

TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies

Lot 26: Networked Standby Losses

Final Report Task 5 – Annexes

Environmental Assessment of Product Groups covered

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Berlin, Paris 21st June 2011

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Annex 1 Environmental Assessment: Home Desktop PC



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Final Report Task 5
Annex 1 – Home Desktop PC

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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.

Input Data

Product definition:

Desktop PC is a computer where the main unit is intended to be located in a permanent location, often on a desk or on the floor. Desktops are not designed for portability and utilize an external computer display, keyboard, and mouse.[1]

This product group also contains Integrated Desktop Computer, a desktop system in which the computer and computer display function as a single unit which receives its ac power through a single cable.[2]

Product stock assumption:

Stock assumption has been based on [TREN Lot 3, 2007][3] and [ICTEE, 2008].[4] The calculated penetration rate of 65% taken as a cross reference is 15% lower than for displays. This installed base seems feasible if we take into account that a larger number of notebook users also facilitate an additional larger flat panel display and that there is not a 1:1 ratio of desktop PC to computer display. Forecast has been based on the assumption that the household penetration will moderately increase until 2015. The market indicates already a wide diversity of products in a range between small servers, workstations or gamer PC on the high performance end and notebooks, sub-notebooks, thin clients on the lower performance end.

Power Modes and Power Management Options:

Desktop PCs are considered to have an integrated power management on the basis for ACPI. The implementation of these power management options are supported by the requirements of the Energy Star Program for Computers. We assume that Desktop PCs are utilizing the existing hardware and software options for reducing idle power and duration and start transitioning into low power sleep modes S3 and S5 according to a default delay time setting. In support of network availability the equipment is utilization Wake-on-LAN in the respective sleep modes.

The following power modes are considered:

[1] Definition according to Energy Star Program Requirements for Computers (Version 5.0)
[2] Definition according to Energy Star Program Requirements for Computers (Version 5.0)
[3] [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; http://www.ecocomputer.org
[4] [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

Active: Mode is equivalent to G0/S0 (applications are running). According to industry sources average active mode power consumption that is approx. factor 1.2 of idle power.

Idle: Mode is equivalent to G0/S0. No application is running [HiNA].

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is equivalent to G1/S3. Average power consumption is oriented on S3sleep with WOL. [MeNA]

LowP3: Mode is equivalent to G1/S3 (sleep).

LowP4: Mode is equivalent to G2/S5 with WOL [LoNA]

LowP5: Mode is equivalent to G2/S5 (soft off)

G1/S4 (hibernate) is not used for Desktop Computers, because it offers only minor savings in energy consumption while increasing the booting times significantly. For Desktop Computers it is more likely being shut down (soft off with/without WOL).

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 1: Home Desktop – Input data for scenarios of reference year 2010

NoNA	**Home Desktop PC**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	210,0	100,0	0,0	0,0	0,0	0,0	28,5	338,5
131 million	TEC Unit/year (kWh/a)	76,7	36,5	0,0	0,0	0,0	0,0	10,4	123,6
	Stock per year (TWh/a)	10,0	4,8	0,0	0,0	0,0	0,0	1,4	16,2

LoNA	Home Desktop PC	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	210,0	100,0	0,0	0,0	0,0	41,8	0,0	351,8
131 million	TEC Unit/year (kWh/a)	76,7	36,5	0,0	0,0	0,0	15,3	0,0	128,4
	Stock per year (TWh/a)	10,0	4,8	0,0	0,0	0,0	2,0	0,0	16,8

MeNA	Home Desktop PC	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	3,0	2,0	0,0	19,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	210,0	100,0	0,0	89,3	0,0	0,0	0,0	399,3
131 million	TEC Unit/year (kWh/a)	76,7	36,5	0,0	32,6	0,0	0,0	0,0	145,7
	Stock per year (TWh/a)	10,0	4,8	0,0	4,3	0,0	0,0	0,0	19,1

HiNA	Home Desktop PC	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	210,0	1050,0	0,0	0,0	0,0	0,0	0,0	1260,0
131 million	TEC Unit/year (kWh/a)	76,7	383,3	0,0	0,0	0,0	0,0	0,0	459,9
	Stock per year (TWh/a)	10,0	50,2	0,0	0,0	0,0	0,0	0,0	60,2

Table 2: Home Desktop PC – Input data for scenarios of forecast year 2020

NoNA	**Home Desktop PC**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	168,0	80,0	0,0	0,0	0,0	0,0	22,8	270,8
143 million	TEC Unit/year (kWh/a)	61,3	29,2	0,0	0,0	0,0	0,0	8,3	98,8
	Stock per year (TWh/a)	8,8	4,2	0,0	0,0	0,0	0,0	1,2	14,1

LoNA	Home Desktop PC	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	168,0	80,0	0,0	0,0	0,0	34,2	0,0	282,2
143 million	TEC Unit/year (kWh/a)	61,3	29,2	0,0	0,0	0,0	12,5	0,0	103,0
	Stock per year (TWh/a)	8,8	4,2	0,0	0,0	0,0	1,8	0,0	14,7

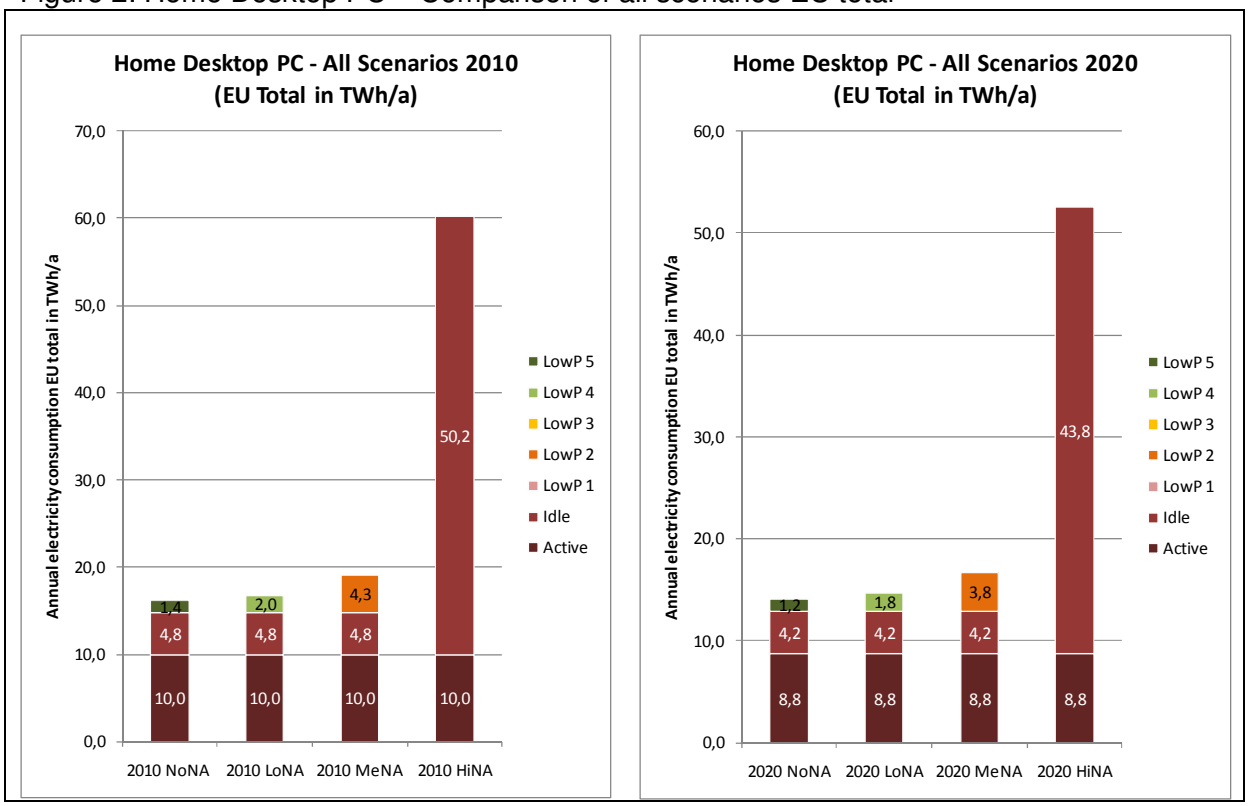
MeNA	Home Desktop PC	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	3,0	2,0	0,0	19,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	168,0	80,0	0,0	72,2	0,0	0,0	0,0	320,2
143 million	TEC Unit/year (kWh/a)	61,3	29,2	0,0	26,4	0,0	0,0	0,0	116,9
	Stock per year (TWh/a)	8,8	4,2	0,0	3,8	0,0	0,0	0,0	16,7

HiNA	Home Desktop PC	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	168,0	840,0	0,0	0,0	0,0	0,0	0,0	1008,0
143 million	TEC Unit/year (kWh/a)	61,3	306,6	0,0	0,0	0,0	0,0	0,0	367,9
	Stock per year (TWh/a)	8,8	43,8	0,0	0,0	0,0	0,0	0,0	52,6

Figure 1: Home Desktop PC – Comparison of all scenarios TEC



Figure 2: Home Desktop PC – Comparison of all scenarios EU total



2. Discussion of results

The use pattern for NoNA and LoNA simulates requirements outlined in TREN Lot 3 computer study. MeNA resembles always online with longest resume time of <10 seconds. A mix of LoNA and MeNA seems to be the most realistic scenario for 2010. The TEC is under 150 kWh/a, which is according to Energy Star Program Requirement quite a good value. In the assessment we are not overestimating the market. The HiNA assumption is unrealistic but helpful in that respect and was included not only due to the formal logic of the assessment model.

The overall energy consumption is decreasing over time despite a slightly growing product stock. The reason for this development is our general assumption that power consumption per mode has improved by 20% in 2020. The difference in power consumption between LoNA and MeNA is less significant. Energy impact of networked standby (indicated by the amount of idle and the low power modes) in these two scenarios is about 6 to 8 TWh per year. Improvement potential is obviously related to a further reduction of idle power level or idle time duration. The HiNA – although unrealistic – shows the impact of such long idle periods and should be the driver for improvement.

Annex 2 Environmental Assessment: Home Notebook



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Input Data

Product definition:

A Notebook is a computer designed specifically for portability and to be operated for extended periods of time either with or without a direct connection to an ac power source. Notebooks must utilize an integrated computer display and be capable of operation off of an integrated battery or other portable power source. In addition, most notebooks use an external power supply and have an integrated keyboard and pointing device. Notebook computers are typically designed to provide similar functionality to desktops, including operation of software similar in functionality as that used in desktops.[5]

Note: Thin clients and zero clients are not considered under this product category. Industry and commercially available market surveys suggest that zero clients and thin clients are a fast growing product segments which will impact not only the enterprise market but also the end-user market. The utilization of such products are to some extent different from Notebooks and Desktop PCs due to the necessary software-as-a-service platforms.

Product stock assumption:

Stock has been again based on [TREN Lot 3, 2007][6] and [ICTEE, 2008].[7] Notebooks are a more rapidly growing market segment with higher diversity performance and price. This trend could lead to a much faster increase of the installed base. However, for the purpose of this study we consider a more conservative development.

Regarding the stock assumption one might argue that because of the introduction of increasing number of fair priced Subnotebooks, Netbooks, and Tablet-PCs the market could develop much more dynamically and that the numbers of user drastically increase. The sensitivity analysis should consider this notion.

Power Modes and Power Management Options:

Notebooks are considered to have an advanced integrated power management on the basis for ACPI. They are optimized for mobile (battery) use and therefore reduce power (e.g. display dimming, shut down devices) whenever possible. The implementation of these power management options are supported by the requirements of the Energy Star Program for Computers. We assume that Notebooks are utilizing the existing hardware and software options for reducing idle power and duration and start transitioning rapidly into low power

[5] Definition according to Energy Star Program Requirements for Computers (Version 5.0)
[6] [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; http://www.ecocomputer.org
[7] [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

sleep modes S3, S4 or S5 according to a default delay time setting. In support of network availability the equipment is utilization Wake-on-LAN in the respective sleep modes.

The following power modes are considered:

Active: Mode is equivalent to G0/S0 (applications are running). According to industry sources average active mode power consumption that is approx. factor 1.2 of idle power.

Idle: Mode is equivalent to G0/S0. No application is running. [HiNA].

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is equivalent to G1/S3. Average power consumption is oriented on S3sleep with WOL. [MeNA]

LowP3: Mode is equivalent to G1/S3 (sleep).

