "2020 BAU" not "2020 BAU+20%".

8.2.3 Scenario results

The following Figure 8-1 shows the mode-specific power consumption of the four scenarios (2020 BAU, 2020 BAU+20%, 2020 Tier 1, 2020 Tier 2) in comparison to the 2010 base case.

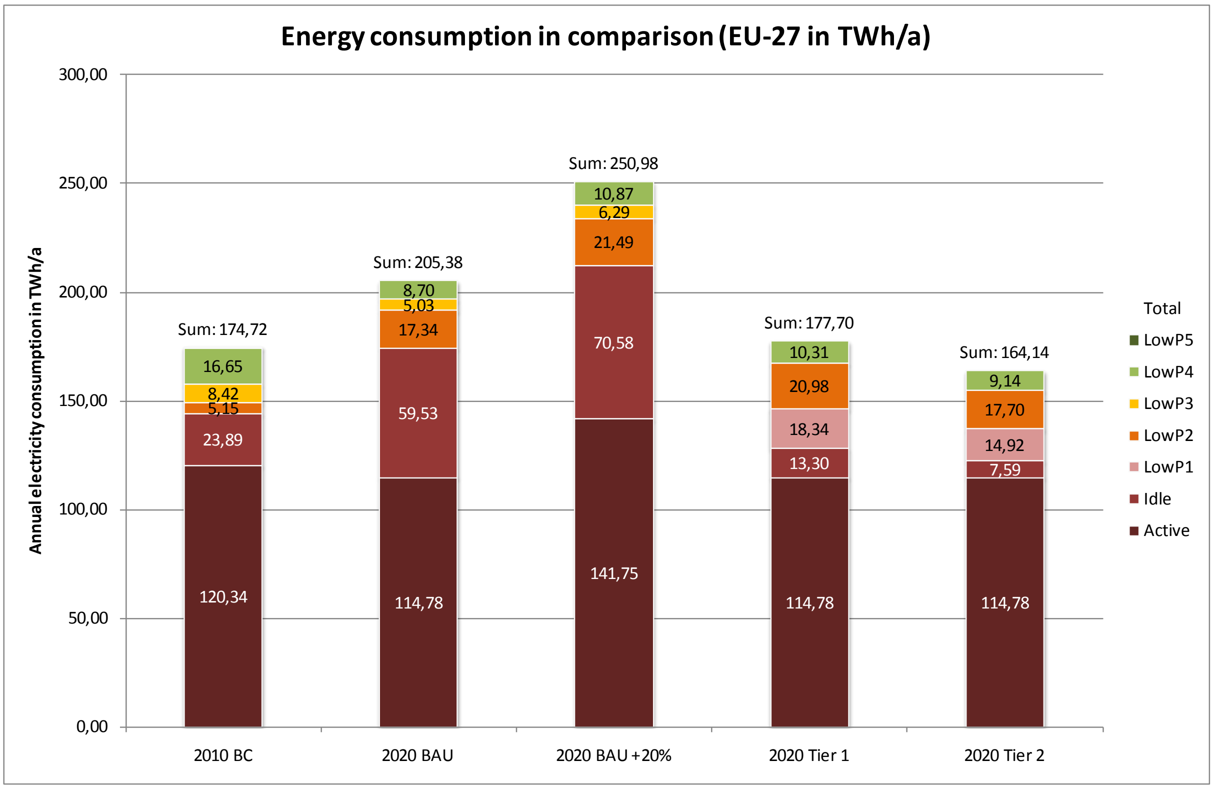

Figure 8-1 Base case and scenarios annual energy consumption

The 2020 BAU and 2020 BAU+20% scenarios show a considerable increase in total energy consumption in comparison to the 2010 base case. With constant use pattern assumptions and constant market data assumptions the 2020 BAU+20% scenario consumes an additional 45 TWh compared to the 2020 BAU scenario (without active mode it is an additional 19 TWh). This shows the magnitude of increase, which could happen in addition to the business as usual. However, a “realistic worst case” would have to include some expected improvements (but not 20% for all products in all modes), which might then be offset by even more time spent in networked standby (“always connected”) and potentially higher product sales for some network intensive product groups.