LowP4: Mode is equivalent to G1/S4 hibernate with WOL [LoNA]

LowP5: Mode is equivalent to G2/S5 (soft off)

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

Recent data suggest that power consumption might further improve depending on the performance, configuration, and selected technologies of an individual product. It is feasible to assume that a combination of LoNA and MeNA is the most realistic real life scenario.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 3: Home Notebook – Input data for scenarios of reference year 2010

NoNA	**Home Notebook**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	90,0	40,0	0,0	0,0	0,0	0,0	15,2	145,2
63 million	TEC Unit/year (kWh/a)	32,9	14,6	0,0	0,0	0,0	0,0	5,5	53,0
	Stock per year (TWh/a)	2,1	0,9	0,0	0,0	0,0	0,0	0,3	3,3

LoNA	Home Notebook	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	90,0	40,0	0,0	0,0	0,0	28,5	0,0	158,5
63 million	TEC Unit/year (kWh/a)	32,9	14,6	0,0	0,0	0,0	10,4	0,0	57,9
	Stock per year (TWh/a)	2,1	0,9	0,0	0,0	0,0	0,7	0,0	3,6

MeNA	Home Notebook	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	3,0	2,0	0,0	19,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	90,0	40,0	0,0	51,3	0,0	0,0	0,0	181,3
63 million	TEC Unit/year (kWh/a)	32,9	14,6	0,0	18,7	0,0	0,0	0,0	66,2
	Stock per year (TWh/a)	2,1	0,9	0,0	1,2	0,0	0,0	0,0	4,2

HiNA	Home Notebook	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	90,0	420,0	0,0	0,0	0,0	0,0	0,0	510,0
63 million	TEC Unit/year (kWh/a)	32,9	153,3	0,0	0,0	0,0	0,0	0,0	186,2
	Stock per year (TWh/a)	2,1	9,7	0,0	0,0	0,0	0,0	0,0	11,7

Table 4: Home Notebook – Input data for scenarios of forecast year 2020

NoNA	**Home Notebook**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	72,0	32,0	0,0	0,0	0,0	0,0	11,4	115,4
123 million	TEC Unit/year (kWh/a)	26,3	11,7	0,0	0,0	0,0	0,0	4,2	42,1
	Stock per year (TWh/a)	3,2	1,4	0,0	0,0	0,0	0,0	0,5	5,2

LoNA	Home Notebook	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	72,0	32,0	0,0	0,0	0,0	22,8	0,0	126,8
123 million	TEC Unit/year (kWh/a)	26,3	11,7	0,0	0,0	0,0	8,3	0,0	46,3
	Stock per year (TWh/a)	3,2	1,4	0,0	0,0	0,0	1,0	0,0	5,7

MeNA	Home Notebook	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	3,0	2,0	0,0	19,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	72,0	32,0	0,0	41,8	0,0	0,0	0,0	145,8
123 million	TEC Unit/year (kWh/a)	26,3	11,7	0,0	15,3	0,0	0,0	0,0	53,2
	Stock per year (TWh/a)	3,2	1,4	0,0	1,9	0,0	0,0	0,0	6,5

HiNA	Home Notebook	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	72,0	336,0	0,0	0,0	0,0	0,0	0,0	408,0
123 million	TEC Unit/year (kWh/a)	26,3	122,6	0,0	0,0	0,0	0,0	0,0	148,9
	Stock per year (TWh/a)	3,2	15,1	0,0	0,0	0,0	0,0	0,0	18,3

Figure 3: Home Notebook – Comparison of all scenarios TEC

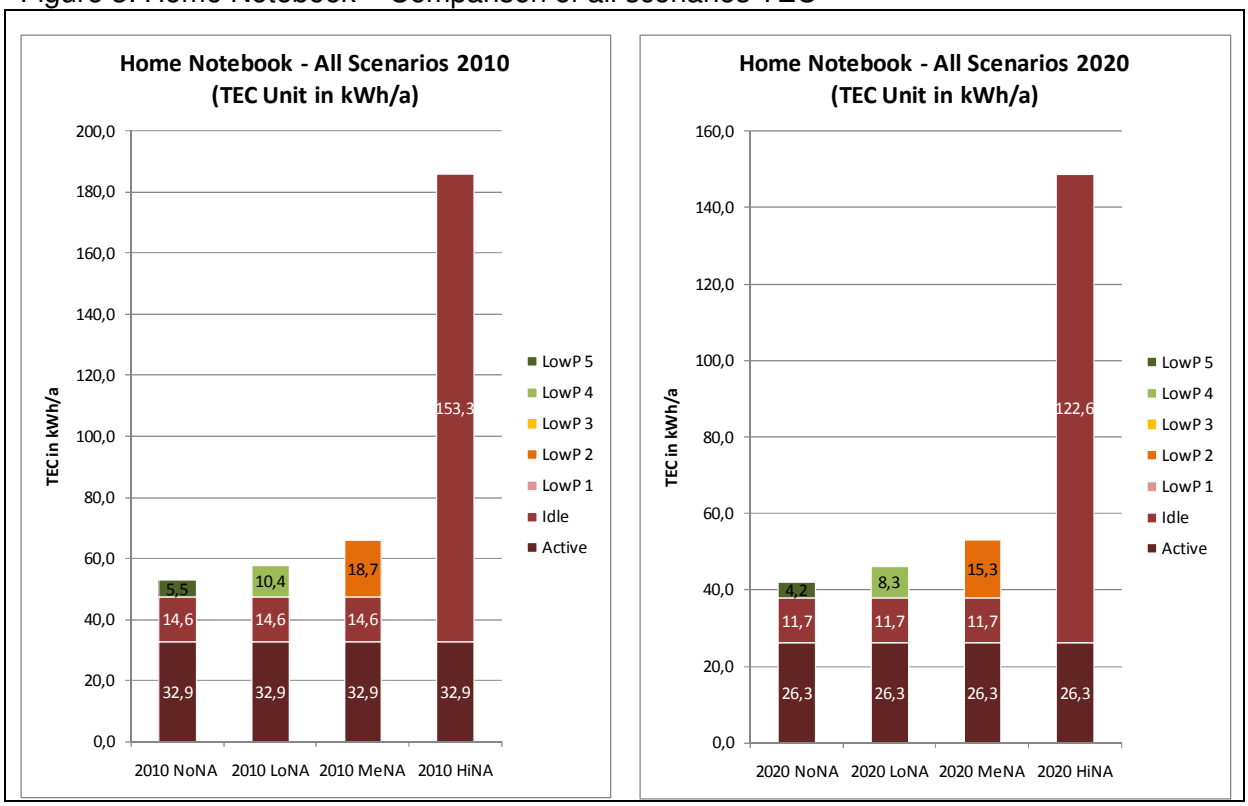
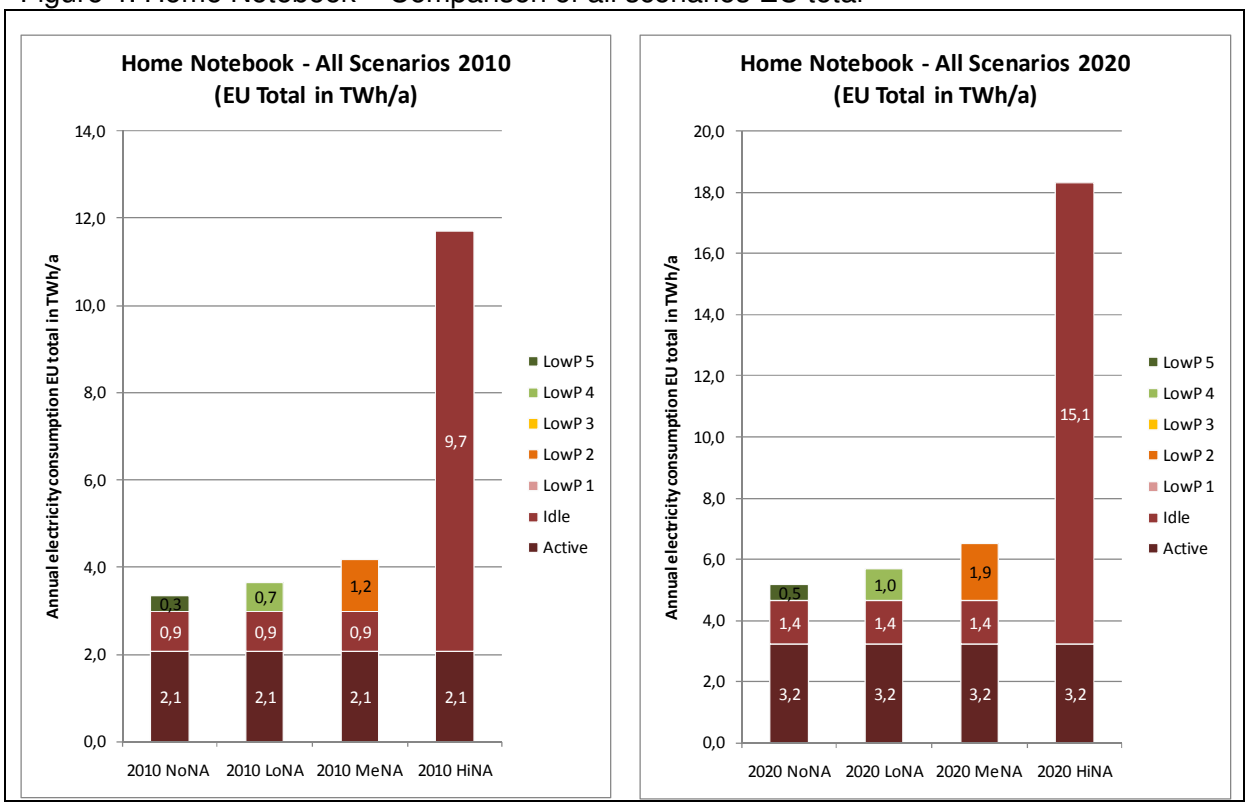


Figure 4: Home Notebook – Comparison of all scenarios EU total



2. Discussion of results

The 2020 scenarios show an overall increase in energy consumption. The main reason is the growing product stock in Europe (the stock basically doubles). On a unit level (individual product) the overall energy consumption decreases. A combination of LoNA and MeNA seems to be the most realistic (real life) development scenario. In MeNA 2020 the unit level energy consumption is with 53 kWh/a slightly lower than the LoNA 2010 with 57 kWh/a. This improvement results from our general assumption of power improvement. Against the background of products entering the market today this is a justified result. HiNA is not realistic but shows again the impact of prolonged idle mode. Energy impact of networked standby (indicated to some extent by the amount of idle and the low power modes) is about 2 TWh per year on the economy level.

Annex 3 Environmental Assessment: Home Display



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 3 – Home Display

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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Input Data

Product definition:

A display screen and its associated electronics encased in a single housing, or within the computer housing (e.g., notebook or integrated desktop computer), that is capable of displaying output information from a computer via one or more inputs, such as a VGA, DVI, Display Port, and/or IEEE 1394.[8]

We consider mostly LCD-based displays with CCFL or LED backlight. OLED displays are an emerging technology with better energy efficiency.

Product stock assumption:

Stock assumption has been based on [TREN Lot 3, 2007][9] and [ICTEE, 2008][10]. The current penetration rate of almost 80% seems realistic taking the fact into account, that 65% of households use the Internet. Forecast reflects further dissemination of Desktop PC, other computing equipment and the trend to utilize more than one display. Household penetration rate is reaching about 100% by 2020. Further increase might be slowed by faster dissemination of Notebooks, Thin clients and the use of larger TV-displays.

Power Modes and Power Management Options:

The display features an active mode and two low power modes.

Active: Mode in which the equipment provides a picture according to the input from the computer. Energy consumption could vary according to the display technology, dynamic backlight adjustment and selected brightness setting.

LowP2: Mode is equivalent to sleep with wake-up over network.

LowP5: Mode is equivalent to soft off.

The daily use pattern of the display has been aligned to the use of the home desktop PC.

Explanatory notes 2020:

The general mode and use assumption is similar to the reference year 2010. General improvement of power consumption per mode: 20%

[8] Definition according to Energy Star Program Requirements for Computers (Version 5.0)
[9] [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; http://www.ecocomputer.org
[10] [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

Further reduction in on-mode power (W/cm²) is feasible. However, we assume that the average screen size will increase over time and compensate the improvement to some extent.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 5: Home Display – Input data for scenarios of reference year 2010

NoNA	**Home Display 22"**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	0,0	0,0	2,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	75,0	0,0	0,0	2,4	0,0	0,0	7,6	85,0
141 million	TEC Unit/year (kWh/a)	27,4	0,0	0,0	0,9	0,0	0,0	2,8	31,0
	Stock per year (TWh/a)	3,9	0,0	0,0	0,1	0,0	0,0	0,4	4,4

LoNA	Home Display 22"	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	0,0	0,0	10,5	0,0	0,0	10,5	24,0
365 d/a	Mode Power (Wh/d)	75,0	0,0	0,0	12,6	0,0	0,0	4,2	91,8
141 million	TEC Unit/year (kWh/a)	27,4	0,0	0,0	4,6	0,0	0,0	1,5	33,5
	Stock per year (TWh/a)	3,9	0,0	0,0	0,6	0,0	0,0	0,2	4,7

MeNA	Home Display 22"	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	0,0	0,0	21,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	75,0	0,0	0,0	25,2	0,0	0,0	0,0	100,2
141 million	TEC Unit/year (kWh/a)	27,4	0,0	0,0	9,2	0,0	0,0	0,0	36,6
	Stock per year (TWh/a)	3,9	0,0	0,0	1,3	0,0	0,0	0,0	5,2

HiNA	Home Display 22"	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	0,0	0,0	21,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	75,0	0,0	0,0	25,2	0,0	0,0	0,0	100,2
141 million	TEC Unit/year (kWh/a)	27,4	0,0	0,0	9,2	0,0	0,0	0,0	36,6
	Stock per year (TWh/a)	3,9	0,0	0,0	1,3	0,0	0,0	0,0	5,2

Table 6: Home Display – Input data for scenarios of forecast year 2020

NoNA	**Home Display 22"**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,0	0,0	0,0	0,3	
Stock	Use hours (h/d)	3,0	0,0	0,0	2,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	60,0	0,0	0,0	2,0	0,0	0,0	5,7	67,7
164 million	TEC Unit/year (kWh/a)	21,9	0,0	0,0	0,7	0,0	0,0	2,1	24,7
	Stock per year (TWh/a)	3,6	0,0	0,0	0,1	0,0	0,0	0,3	4,1

LoNA	Home Display 22"	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,0	0,0	0,0	0,3	
Stock	Use hours (h/d)	3,0	0,0	0,0	10,5	0,0	0,0	10,5	24,0
365 d/a	Mode Power (Wh/d)	60,0	0,0	0,0	10,5	0,0	0,0	3,2	73,7
164 million	TEC Unit/year (kWh/a)	21,9	0,0	0,0	3,8	0,0	0,0	1,1	26,9
	Stock per year (TWh/a)	3,6	0,0	0,0	0,6	0,0	0,0	0,2	4,4

MeNA	Home Display 22"	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,0	0,0	0,0	0,3	
Stock	Use hours (h/d)	3,0	0,0	0,0	21,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	60,0	0,0	0,0	21,0	0,0	0,0	0,0	81,0
164 million	TEC Unit/year (kWh/a)	21,9	0,0	0,0	7,7	0,0	0,0	0,0	29,6
	Stock per year (TWh/a)	3,6	0,0	0,0	1,3	0,0	0,0	0,0	4,8

HiNA	Home Display 22"	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,0	0,0	0,0	0,3	
Stock	Use hours (h/d)	3,0	0,0	0,0	21,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	60,0	0,0	0,0	21,0	0,0	0,0	0,0	81,0
164 million	TEC Unit/year (kWh/a)	21,9	0,0	0,0	7,7	0,0	0,0	0,0	29,6
	Stock per year (TWh/a)	3,6	0,0	0,0	1,3	0,0	0,0	0,0	4,8

Figure 5: Home Display – Comparison of all scenarios TEC

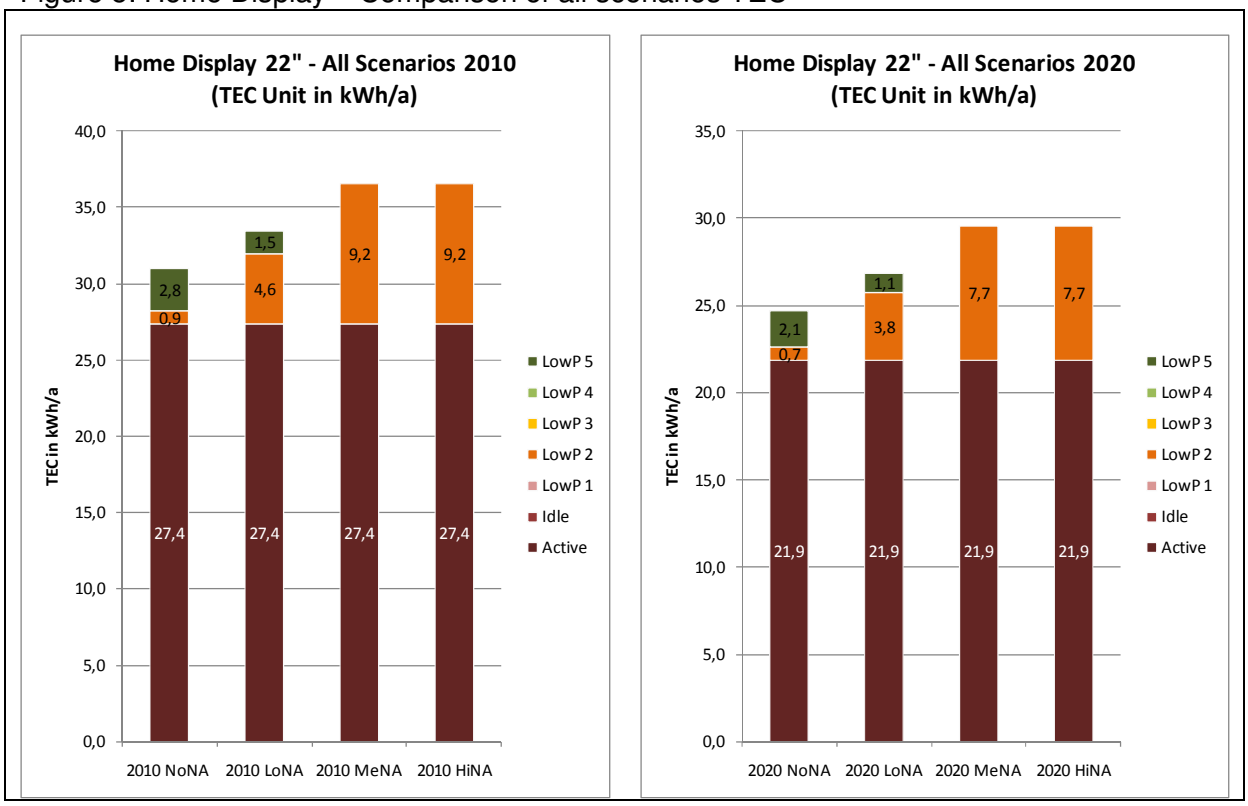
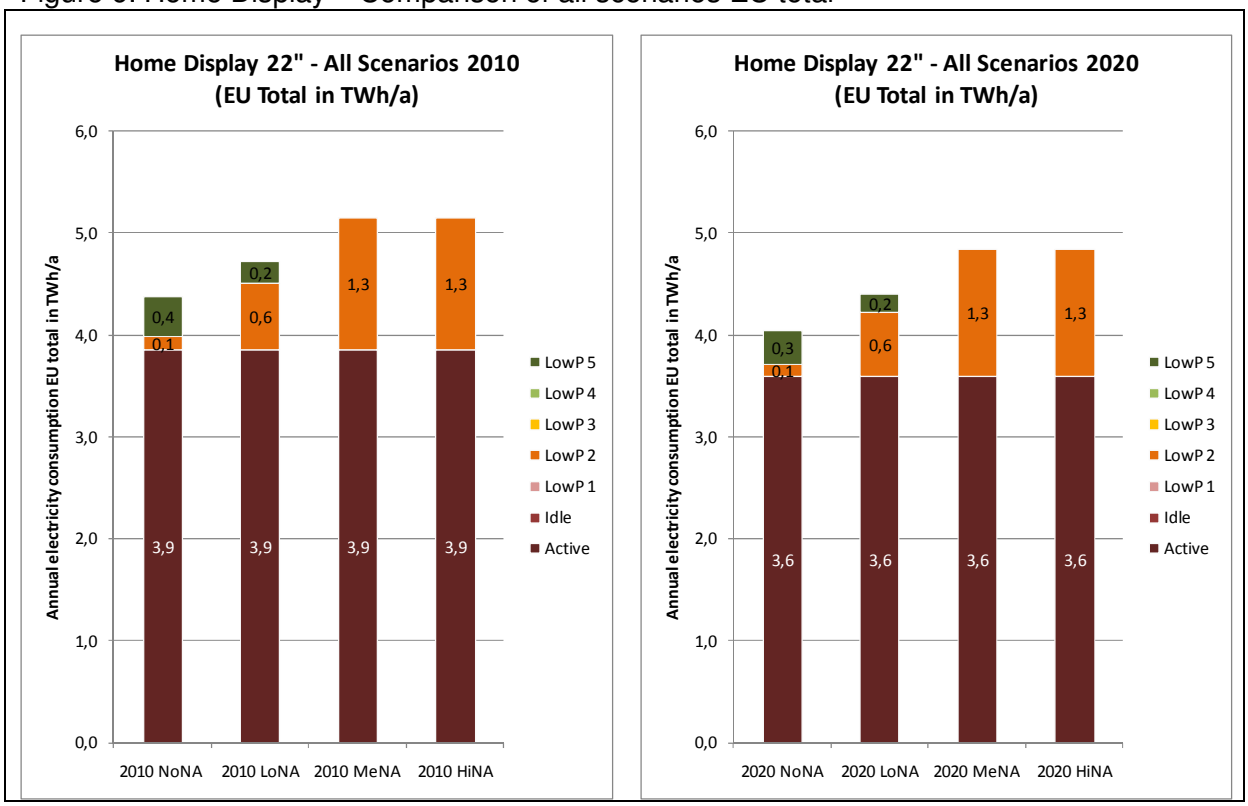


Figure 6: Home Display – Comparison of all scenarios EU total



2. Discussion of results

The overall energy consumption decreases by 2020 due to the general improvement of power consumption per mode. Networked standby power accounts on an economy level for little over 1 TWh per year. Further improvement potential is related to active/idle power management in conjunction with the PC use. Examples are active user detection (sensors), dynamic brightness adjustment and local dimming.

Annex 4 Environmental Assessment: Home NAS



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 4 – Home NAS

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Input Data

Product definition:

Networked Attached Storage unit is a small computer typically LAN or USB connected and only provides file-based data storage services to other devices on the network. NAS systems contain one or more hard disks (HDD) or Solid State Devices (SSD), often arranged into logical, redundant storage containers or RAID arrays.[11] Wireless (WLAN) access is likely in the future. We do not consider larger NAS (more than 2 HDDs) in the home environment.

Small NAS (e.g. external HDD/SSD) are utilized more and more in conjunction with PC and Internet applications (http/ftp-access, Mail-Client, etc.), as well as TV and STBs.

Product stock assumption:

Actual market data have not been available from public sources. Stock and forecast estimates have been based on simple assumption regarding current and future household penetration rate.

Power Modes and Power Management Options:

The product is considered to have a similar mode structure as a computer. However actual mode utilization might differ from computers

Active: Mode is equivalent to G0/S0 (applications are running). According to industry sources average active mode power consumption that is approx. factor 1.2 of idle power.

Idle: Mode is equivalent to G0/S0. No application is running [HiNA].

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is equivalent to G1/S3. Average power consumption is oriented on S3sleep with WOL. [MeNA]

LowP4: Mode is equivalent to G2/S5 with WOL [LoNA]

LowP5: Mode is equivalent to G2/S5 (soft off)

Explanatory notes 2020:

11 Wikipedia: Network-attached storage; http://en.wikipedia.org/wiki/Network-attached_storage

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

Stock is increasingly growing due to the understanding, that external or networked attached storage devices are used in conjunction with media servers.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are MeNA 2010 to MeNA 2020.

Table 7: Home NAS – Input data for scenarios of reference year 2010

NoNA	**Home NAS**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	15,0	0,0	5,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	60,0	30,0	0,0	0,0	0,0	0,0	9,5	99,5
10 million	TEC Unit/year (kWh/a)	21,9	11,0	0,0	0,0	0,0	0,0	3,5	36,3
	Stock per year (TWh/a)	0,2	0,1	0,0	0,0	0,0	0,0	0,0	0,4

LoNA	Home NAS	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	15,0	0,0	5,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	3,0	2,0	0,0	9,5	0,0	0,0	9,5	24,0
365 d/a	Mode Power (Wh/d)	60,0	30,0	0,0	47,5	0,0	0,0	4,8	142,3
10 million	TEC Unit/year (kWh/a)	21,9	11,0	0,0	17,3	0,0	0,0	1,7	51,9
	Stock per year (TWh/a)	0,2	0,1	0,0	0,2	0,0	0,0	0,0	0,5

MeNA	Home NAS	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	15,0	0,0	5,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	3,0	2,0	0,0	19,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	60,0	30,0	0,0	95,0	0,0	0,0	0,0	185,0
10 million	TEC Unit/year (kWh/a)	21,9	11,0	0,0	34,7	0,0	0,0	0,0	67,5
	Stock per year (TWh/a)	0,2	0,1	0,0	0,3	0,0	0,0	0,0	0,7

HiNA	Home NAS	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	15,0	0,0	5,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	60,0	315,0	0,0	0,0	0,0	0,0	0,0	375,0
10 million	TEC Unit/year (kWh/a)	21,9	115,0	0,0	0,0	0,0	0,0	0,0	136,9
	Stock per year (TWh/a)	0,2	1,1	0,0	0,0	0,0	0,0	0,0	1,4

Table 8: Home NAS – Input data for scenarios of forecast year 2020

NoNA	**Home NAS**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,0	0,0	4,0	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	2,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	48,0	24,0	0,0	0,0	0,0	0,0	7,6	79,6
30 million	TEC Unit/year (kWh/a)	17,5	8,8	0,0	0,0	0,0	0,0	2,8	29,1
	Stock per year (TWh/a)	0,5	0,3	0,0	0,0	0,0	0,0	0,1	0,9

LoNA	Home NAS	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,0	0,0	4,0	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	2,0	0,0	9,5	0,0	0,0	9,5	24,0
365 d/a	Mode Power (Wh/d)	48,0	24,0	0,0	38,0	0,0	0,0	3,8	113,8
30 million	TEC Unit/year (kWh/a)	17,5	8,8	0,0	13,9	0,0	0,0	1,4	41,5
	Stock per year (TWh/a)	0,5	0,3	0,0	0,4	0,0	0,0	0,0	1,2

MeNA	Home NAS	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,0	0,0	4,0	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	2,0	0,0	19,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	48,0	24,0	0,0	76,0	0,0	0,0	0,0	148,0
30 million	TEC Unit/year (kWh/a)	17,5	8,8	0,0	27,7	0,0	0,0	0,0	54,0
	Stock per year (TWh/a)	0,5	0,3	0,0	0,8	0,0	0,0	0,0	1,6

HiNA	Home NAS	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,0	0,0	4,0	0,0	0,0	0,4	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	48,0	252,0	0,0	0,0	0,0	0,0	0,0	300,0
30 million	TEC Unit/year (kWh/a)	17,5	92,0	0,0	0,0	0,0	0,0	0,0	109,5
	Stock per year (TWh/a)	0,5	2,8	0,0	0,0	0,0	0,0	0,0	3,3