In the mix of these effects, the 2020 BAU+20% scenario is useful to display what could happen if no regulation is implemented and no further efforts are pursued to increase energy efficiency of the covered product groups.

The Tier 1 and Tier 2 improvement scenarios show the effect of effectively implemented power management. Although this is a simplification of reality, it nevertheless indicates the significant effect of the proposed policy measures. When taking the 205 TWh of the 2020 BAU scenario as a benchmark, the Tier 1 measures reduce the overall energy consumption by almost 28 TWh and the Tier 2 measures by about 41 TWh. These scenarios are assuming that all products in stock in 2020 were to comply with the proposed Tier 1 or Tier 2 regulation.

Note that if Tier 2 is in force starting in 2016, not all products will have been exchanged by 2020, so the error is in principle bigger than for the Tier 1 scenario (the values would on average be achieved later). On the other hand, if Tier 1 does precede Tier 2 as proposed, then the worst performing products will already have had a few years to work on their mandatory power management routines.

Figure 8-2 and Figure 8-3 below show the simplified effect of Tier 1 and Tier 2 regulation in 2020, without the contribution of active mode, and broken down by product groups. The effect of the regulation varies according to the selected product groups and between Tier 1 and Tier 2. For example, the effects on Home Gateways are considerably larger in the Tier 2 implementation scenario. For other products, the difference between Tier 1 and Tier 2 is rather small due to the good level of energy efficiency at present. The Game Consoles show a considerable improvement in this first tier due to the introduction of power management.