Figure 7: Home NAS – Comparison of all scenarios TEC

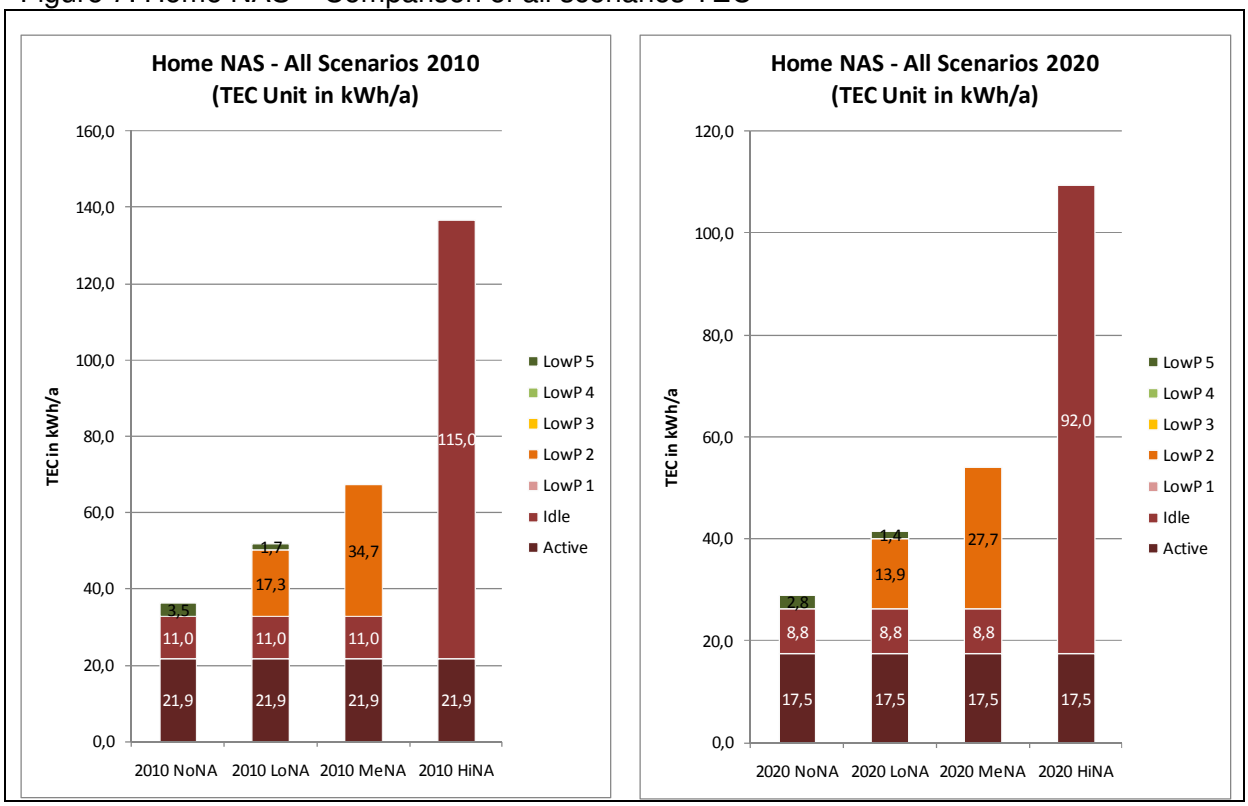
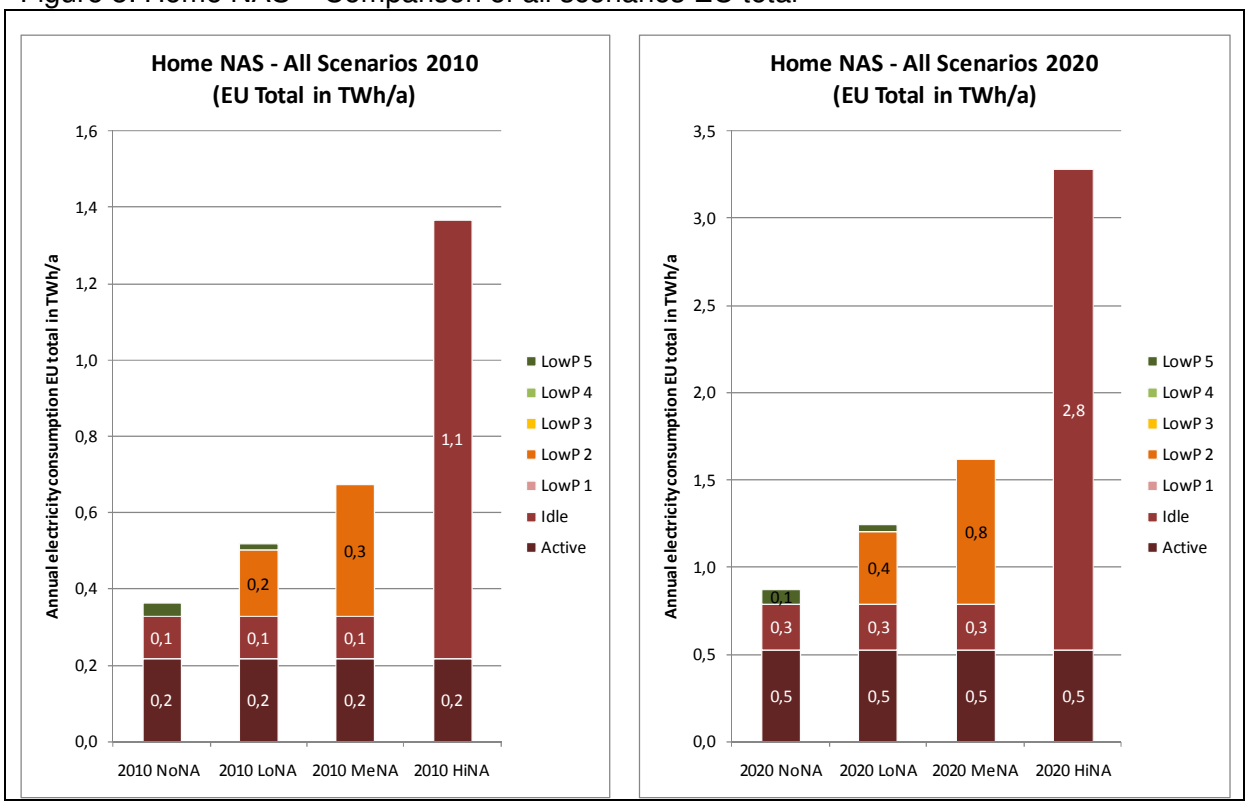


Figure 8: Home NAS – Comparison of all scenarios EU total



2. Discussion of results

The overall energy consumption related to external or network attached storage devices are increasing due to the growing installed base (EU stock). Due to our assumption of small NAS the overall energy impact is rather small although the HINA scenario suggests that larger NAS could have a significant impact on the scale of a few TWh per year. Energy impact of networked standby (indicated to some extent by the amount of idle and the low power modes) is in the MeNA 2020 scenario about 1 TWh per year. This overall low level should not be underestimated. With the ongoing digitalization of media (e.g. music, video, picture, games, mail, documents) the external storage capacity will considerably increase. Redundancy (back-up) is also a factor that needs attention in that respect. The NAS example shows that power management – even for smaller computer peripheral devices – is an important issue.

Annex 5 Environmental Assessment: Home Inkjet Printer/MFD



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 5 –
Home Inkjet Printer/MFD

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Dr. Andreas Middendorf, Technische Universität Berlin and Fraunhofer IZM

Disclaimer

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Input Data

Product definition:

The product and technology definitions are according to Energy Star Program Requirements for Imaging Equipment. This product category combines single function printer, copier or multifunctional devices with Ink-Jet (IJ) marking technology. In support of network availability the equipment is utilization different network options including wired (LAN, USB) and as a growing application wireless (WLAN, Bluetooth).

Product stock assumption:

Stock data have been again slightly modified from [TREN Lot 4, 2007][12] and [ICTEE, 2008] in order to distinguish between home and office use. The installed base seems again a little bit low.

Power Modes and Power Management Options:

Imaging equipment such as IJ-Printer/MFD is considered to have an integrated power management. The implementation of these power management options are supported by the requirements of the Energy Star Program for Imaging Equipment although the so called functional added approach seems to be less ambitious. We assume that IJ-Printer/MFD are utilizing the existing hardware and software options for reducing idle power and duration and start transitioning into a low power sleep mode according to a default delay time setting.

The following power modes are considered:

Active: Mode is equivalent to G0/S0 (applications are running).

Idle: Mode is equivalent to “ready mode” (imaging equipment industry terminology). The delay time after the print job is assumed to be no more than 5 to 10 minutes [HiNA]. Then the device shifts into LowP2. A prolonged idle mode is not assumed in the HiNA scenario due to the existing power management.

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is a sleep mode from which the product can resume operation within 10 to 20 seconds depending on the device. In this mode the product is fax capable (MeNA).

LowP4: Mode is equivalent to soft-off with WOL [LoNA]

LowP5: Mode is equivalent to soft-off

[12] [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; http://www.ecoimaging.org

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to LoNA 2020. This selected scenario considers best practice and the implementation of advanced power management (about 80% of products fulfill Energy Star Program Requirements). The MeNA scenario (e.g. the assumption that the equipment is use with wireless LAN interface) would increase overall energy consumption considerably. Again, we try to show a tendency in the market. For an individual environmental assessment the reader should consider mixed scenarios including prolonged medium network availability phases.

Table 9: Home Inkjet Printer/MFD – Input data for scenarios of reference year 2010

NoNA	**Home IJ Printer**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	3,4	15,3	0,0	16,0	0,0	0,0	9,5	44,2
76 million	TEC Unit/year (kWh/a)	1,2	5,6	0,0	5,8	0,0	0,0	3,5	16,1
	Stock per year (TWh/a)	0,1	0,4	0,0	0,4	0,0	0,0	0,3	1,2

LoNA	Home IJ Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	3,4	15,3	0,0	16,0	0,0	28,5	0,0	63,2
76 million	TEC Unit/year (kWh/a)	1,2	5,6	0,0	5,8	0,0	10,4	0,0	23,1
	Stock per year (TWh/a)	0,1	0,4	0,0	0,4	0,0	0,8	0,0	1,8

MeNA	Home IJ Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	3,4	15,3	0,0	92,0	0,0	0,0	0,0	110,7
76 million	TEC Unit/year (kWh/a)	1,2	5,6	0,0	33,6	0,0	0,0	0,0	40,4
	Stock per year (TWh/a)	0,1	0,4	0,0	2,6	0,0	0,0	0,0	3,1

HiNA	Home IJ Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	3,4	15,3	0,0	92,0	0,0	0,0	0,0	110,7
76 million	TEC Unit/year (kWh/a)	1,2	5,6	0,0	33,6	0,0	0,0	0,0	40,4
	Stock per year (TWh/a)	0,1	0,4	0,0	2,6	0,0	0,0	0,0	3,1

Table 10: Home Inkjet Printer/MFD – Input data for scenarios of forecast year 2020

NoNA	**Home IJ Printer**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	2,7	12,2	0,0	12,8	0,0	0,0	7,6	35,4
84 million	TEC Unit/year (kWh/a)	1,0	4,5	0,0	4,7	0,0	0,0	2,8	12,9
	Stock per year (TWh/a)	0,1	0,4	0,0	0,4	0,0	0,0	0,2	1,1

LoNA	Home IJ Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	2,7	12,2	0,0	12,8	0,0	22,8	0,0	50,6
84 million	TEC Unit/year (kWh/a)	1,0	4,5	0,0	4,7	0,0	8,3	0,0	18,5
	Stock per year (TWh/a)	0,1	0,4	0,0	0,4	0,0	0,7	0,0	1,6

MeNA	Home IJ Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	2,7	12,2	0,0	73,6	0,0	0,0	0,0	88,6
84 million	TEC Unit/year (kWh/a)	1,0	4,5	0,0	26,9	0,0	0,0	0,0	32,3
	Stock per year (TWh/a)	0,1	0,4	0,0	2,3	0,0	0,0	0,0	2,7

HiNA	Home IJ Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	2,7	12,2	0,0	73,6	0,0	0,0	0,0	88,6
84 million	TEC Unit/year (kWh/a)	1,0	4,5	0,0	26,9	0,0	0,0	0,0	32,3
	Stock per year (TWh/a)	0,1	0,4	0,0	2,3	0,0	0,0	0,0	2,7

Figure 9: Home Inkjet Printer/MFD – Comparison of all scenarios TEC

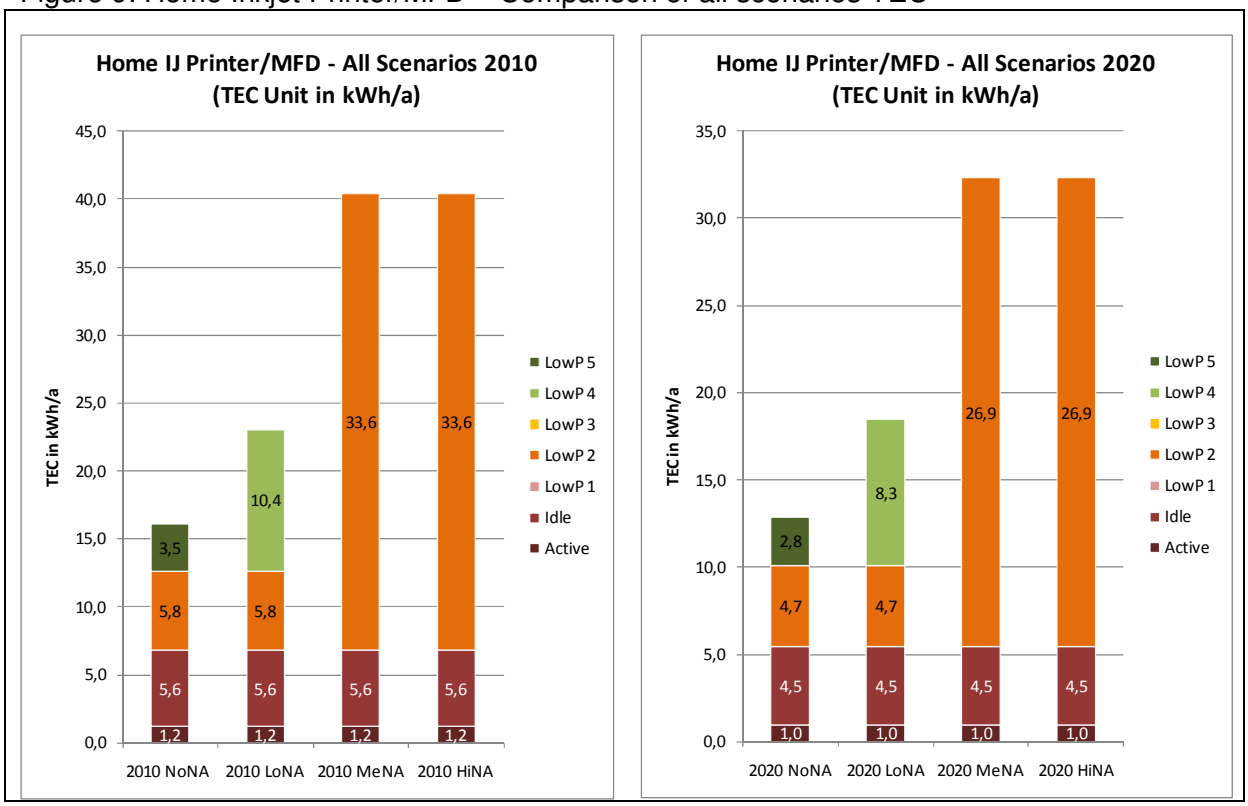
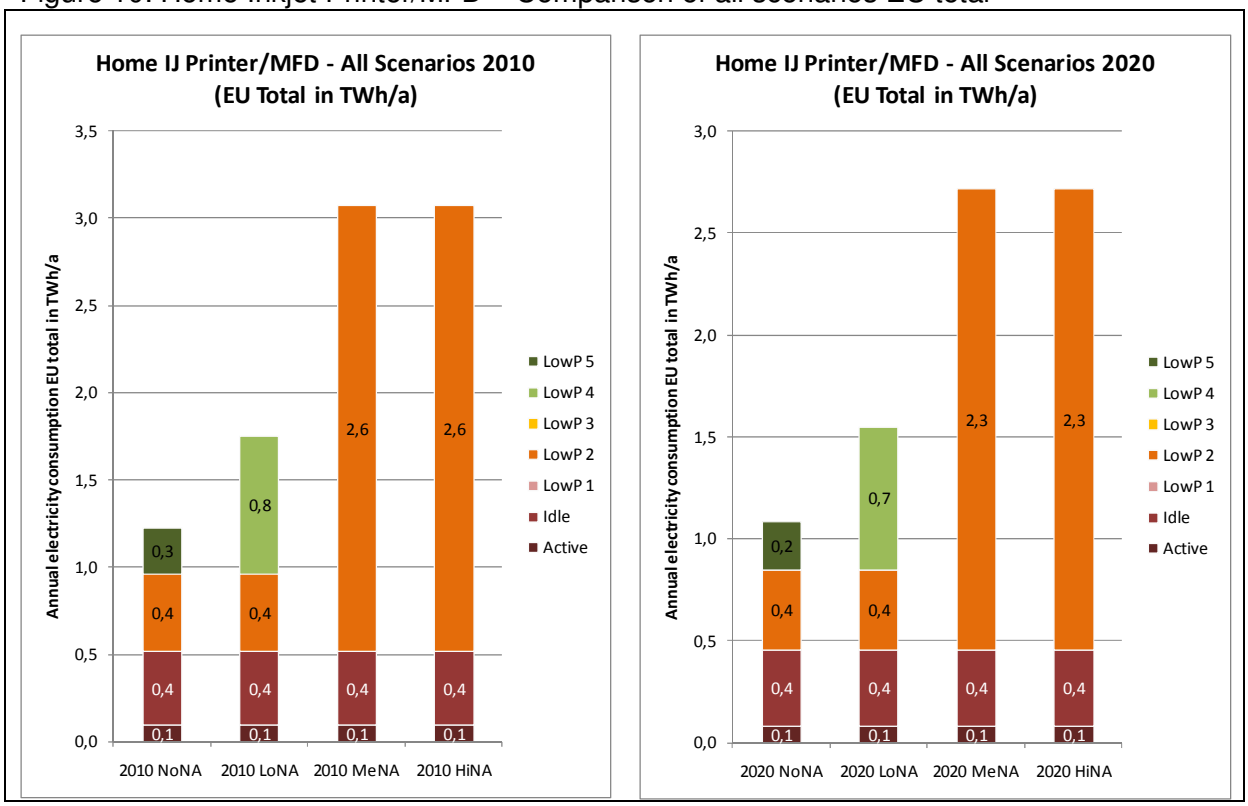


Figure 10: Home Inkjet Printer/MFD – Comparison of all scenarios EU total



2. Discussion of results

The environmental assessment of home IJ-Printer/MDF considered the implementation of power management, moderate use and stock increase, as well as a further general 20% improvement of power consumption per mode. A mix of LoNA and MeNA should be considered a real life scenario. The MeNA scenario is insofar realistic due to the growing application of wireless network technology. Against that background economy level energy consumption is with about 3 TWh per year on a good level. Active use is not dominant. This indicates the importance of power management and the utilization of low power modes. The LowP2 (MeNA) energy consumption is with more than 2 TWh per year considerable. New network options (wireless) in conjunction with larger data volumes could easily increase the overall energy consumptions. The product group should be considered for networked standby.

Annex 6 Environmental Assessment: Home EP Printer



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 6 – Home EP Printer

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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.

Input Data

Product definition:

The product and technology definitions are according to Energy Star Program Requirements for Imaging Equipment. This product category combines single function printer, copier or multifunctional devices with Electro-Photography (EP) marking technology. In support of network availability the equipment is utilization different network options including wired (LAN, USB) and as a growing application wireless (WLAN). This product group represents a typical multifunction laser printer with output of about 25 images per minute.

Product stock assumption:

Stock data have been again slightly modified from [TREN Lot 4, 2007][13] and [ICTEE, 2008] in order to distinguish between home and office use. The available stock figures seem to be low.

Power Modes and Power Management Options:

Imaging equipment such as EP-Printer/MFD is considered to have a highly advanced power management. The implementation of these power management options are supported by the requirements of the Energy Star Program for Imaging Equipment based on the Typical Energy Consumption (TEC) approach. We assume that EP-Printer/MFD are utilizing the existing hardware and software options for reducing idle power and duration immediately and start transitioning into a low power sleep mode according to a default delay time setting.

The following power modes are considered:

Active: Mode is equivalent to G0/S0 (applications are running).

Idle: Mode is equivalent to “ready mode” (imaging equipment industry terminology). The delay time after the print job is assumed to be no more than 5 to 10 minutes [HiNA]. Then the device shifts into LowP2. A prolonged idle mode is not assumed in the HiNA scenario due to the existing power management.

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is a sleep mode from which the product can resume operation within 10 to 20 seconds depending on the device. In this mode the product is fax capable (MeNA).

LowP4: Mode is equivalent to soft-off with WOL [LoNA]

[13] [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; http://www.ecoimaging.org

LowP5: Mode is equivalent to soft-off

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

During the investigation of exemplary products we observed that products featuring Energy Star Label or the Blue Angel Label have considerably lower ready and sleep mode power consumption and feature strict power management settings. For example idle mode for a similar product could be 50 Watt or 120 Watt. Such differences are influencing the impact of this product group to a large extent.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to LoNA 2020. This selected scenario considers best practice and the implementation of advanced power management (about 80% of products fulfill Energy Star Program Requirements). The MeNA scenario assumes an increasing utilization of the wireless LAN interface for data input. With the selected scenario we try to show a tendency in the market. For an individual environmental assessment the reader should consider mixed scenarios including prolonged medium and high network availability phases. A consequent HiNA scenario with prolonged idle mode is not considered.

Table 11: Home EP Printer – Input data for scenarios of reference year 2010

NoNA	**Home EP Printer**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	500,0	50,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	50,0	45,0	0,0	40,0	0,0	0,0	9,5	144,5
5 million	TEC Unit/year (kWh/a)	18,3	16,4	0,0	14,6	0,0	0,0	3,5	52,7
	Stock per year (TWh/a)	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,3

LoNA	Home EP Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	500,0	50,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	50,0	45,0	0,0	40,0	0,0	133,0	0,0	268,0
5 million	TEC Unit/year (kWh/a)	18,3	16,4	0,0	14,6	0,0	48,5	0,0	97,8
	Stock per year (TWh/a)	0,1	0,1	0,0	0,1	0,0	0,2	0,0	0,5

MeNA	Home EP Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	500,0	50,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	50,0	45,0	0,0	230,0	0,0	0,0	0,0	325,0
5 million	TEC Unit/year (kWh/a)	18,3	16,4	0,0	84,0	0,0	0,0	0,0	118,6
	Stock per year (TWh/a)	0,1	0,1	0,0	0,4	0,0	0,0	0,0	0,6

HiNA	Home EP Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	500,0	50,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	50,0	45,0	0,0	230,0	0,0	0,0	0,0	325,0
5 million	TEC Unit/year (kWh/a)	18,3	16,4	0,0	84,0	0,0	0,0	0,0	118,6
	Stock per year (TWh/a)	0,1	0,1	0,0	0,4	0,0	0,0	0,0	0,6

Table 12: Home EP Printer – Input data for scenarios of forecast year 2020

NoNA	**Home EP Printer**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	400,0	40,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	40,0	36,0	0,0	32,0	0,0	0,0	7,6	115,6
7 million	TEC Unit/year (kWh/a)	14,6	13,1	0,0	11,7	0,0	0,0	2,8	42,2
	Stock per year (TWh/a)	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,3

LoNA	Home EP Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	400,0	40,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	4,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	40,0	36,0	0,0	32,0	0,0	106,4	0,0	214,4
7 million	TEC Unit/year (kWh/a)	14,6	13,1	0,0	11,7	0,0	38,8	0,0	78,3
	Stock per year (TWh/a)	0,1	0,1	0,0	0,1	0,0	0,3	0,0	0,5

MeNA	Home EP Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	400,0	40,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	40,0	36,0	0,0	184,0	0,0	0,0	0,0	260,0
7 million	TEC Unit/year (kWh/a)	14,6	13,1	0,0	67,2	0,0	0,0	0,0	94,9
	Stock per year (TWh/a)	0,1	0,1	0,0	0,5	0,0	0,0	0,0	0,7

HiNA	Home EP Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	400,0	40,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,1	0,9	0,0	23,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	40,0	36,0	0,0	184,0	0,0	0,0	0,0	260,0
7 million	TEC Unit/year (kWh/a)	14,6	13,1	0,0	67,2	0,0	0,0	0,0	94,9
	Stock per year (TWh/a)	0,1	0,1	0,0	0,5	0,0	0,0	0,0	0,7

Figure 11: Home EP Printer – Comparison of all scenarios TEC

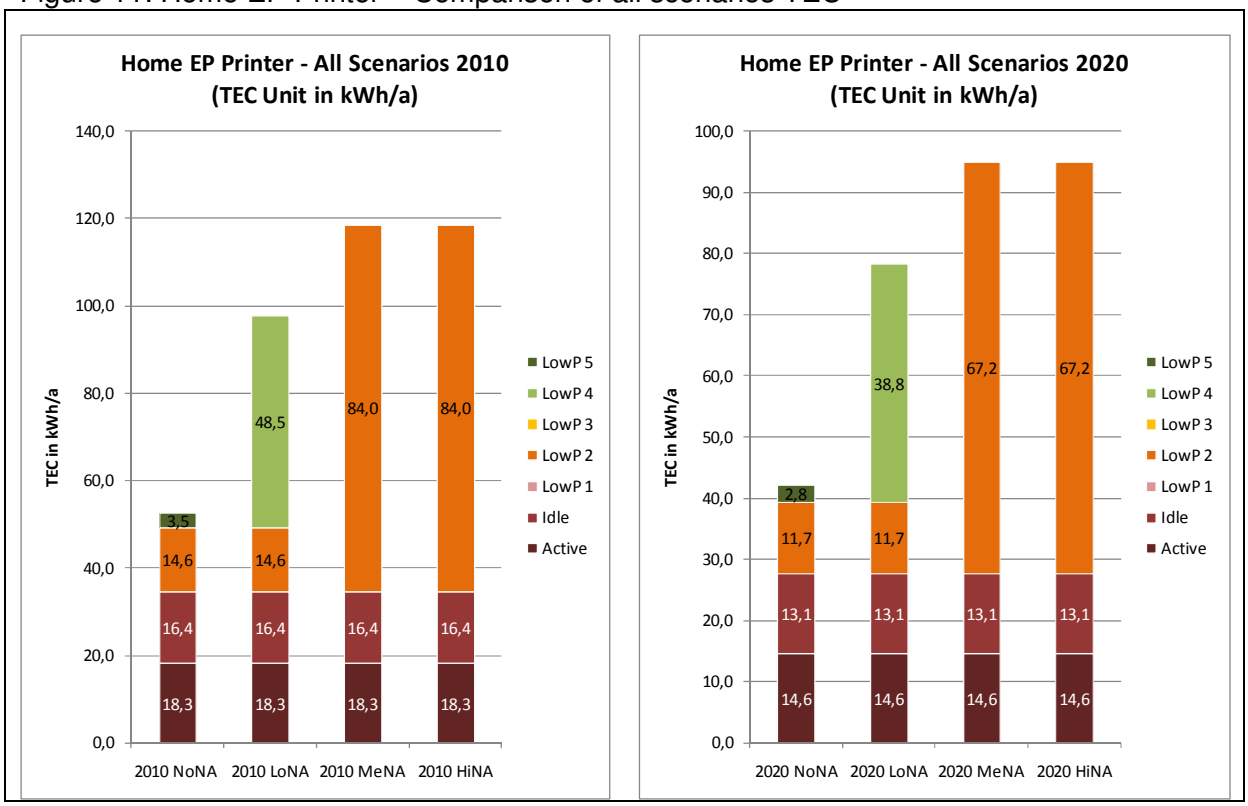
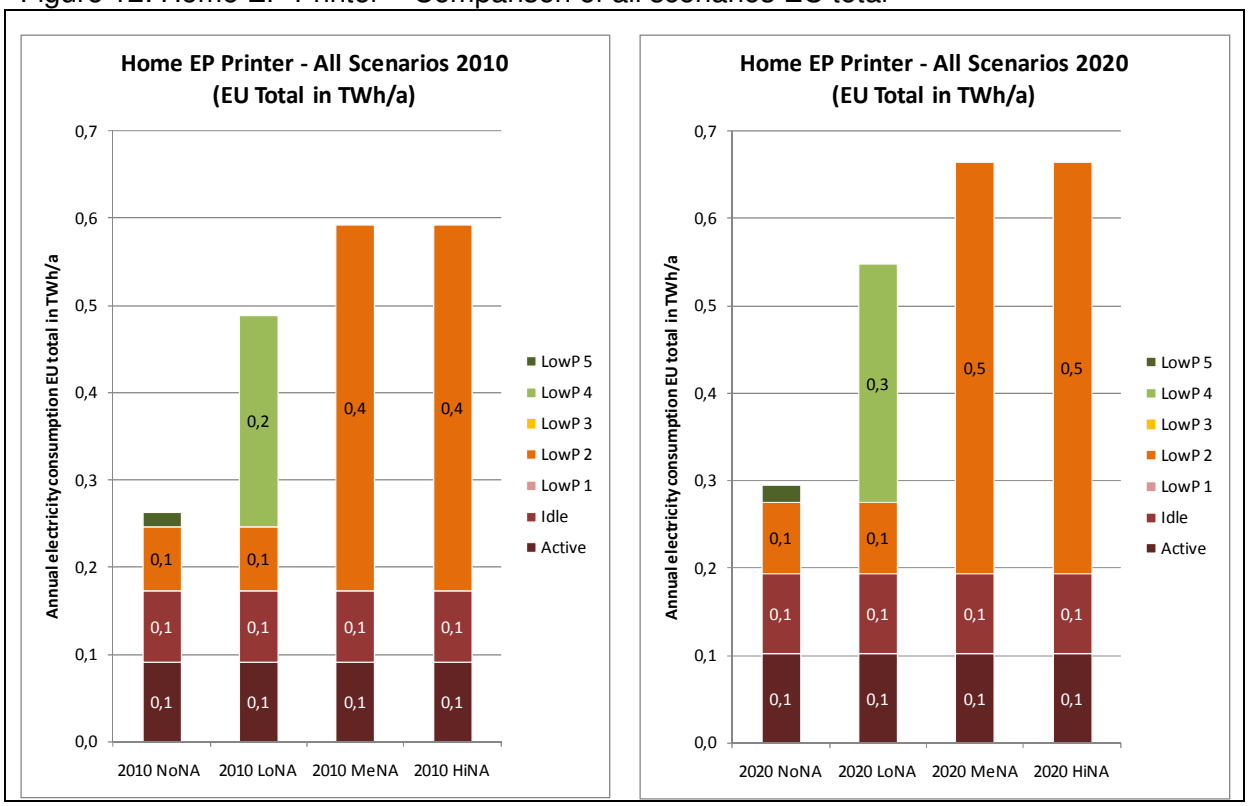


Figure 12: Home EP Printer – Comparison of all scenarios EU total



2. Discussion of results

The overall energy impact of this product groups is less than 1 TWh. The low market penetration of 3.4% (7 million units in a total of 205 million households) influences this result. The industry has displayed in the past years great awareness for power management. This resulted in an improvement of the product's overall energy efficiency. A mix of LoNA and MeNA should be considered a real life scenario. The MeNA scenario is insofar realistic due to the growing application of wireless network technology. The LoNA 2010 to LoNA 2020 scenario has been selected for the base case in order to show realistic proportions.