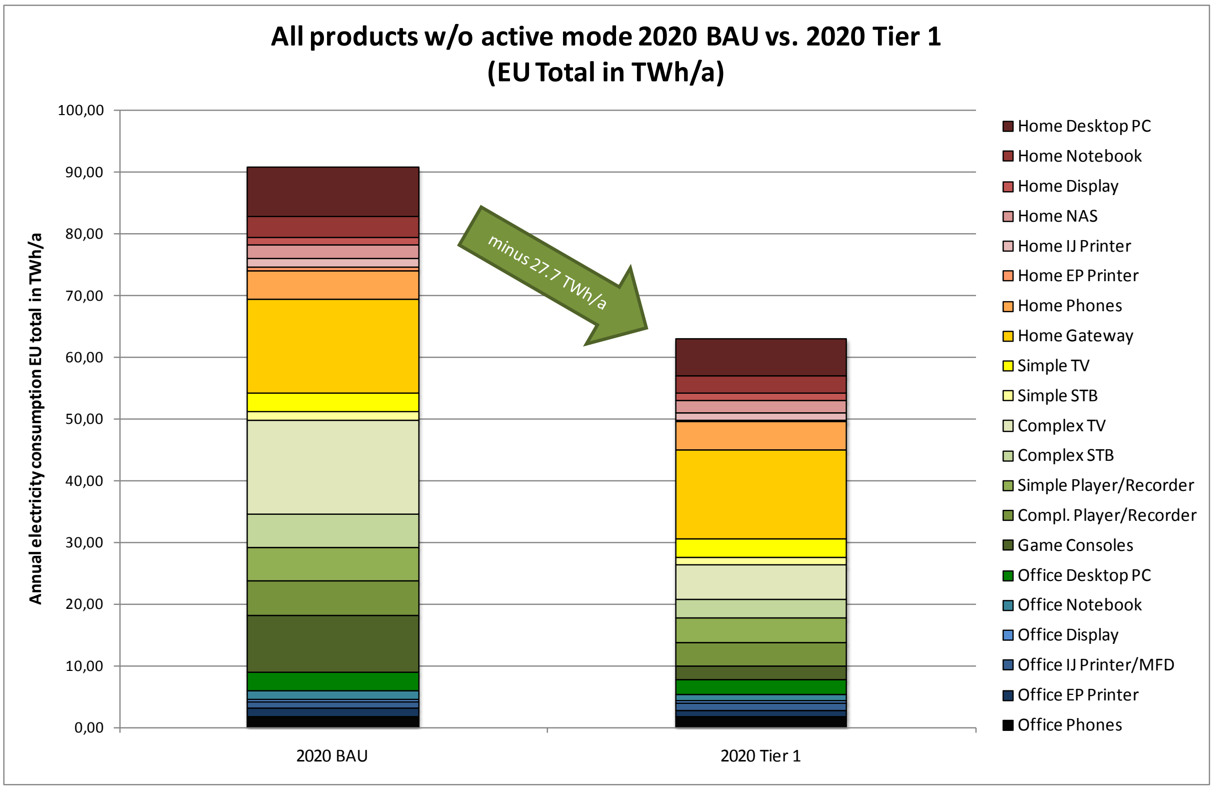

Figure 8-2 Simplified effect of Tier 1 regulation in 2020 without the contribution of active mode (broken down by product groups)

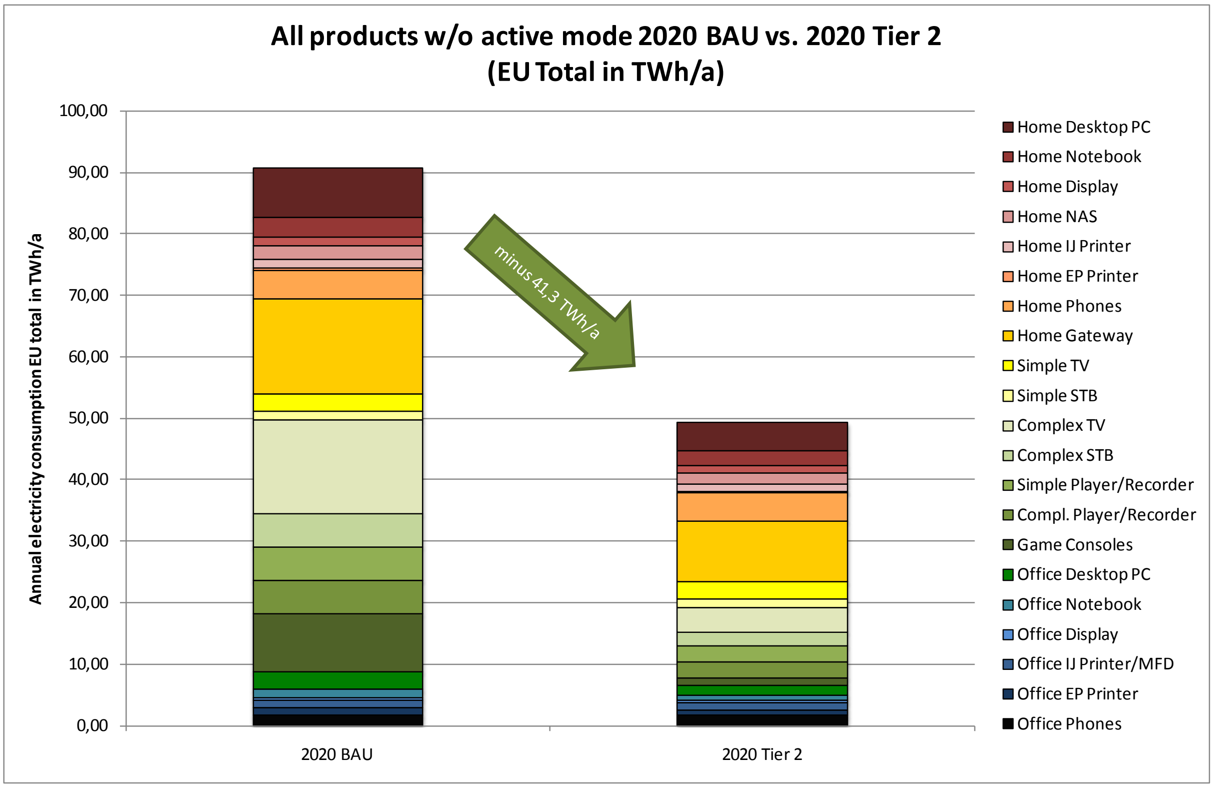

Figure 8-3 Simplified effect of Tier 2 regulation in 2020 without the contribution of active mode (broken down by product groups)