Annex 7 Environmental Assessment: Home Phones



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 7 – Home Phones

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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.

Input Data

Product definition:

A home phone is defined as a commercially available electronic product with a base station and a handset whose purpose is to convert sound into electrical impulses for transmission. Most of these devices require an external power supply for power, are plugged into an AC power outlet for 24 hours per day, and do not have a power switch to turn them off. To qualify, the base station of the cordless phone or its power supply must be designed to plug into a wall outlet and there must not be a physical connection between the portable handset and the phone jack.[14]

The product group is represented by an average DECT telephone.

Product stock assumption:

Stock based on ICTEE, 2008. Data given for 2010 and 2020, interpolated for 2015

Power Modes and Power Management Options:

The telephone is ether active or idle. Own measurements indicate that some telephones actually consume more power in idle, because the display is on when the device is in the cradle. Product is always online (HiNA). We therefore made no use distinction in the scenarios.

Explanatory notes 2020:

Energy consumption per mode is assumed to decrease by 20% across all modes.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

[14] Product and technology definitions according to Energy Start Program Requirements for Telephony.

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 13: Home Phones – Input data for scenarios of reference year 2010

NoNA	**Phones**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,5	3,5	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	9,0	77,0	0,0	0,0	0,0	0,0	0,0	86,0
141 million	TEC Unit/year (kWh/a)	3,3	28,1	0,0	0,0	0,0	0,0	0,0	31,4
	Stock per year (TWh/a)	0,5	4,0	0,0	0,0	0,0	0,0	0,0	4,4

LoNA	Phones	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,5	3,5	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	9,0	77,0	0,0	0,0	0,0	0,0	0,0	86,0
141 million	TEC Unit/year (kWh/a)	3,3	28,1	0,0	0,0	0,0	0,0	0,0	31,4
	Stock per year (TWh/a)	0,5	4,0	0,0	0,0	0,0	0,0	0,0	4,4

MeNA	Phones	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,5	3,5	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	9,0	77,0	0,0	0,0	0,0	0,0	0,0	86,0
141 million	TEC Unit/year (kWh/a)	3,3	28,1	0,0	0,0	0,0	0,0	0,0	31,4
	Stock per year (TWh/a)	0,5	4,0	0,0	0,0	0,0	0,0	0,0	4,4

HiNA	Phones	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,5	3,5	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	9,0	77,0	0,0	0,0	0,0	0,0	0,0	86,0
141 million	TEC Unit/year (kWh/a)	3,3	28,1	0,0	0,0	0,0	0,0	0,0	31,4
	Stock per year (TWh/a)	0,5	4,0	0,0	0,0	0,0	0,0	0,0	4,4

Table 14: Home Phones – Input data for scenarios of forecast year 2020

NoNA	**Phones**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	3,6	2,8	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	7,2	61,6	0,0	0,0	0,0	0,0	0,0	68,8
205 million	TEC Unit/year (kWh/a)	2,6	22,5	0,0	0,0	0,0	0,0	0,0	25,1
	Stock per year (TWh/a)	0,5	4,6	0,0	0,0	0,0	0,0	0,0	5,1

LoNA	Phones	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	3,6	2,8	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	7,2	61,6	0,0	0,0	0,0	0,0	0,0	68,8
205 million	TEC Unit/year (kWh/a)	2,6	22,5	0,0	0,0	0,0	0,0	0,0	25,1
	Stock per year (TWh/a)	0,5	4,6	0,0	0,0	0,0	0,0	0,0	5,1

MeNA	Phones	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	3,6	2,8	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	7,2	61,6	0,0	0,0	0,0	0,0	0,0	68,8
205 million	TEC Unit/year (kWh/a)	2,6	22,5	0,0	0,0	0,0	0,0	0,0	25,1
	Stock per year (TWh/a)	0,5	4,6	0,0	0,0	0,0	0,0	0,0	5,1

HiNA	Phones	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	3,6	2,8	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	7,2	61,6	0,0	0,0	0,0	0,0	0,0	68,8
205 million	TEC Unit/year (kWh/a)	2,6	22,5	0,0	0,0	0,0	0,0	0,0	25,1
	Stock per year (TWh/a)	0,5	4,6	0,0	0,0	0,0	0,0	0,0	5,1

Figure 13: Home Phones – Comparison of all scenarios TEC

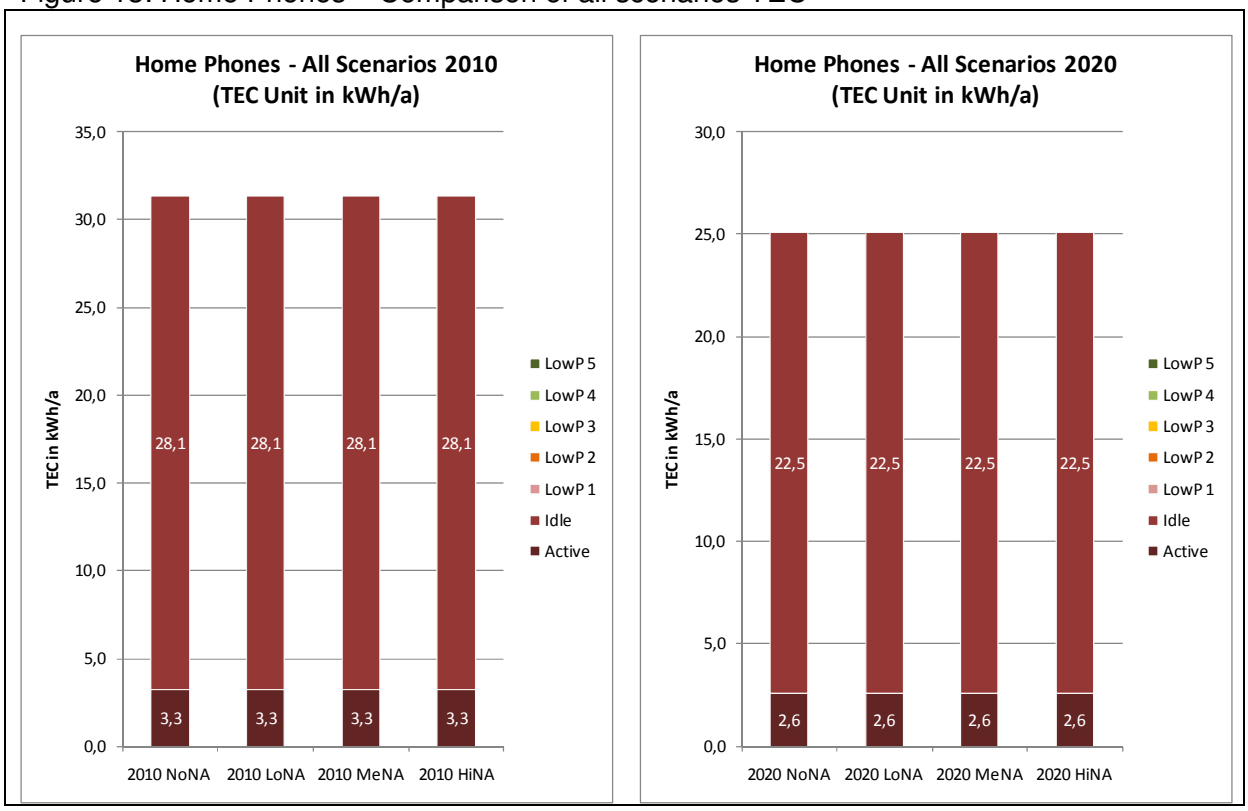
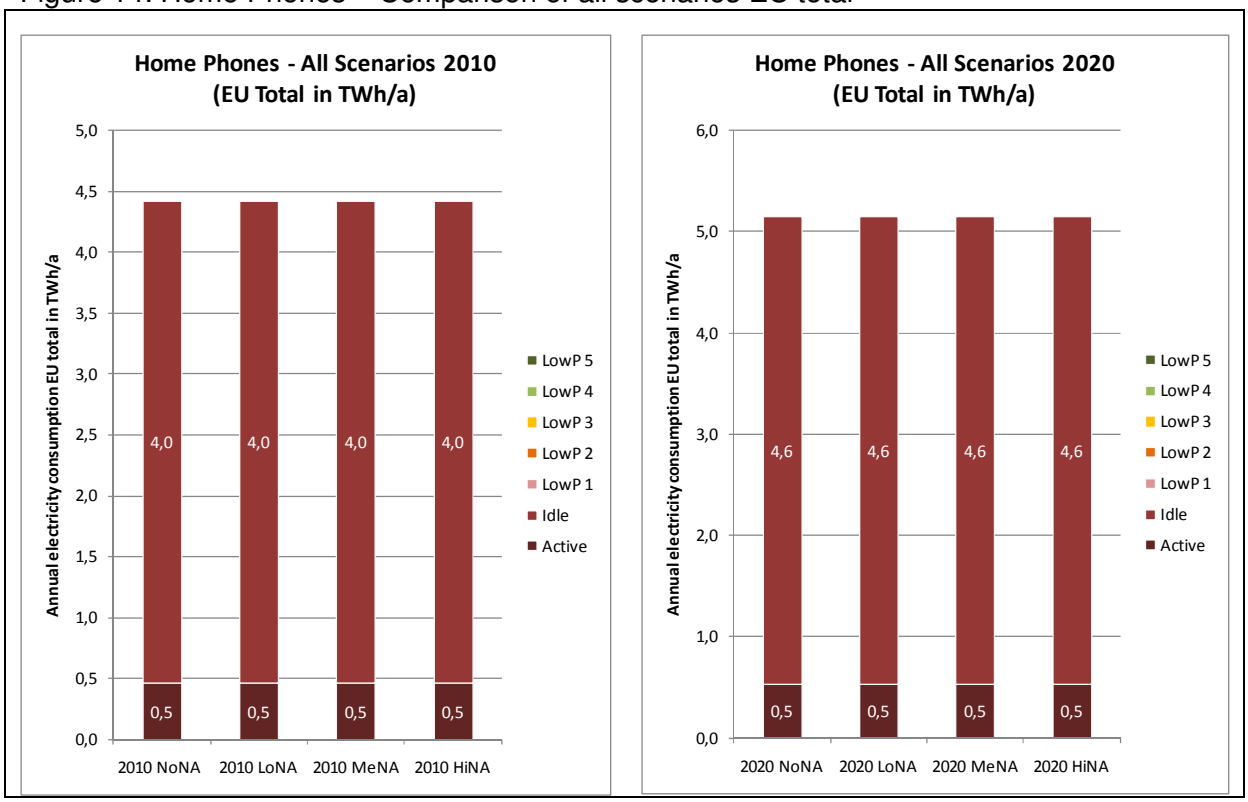


Figure 14: Home Phones – Comparison of all scenarios EU total



2. Discussion of results

As the device is always on, there is no change in annual energy consumption at the EU-27 level across the different scenarios. The overall energy consumption is about 5 TWh per year. That said, idle mode dominates with about 4.5 TWh/a the overall energy consumption in all scenarios presenting a possible target for improvement.

The 2020 scenarios show slightly increasing overall energy consumption due to growing number of devices, despite increasing efficiency.

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Annex 8 Environmental Assessment: Home Gateway



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 8 – Home Gateway

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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.

Input Data

Product definition:

Home Gateway is a Customer Premises Equipment with the main function of providing access to a wide area network (WAN) via modem (DSL, DOCSIS, FTTH, Femto Cell) and routing for wired or wireless local area networks (LAN). The product is a stand-alone device (non-rack) with multiple network interface options. The home gateways may include VoIP or DVB tuner/decoder (headed gateways).

Product stock assumption:

DSL Gateway:

- Stock: Installed base has been estimated based on EUROSTAT data regarding broadband access in the EU (status 07/2009)[15]. According to this source, the broadband access penetration rate (number of broadband lines per 100 populations) is 23.9. There are in total 94 million DSL access lines and 25 million broadband access lines (non-DSL). Of this last number 18 million are Cable modems and 7 million approximately optical fibre lines. This figure does not indicate the number of home gateways yet. Retail lines are the main wholesale access for new entrants with 71.4% of DSL lines. We make the assumption that 70% of the 94 million DSL lines are end user access point. This would mean that there are 66 million DSL gateways installed. Future development has been based on the assumption that DSL will maintain a main access technology and slightly increase in the next ten years. Optical technologies will however limit the increase in the long term. Based on these considerations we assume a maximum household penetration rate of 40% or 82 million units as installed base in 2010.

Cable-TV Gateway:

- Stock: Installed base has been estimated based on "ASTRA Reach 2009" Market Report.[16] According to this report approximately 30% of households in Europe receive TV and Internet services via TV-Cable. Future development has been based on two assumptions. In the short term the number of the installed base will slightly increase (35% household penetration rate) due to good price to broadband ratio. In the

15 http://ec.europa.eu/information_society/eeurope/i2010/docs/interinstitutional/cocom_broadband_july09.pdf

16 Internet download (2009-12-03): http://www.international-television.org/archive/astra_satellite_monitor_europe_2009.pdf

midterm however the stock declines due to availability and more capable fibre-to-the-home and wireless broadband access solutions.

Optical Gateway:

- Stock: In July 2009 a total of 120 million fixed broadband lines have been counted by EUROSTAT. According to the FTTH Council Europe only 1.75% of all fixed lines in Europe are currently Fibre-to-the-Home (+40% year-on-year). For this study we assume a slightly higher penetration rate of 3% for the reference year 2010. In the midterm we expect a strong increase of FTTH. Our forecast for 2015 and 2020 are based on household penetration rate assumptions.

Power Modes and Power Management Options:

The following power modes are considered:

Active: Power consumption in active and idle mode correlates with an average ADSL modem/router with LAN, WLAN, VoIP and USB ports. We distinguish an active and idle power state. Idle is the product when full on but not transmitting or processing a signal or data.

Idle: See active. No application is running [HiNA].

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is optional sleep mode where modem and 1xLAN is active/idle and WLAN powered-down [MeNA]

LowP3: Mode is not relevant

LowP4: Mode is not relevant

LowP5: Mode is equivalent to soft off

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

The power consumption values are based on average power consumption of simple modem/router products. It is feasible to assume that power consumption could increase due to increasing bandwidth (symmetrical), number of integrated network ports, constant powering of plug-in devices (Power-over-Ethernet, Power-over-USB) and particularly due to

increase wireless demand (active antenna). Further consideration has to be given to the integration of storage capacity (e.g. HDD, SSD) and the utilization of the device as a home server. In this case passive cooling might not be possible and a hybrid home gateway/server-type would result (including different use pattern). Another trend is triple-play capable headed gateways that emerge from the CSTB sector. These hybrid products shift the use patterns and require permanent high network availability (HiNA).

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are MeNA 2010 to HiNA 2020.

Table 15: Home Gateway – Input data for scenarios of reference year 2010

NoNA	**Home Gateway**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,0	10,0	0,0	6,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	7,0	0,0	0,0	0,0	0,0	0,0	17,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	0,0	0,0	0,0	0,0	0,0	8,5	92,5
136 million	TEC Unit/year (kWh/a)	30,7	0,0	0,0	0,0	0,0	0,0	3,1	33,8
	Stock per year (TWh/a)	4,2	0,0	0,0	0,0	0,0	0,0	0,4	4,6

LoNA	Home Gateway	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,0	10,0	0,0	6,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	7,0	0,0	0,0	17,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	0,0	0,0	102,0	0,0	0,0	0,0	186,0
136 million	TEC Unit/year (kWh/a)	30,7	0,0	0,0	37,2	0,0	0,0	0,0	67,9
	Stock per year (TWh/a)	4,2	0,0	0,0	5,1	0,0	0,0	0,0	9,2

MeNA	Home Gateway	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,0	10,0	0,0	6,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	7,0	8,5	0,0	8,5	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	85,0	0,0	51,0	0,0	0,0	0,0	220,0
136 million	TEC Unit/year (kWh/a)	30,7	31,0	0,0	18,6	0,0	0,0	0,0	80,3
	Stock per year (TWh/a)	4,2	4,2	0,0	2,5	0,0	0,0	0,0	10,9

HiNA	Home Gateway	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,0	10,0	0,0	6,0	0,0	0,0	0,5	
Stock	Use hours (h/d)	7,0	17,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	170,0	0,0	0,0	0,0	0,0	0,0	254,0
136 million	TEC Unit/year (kWh/a)	30,7	62,1	0,0	0,0	0,0	0,0	0,0	92,7
	Stock per year (TWh/a)	4,2	8,4	0,0	0,0	0,0	0,0	0,0	12,6

Table 16: Home Gateway – Input data for scenarios of forecast year 2020

NoNA	**Home Gateway**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	9,6	8,0	0,0	4,8	0,0	0,0	0,4	
Stock	Use hours (h/d)	7,0	0,0	0,0	0,0	0,0	0,0	17,0	24,0
365 d/a	Mode Power (Wh/d)	67,2	0,0	0,0	0,0	0,0	0,0	6,8	74,0
225 million	TEC Unit/year (kWh/a)	24,5	0,0	0,0	0,0	0,0	0,0	2,5	27,0
	Stock per year (TWh/a)	5,5	0,0	0,0	0,0	0,0	0,0	0,6	6,1

LoNA	Home Gateway	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	9,6	8,0	0,0	4,8	0,0	0,0	0,4	
Stock	Use hours (h/d)	7,0	0,0	0,0	17,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	67,2	0,0	0,0	81,6	0,0	0,0	0,0	148,8
225 million	TEC Unit/year (kWh/a)	24,5	0,0	0,0	29,8	0,0	0,0	0,0	54,3
	Stock per year (TWh/a)	5,5	0,0	0,0	6,7	0,0	0,0	0,0	12,2

MeNA	Home Gateway	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	9,6	8,0	0,0	4,8	0,0	0,0	0,4	
Stock	Use hours (h/d)	7,0	8,5	0,0	8,5	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	67,2	68,0	0,0	40,8	0,0	0,0	0,0	176,0
225 million	TEC Unit/year (kWh/a)	24,5	24,8	0,0	14,9	0,0	0,0	0,0	64,2
	Stock per year (TWh/a)	5,5	5,6	0,0	3,4	0,0	0,0	0,0	14,5

HiNA	Home Gateway	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	9,6	8,0	0,0	4,8	0,0	0,0	0,4	
Stock	Use hours (h/d)	7,0	17,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	67,2	136,0	0,0	0,0	0,0	0,0	0,0	203,2
225 million	TEC Unit/year (kWh/a)	24,5	49,6	0,0	0,0	0,0	0,0	0,0	74,2
	Stock per year (TWh/a)	5,5	11,2	0,0	0,0	0,0	0,0	0,0	16,7

Figure 15: Home Gateway – Comparison of all scenarios TEC

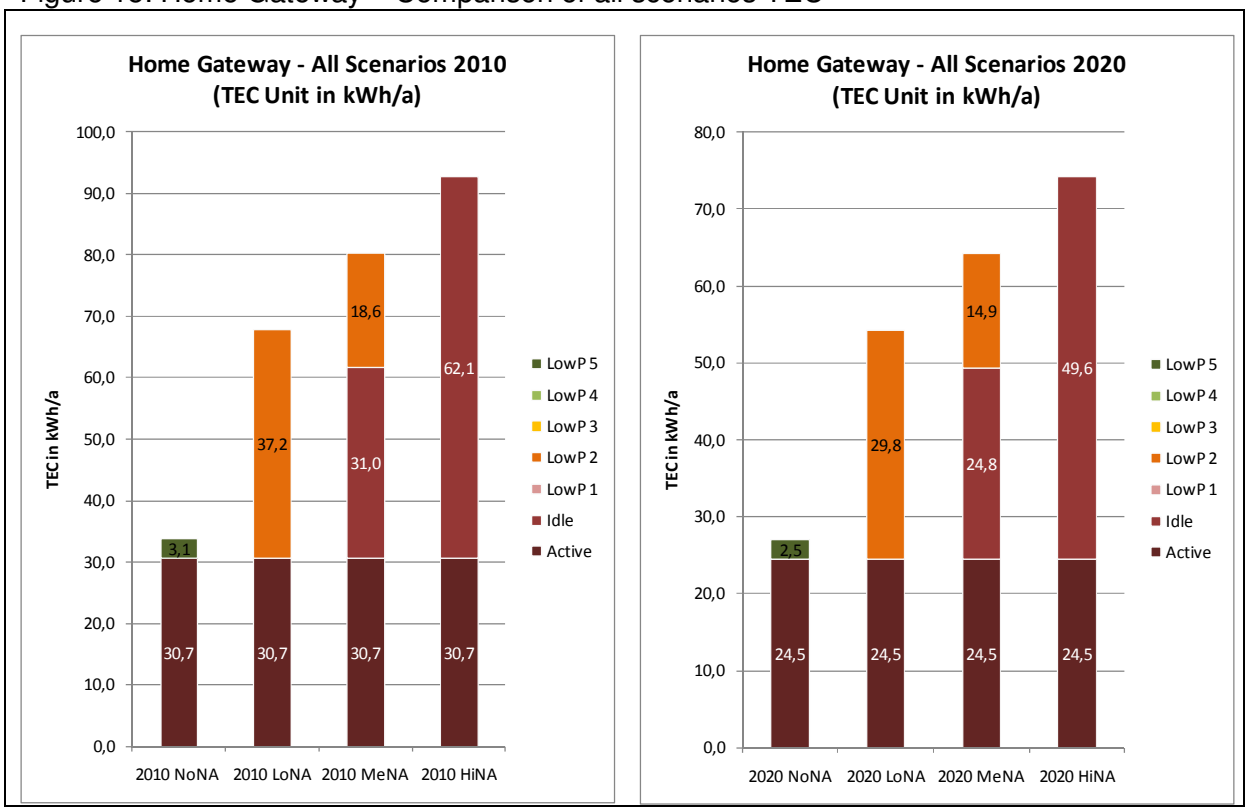
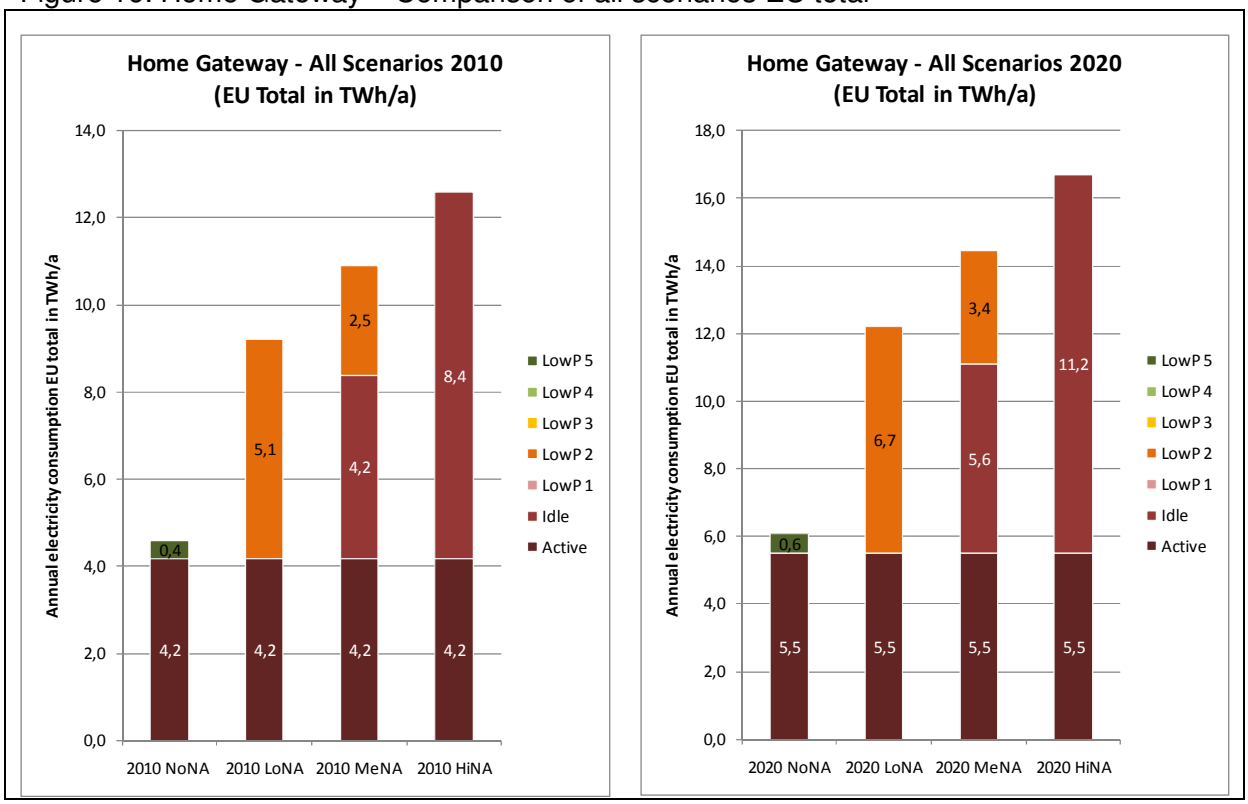


Figure 16: Home Gateway – Comparison of all scenarios EU total



2. Discussion of results

The development scenarios show increasing overall energy consumption from about 10 TWh in 2010 to about 15 TWh in 2010. This increase results from the growing installed base (stock). It also includes a general 20% improvement per mode, which has been question by some stakeholder as not realistic due to increasing network capability (bandwidth, wireless) and traffic (e.g. thin client applications). A mixed MeNA and HiNA scenario seems to be the most realistic scenario. Such mixed scenario would indicate existing power management options and the partial deactivation of functionality. And although home gateways are networking equipment, that needs to provide high network availability, the implementation of an advanced power management should be considered. Critical factor for such implementation is the interoperability towards WAN and LAN equipment (combined effort) including energy efficiency support by protocols (combined effort, see Task 7).

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Annex 9 Environmental Assessment: Simple TV



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 9 – Simple TV

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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Input Data

Product definition:

A commercially available electronic product designed primarily for the reception and display of audiovisual signals received from terrestrial, cable, satellite, Internet Protocol TV (IPTV), or other digital or analogue sources. A TV consists of a tuner/receiver and a display encased in a single enclosure. Simple TVs are used in conjunction with a set-top box and lack the integrated DVB tuner/receiver of Complex TVs.

Simple TVs cover both older analogue TVs and digital TVs lacking conditional access. It is technically possible to wake-up the TV over network (SCART) e.g. in conjunction with STB booting.

Product stock assumption:

Overall stock assumption has been based on TREN Lot 5, 2007[17]. Data was given for years 2005, 2010 and 2020. An interpolation was used for the year 2015 between 2010 and 2020. We assume an average of two devices per household.

Power Modes and Power Management Options:

Simple TVs are assumed to have three modes:

- Active mode (4h per day) for which power consumption reflects larger, less efficient displays.
- LowP4 is equivalent to (active low) standby. There are still older devices in the market that consume more than 1W.
- LowP5 is off-mode with losses.

Explanatory notes 2020:

Mode and use assumption is similar to reference year 2010 (4 hours active and 20 hours in LowP4, per day). Product stock is assumed to be shrinking as Complex TVs take some of the market share of Simple TVs. Overall, energy consumption is assumed to improve by 20% in all modes. The considerable number of older, less mature TVs in secondary use influences the higher value of the active mode.

New products, not yet on the market, could include a higher power standby mode through HDMI-CEC wake-up. However, actual market data are not available in that respect.

[17] [TREN Lot 5, 2007]: EuP Study on Televisions, 2007; http://www.ecotelevision.org/

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 and LoNA 2020.