Table 8-4: Ranking of product groups according to improvement from 2020 BAU to Tier 2 (TWh/a)

Item No.	Product Category	Total				
		2010 BC	2020 BAU	2020 BAU+20%	2020 Tier 1	2020 Tier 2
11	Complex TV	0,29	15,32	19,16	5,42	3,92
15	Game Consoles	4,47	9,35	11,69	2,28	1,23
8	Home Gateway	7,17	15,36	15,36	14,39	9,92
1	Home Desktop PC	6,78	7,94	9,88	6,05	4,68
12	Complex STB	1,14	5,33	6,66	3,12	2,23
14	Compl. Player/Recorder	0,44	5,51	6,88	3,77	2,45
13	Simple Player/Recorder	9,10	5,44	6,80	3,90	2,78
16	Office Desktop PC	2,64	2,97	3,70	2,37	1,64
2	Home Notebook	1,58	3,31	4,10	2,69	2,38
4	Home NAS	0,91	2,23	2,78	2,05	1,69
20	Office EP Printer	1,43	1,37	1,71	1,08	0,92
17	Office Notebook	0,89	1,32	1,64	1,10	0,87
6	Home EP Printer	0,40	0,45	0,56	0,24	0,19
5	Home IJ Printer	1,66	1,47	1,83	1,22	1,22
3	Home Display	0,86	1,26	1,51	1,26	1,26
7	Home Phones	3,96	4,61	5,76	4,61	4,61
9	Simple TV	5,61	2,87	3,59	2,87	2,87
10	Simple STB	2,09	1,36	1,71	1,36	1,36
18	Office Display	0,26	0,44	0,55	0,44	0,44
19	Office IJ Printer/MFD	0,91	1,06	1,32	1,06	1,06
21	Office Phones	1,80	1,63	2,04	1,63	1,63
Total:		**54,39**	**90,60**	**109,23**	**62,92**	**49,36**

Table 8-4 above shows a ranking of the product groups with respect to the largest reduction in power consumption (all modes without active). This ranking is based on the comparison of the 2020 BAU scenario with the 2020 Tier 2 scenario. This direct comparison of individual product groups indicates that the proposed measures would have an effect on those products identified in the study as products with improvement potential.

Table 8-5 summarises the scenarios without the contributions from active modes.

Table 8-5: Scenario comparison (without active mode, in TWh for EU-27)

	2010 BC	2020 BAU	2020 BAU+20%	2020 Tier 1	2020 Tier 2
Total	54.39	90.60	109.23	62.92	49.36
Difference to 2010 BC		+36.22	+54.85	+8.54	-5.03
Difference to 2020 BAU	-36.22		+18.63	-27.68	-41.25

Cost calculations

Figure 8-4 shows the electricity costs associated with the non-active power consumption.

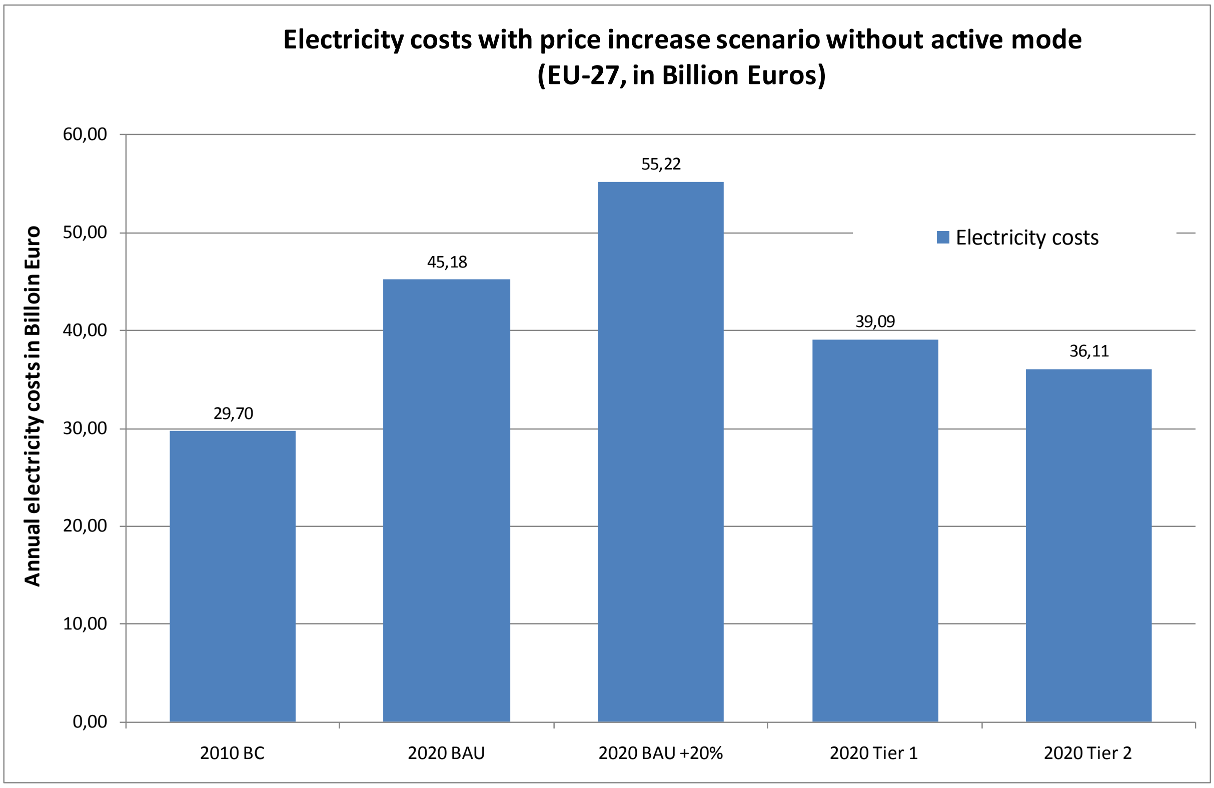

Figure 8-4 Electricity costs for all scenarios (without active mode)

The relevant estimated savings amount to 6 billion Euros for Tier 1 in comparison to 2020 BAU and 9 billion Euros for Tier 2 respectively.

8.3 Sensitivity Analysis

In order to develop a manageable policy scenario, certain assumptions need to be made and some influences must be excluded from the analysis. In particular, this analysis does not take fully into account the following factors:

- Increase of energy prices;
- The general economic situation in the EU influencing the capital spending of the consumers and the price awareness with respect to the products' full life cycle;
- Variability within product groups;
    - in terms of variations in the real use pattern, including the possible changes to power management settings, or disconnection from the network;
    - in terms of differences in features, performance and available modes; the average power consumption will change accordingly, we need to assume that energy improvements on the component level will be over-compensated by an increase in functionality;
    - in terms of home and office network architecture including network standards, physical components, organization and policy rules (configuration)
- Products not covered, but intended to fall into the scope of the regulation;
- The time dependencies of the scenarios, including the dynamics of technology migration for products and provider network infrastructure (e.g. shift to FTTH).

In order to understand the potential impact of these factors, this section will perform a sensitivity analysis along some of the aspects. This analysis will provide the stakeholders and the European Commission with a clearer understanding of the factors which could have an effect on the efficacy of the proposed policy recommendations.

8.3.1 Increase of energy prices

The base cases calculated in Tasks 7 and 8 assume a fixed energy price. That said, it is expected that energy prices will continue their gradual trend upwards. The influencing factors are e.g. the ongoing increase in fuel prices, the discussion on nuclear power, the rollout of renewable energy and the necessary investments for new and smart energy distribution networks. A likely scenario is a 25% increase in average energy price. There would be two principle outcomes of such an increase, which are relevant to this study:

- the cost savings that consumers enjoy as a result of using more efficient products will increase;
- the potential increase in product prices resulting from redesigns or additional components would be allowed to be higher without endangering the net benefit over the total cost of ownership to the consumer.

In order to demonstrate the scale of this impact, Figure 8-5 below illustrates the results of an increase in 2020 electricity prices from 0.22€ per kWh to 0.25€ per kWh. The scenarios calculated above in Task 8 showed a savings to consumers of 9 billion € for “2020 Tier 2” relative to “2020 BAU”, while this scenario, with its higher electricity prices, shows a savings of more than 10 billion €, an increase of 1.3 billion €.

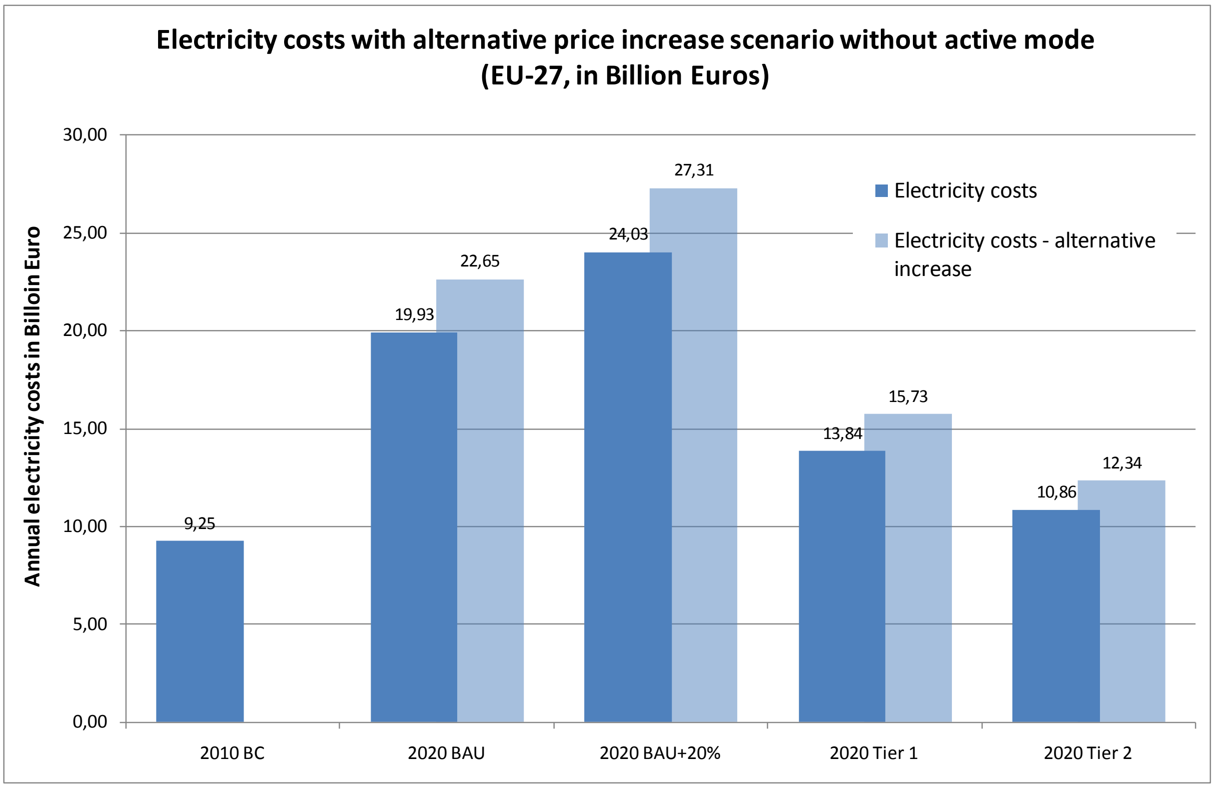

Figure 8-5 Electricity costs for all scenarios with alternative electricity costs in 2020

While the arithmetic is almost trivial (when all 2020 costs rise by 13% then the savings also increase by 13%), the potential additional savings could be invested in the necessary power saving technologies.

8.3.2 Variability within product groups

The mix of 21 different product groups ensues that a wide range of network technologies, services, user behaviours, and technical developments are accurately modelled. Within each product group it is assumed that all products and users are equal. While this is clearly a simplification of real-world users and behaviours, it is necessary in order to have a manageable dataset and calculations.

It is important that the European Commission takes this variability into account when developing and implementing a regulation, especially as some of the underlying assumptions have been challenged by manufacturers and interest groups. In some cases, this has led the project team to revise its models, though in others the model is not able to integrate particularly complex (i.e. differentiated) use patterns or highly variable product performance within a single product group (i.e. imaging equipment). Furthermore, the changes in user behaviour out to 2020 are particularly difficult to predict and remain a point of uncertainty.

Another source of uncertainty with respect to the scenario assumptions is the actual design of home and office network architecture including the applied network standards, physical components, organization, and policy rules. The dynamic technical development with respect to network standards (i.e. Ethernet over HDMI), and the option to create multiple parallel networks or to consolidate existing networks into one architecture is increasing options of how equipment is applied in real life situations.

Despite this general uncertainty, it is possible to make an informed estimation of how use patterns will likely evolve over time. As such, the scenarios developed in this study use only modes which either currently exists or which are assumed to be available in products by 2020. These modes are generally networked standby modes, which would tend to increase convenience to consumers. Assuming that these modes actually exist in 2020, it is reasonable to assume that consumers will continue their trend towards higher network availability, shifting usage patterns towards more connectedness. The projected use patterns used in the scenarios take into account that a portion of users might defect from the general trend and power down their devices completely, rather than leaving them in a networked standby mode. However, the general trend towards “always connected” and “always available” is nevertheless dominant.

While efficiency improvements will be the primary measure to tackle the increased energy consumption brought on by these changes in behaviour and expectations, efforts to change user behaviour and expectations for the network availability of their products should also be considered complementary to purely technical efficiency increases.

8.3.3 Products not covered, but intended to fall into the scope

The horizontal approach of the ENER Lot 26 study is particularly challenging in terms of product and market data. The study assumed a hybrid approach by selecting 21 representative product groups. These cover 2 billion products in the market. This approach is by necessity a simplification of reality. However, the authors like to point out again, that the EU total product stock is in reality larger than the EU total referred to in the base case assessment and related scenarios. With respect to future policy measures this means that more products will eventually be covered, thereby increasing the overall energy figures.

For example, white goods were not included in the study calculations as there were not a sufficient number of examples on the market to be able to create a useful base case. That said, as these tend to be larger devices with greater levels of energy consumption, there is a risk that they would find it difficult to meet the requirements. For some product types, where these products will be relatively new to the market with network capabilities in 2013 and 2016, the designers may not have had the time and experience required to develop an optimised and efficient product, making compliance more of a challenge. On the other hand, even in the white goods sector, many test generations of networked appliances have already been demonstrated.

Other products wanting to expand into network availability at a later stage will be able to make use of even more efficient, integrated communication modules, so late hybridisation is not a reason for not achieving the power level requirements.

For the sake of transparency, it was decided to elaborate and declare all totals based on the 21 product groups without adding an overhead for networked devices principally in scope but not covered by the calculations.

8.3.4 Time dependencies of the scenarios

As with other factors, the analytical model developed in this study simplifies factors related to time as well. For example, the rate at which existing products are exchanged for more efficient products is a simple linear rate for the base scenario and does not take into account other rapid advances, which could take place. For the Tier 1, and more specifically for the Tier 2 scenario, the 2020 values assume even faster stock replacement than the standard linear models. However, as has been discussed with the scenarios above, the numerical deviation is assumed to be smaller than other uncertainties.