Table 17: Simple TV – Input data for scenarios of reference year 2010

NoNA	**Simple TV**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	0,0	20,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	0,0	0,0	0,0	0,0	0,0	10,0	490,0
384 million	TEC Unit/year (kWh/a)	175,2	0,0	0,0	0,0	0,0	0,0	3,7	178,9
	Stock per year (TWh/a)	67,3	0,0	0,0	0,0	0,0	0,0	1,4	68,7

LoNA	Simple TV	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	0,0	0,0	0,0	0,0	40,0	0,0	520,0
384 million	TEC Unit/year (kWh/a)	175,2	0,0	0,0	0,0	0,0	14,6	0,0	189,8
	Stock per year (TWh/a)	67,3	0,0	0,0	0,0	0,0	5,6	0,0	72,9

MeNA	Simple TV	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	0,0	0,0	0,0	0,0	40,0	0,0	520,0
384 million	TEC Unit/year (kWh/a)	175,2	0,0	0,0	0,0	0,0	14,6	0,0	189,8
	Stock per year (TWh/a)	67,3	0,0	0,0	0,0	0,0	5,6	0,0	72,9

HiNA	Simple TV	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	0,0	0,0	0,0	0,0	40,0	0,0	520,0
384 million	TEC Unit/year (kWh/a)	175,2	0,0	0,0	0,0	0,0	14,6	0,0	189,8
	Stock per year (TWh/a)	67,3	0,0	0,0	0,0	0,0	5,6	0,0	72,9

Table 18: Simple TV – Input data for scenarios of forecast year 2020

NoNA	**Simple TV**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	96,0	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	0,0	20,0	24,0
365 d/a	Mode Power (Wh/d)	384,0	0,0	0,0	0,0	0,0	0,0	8,0	392,0
246 million	TEC Unit/year (kWh/a)	140,2	0,0	0,0	0,0	0,0	0,0	2,9	143,1
	Stock per year (TWh/a)	34,5	0,0	0,0	0,0	0,0	0,0	0,7	35,2

LoNA	Simple TV	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	96,0	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	384,0	0,0	0,0	0,0	0,0	32,0	0,0	416,0
246 million	TEC Unit/year (kWh/a)	140,2	0,0	0,0	0,0	0,0	11,7	0,0	151,8
	Stock per year (TWh/a)	34,5	0,0	0,0	0,0	0,0	2,9	0,0	37,4

MeNA	Simple TV	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	96,0	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	384,0	0,0	0,0	0,0	0,0	32,0	0,0	416,0
246 million	TEC Unit/year (kWh/a)	140,2	0,0	0,0	0,0	0,0	11,7	0,0	151,8
	Stock per year (TWh/a)	34,5	0,0	0,0	0,0	0,0	2,9	0,0	37,4

HiNA	Simple TV	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	96,0	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	384,0	0,0	0,0	0,0	0,0	32,0	0,0	416,0
246 million	TEC Unit/year (kWh/a)	140,2	0,0	0,0	0,0	0,0	11,7	0,0	151,8
	Stock per year (TWh/a)	34,5	0,0	0,0	0,0	0,0	2,9	0,0	37,4

Figure 17: Simple TV – Comparison of all scenarios TEC

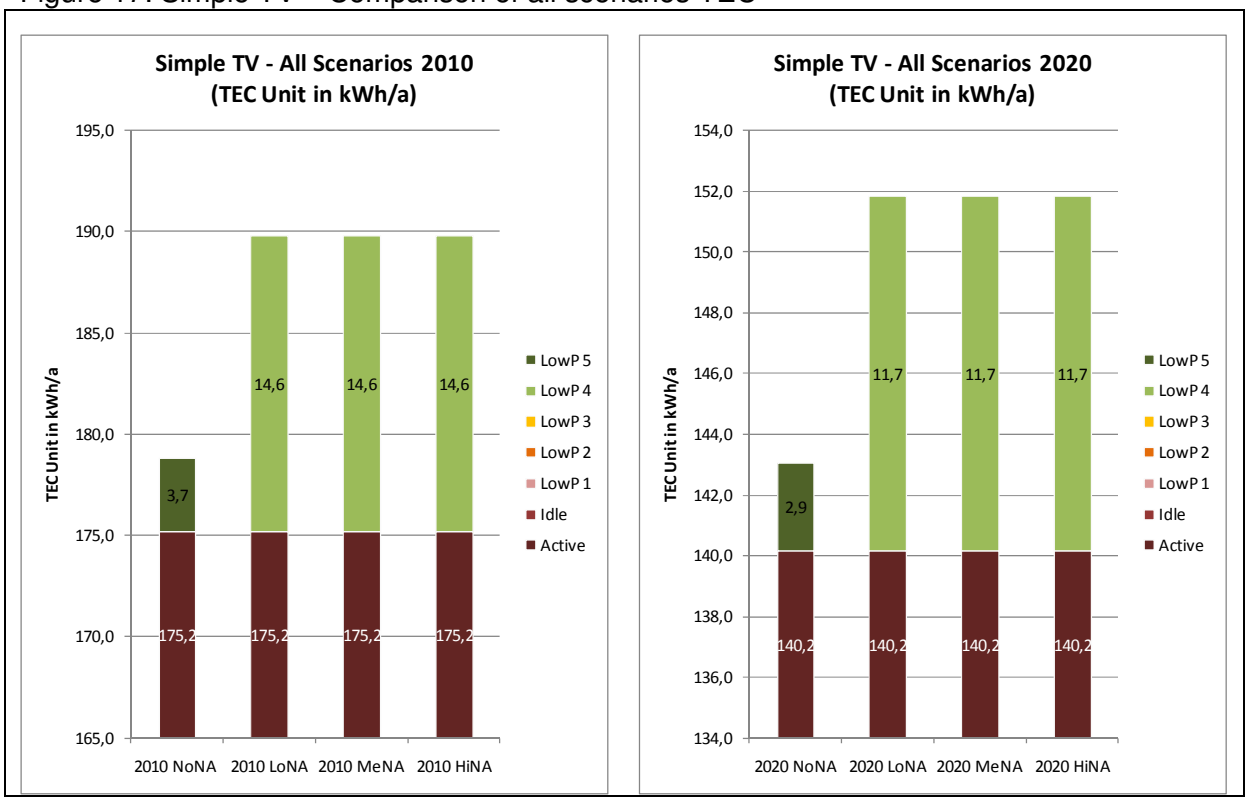
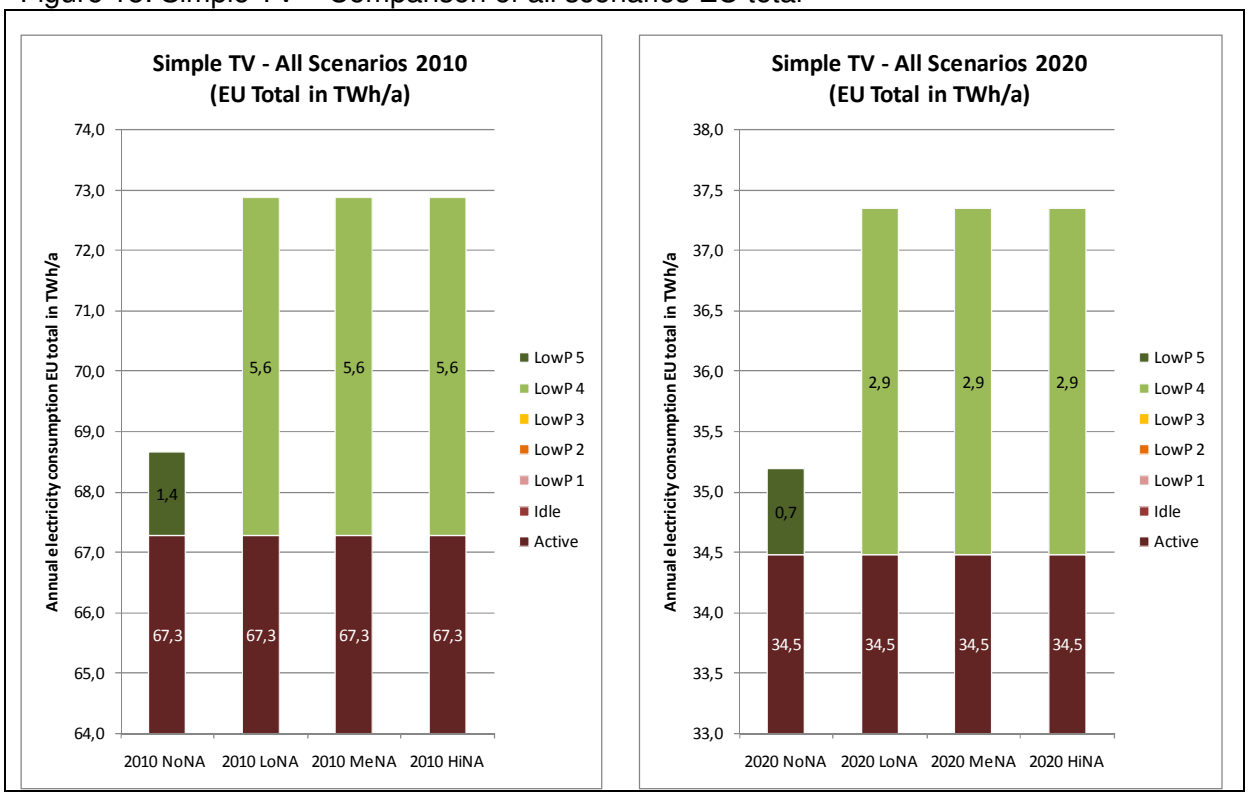


Figure 18: Simple TV – Comparison of all scenarios EU total



2. Discussion of results

Active mode energy consumption is significant and absolutely dominates the overall consumption. The overall energy consumption is going to decrease from about 72 TWh in 2010 to about 37 TWh in 2020. The overall decrease in energy consumption at the EU-27 level in the 2020 scenarios reflects the shrinking product stock of these older types of models in the market. The standby/off energy consumption is less than 10% of overall energy consumption. Still with 3 to 5 TWh per year it is a considerable amount of energy. This product case has to be put in conjunction with the complex TV for which a higher “active” standby has been assumed. It is important to notice that after a short period of good practice following the implementation of the standby/off regulation (EC1275/2008) the danger is that with higher network availability the overall energy consumption could increase again.

Annex 10 Environmental Assessment: Simple Set Top Box



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 10 – Simple Set Top Box

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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Input Data

Product definition:

A stand-alone device whose primary function is converting standard-definition (SD) or high-definition (HD), free-to-air digital broadcast signals to analogue broadcast signals suitable for analogue television or radio, has no "conditional access" function, and offers no recording function based on removable media in standard library format.[18]

Product stock assumption:

Stock for the reference year 2010 is based on TREN Lot 0, 2007[19]. Data extrapolated from EU-25 to EU-27 based on 2005 population. According to TREN Lot 0, Simple STBs are expected to be obsolete by 2025. We are not following this assumption and rather assume that Simple STBs will remain in the market for a considerable amount of time. Replacement will start after 2020 with mass utilization of IPTV.

Power Modes and Power Management Options:

Simple STBs feature only three modes:

- Active mode, the duration of which is 4h of TV reception and 1h of recording TV programmes. MeNA and HiNA scenarios consider longer active mode duration for users that do not use a timer function.
- LowP4 is equivalent to standby. The 2W assumption reflects the amount of older models still in the market.
- LowP5 is off mode with losses.

Explanatory notes 2020:

The product stock is gradually shrinking as the market shifts towards Complex STBs and Complex TVs. Simple STBs might be used for a secondary TV (e.g. with DVB-T).

Modes and use assumptions are similar to 2010 scenarios with a general power consumption improvement of 20% per mode. However, it is possible that no improvement in energy consumption will occur due to the remaining older product stock in the market.

[18] Product and technology definitions according to EC Regulation 107/2009/EC.

[19] [TREN Lot 0, 2007] EuP study on Simple Set Top Boxes, 2007.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 19: Simple Set Top Box – Input data for scenarios of reference year 2010

NoNA	**Simple STB**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	80,0	0,0	0,0	0,0	0,0	0,0	9,5	89,5
151 million	TEC Unit/year (kWh/a)	29,2	0,0	0,0	0,0	0,0	0,0	3,5	32,7
	Stock per year (TWh/a)	4,4	0,0	0,0	0,0	0,0	0,0	0,5	4,9

LoNA	Simple STB	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	80,0	0,0	0,0	0,0	0,0	38,0	0,0	118,0
151 million	TEC Unit/year (kWh/a)	29,2	0,0	0,0	0,0	0,0	13,9	0,0	43,1
	Stock per year (TWh/a)	4,4	0,0	0,0	0,0	0,0	2,1	0,0	6,5

MeNA	Simple STB	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	80,0	0,0	0,0	0,0	0,0	38,0	0,0	118,0
151 million	TEC Unit/year (kWh/a)	29,2	0,0	0,0	0,0	0,0	13,9	0,0	43,1
	Stock per year (TWh/a)	4,4	0,0	0,0	0,0	0,0	2,1	0,0	6,5

HiNA	Simple STB	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	0,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	24,0	0,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	384,0	0,0	0,0	0,0	0,0	0,0	0,0	384,0
151 million	TEC Unit/year (kWh/a)	140,2	0,0	0,0	0,0	0,0	0,0	0,0	140,2
	Stock per year (TWh/a)	21,2	0,0	0,0	0,0	0,0	0,0	0,0	21,2

Table 20: Simple Set Top Box – Input data for scenarios of forecast year 2020

NoNA	**Simple STB**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,8	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	64,0	0,0	0,0	0,0	0,0	0,0	7,6	71,6
123 million	TEC Unit/year (kWh/a)	23,4	0,0	0,0	0,0	0,0	0,0	2,8	26,1
	Stock per year (TWh/a)	2,9	0,0	0,0	0,0	0,0	0,0	0,3	3,2

LoNA	Simple STB	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,8	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	64,0	0,0	0,0	0,0	0,0	30,4	0,0	94,4
123 million	TEC Unit/year (kWh/a)	23,4	0,0	0,0	0,0	0,0	11,1	0,0	34,5
	Stock per year (TWh/a)	2,9	0,0	0,0	0,0	0,0	1,4	0,0	4,2

MeNA	Simple STB	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,8	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	64,0	0,0	0,0	0,0	0,0	30,4	0,0	94,4
123 million	TEC Unit/year (kWh/a)	23,4	0,0	0,0	0,0	0,0	11,1	0,0	34,5
	Stock per year (TWh/a)	2,9	0,0	0,0	0,0	0,0	1,4	0,0	4,2

HiNA	Simple STB	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	12,8	0,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	24,0	0,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	307,2	0,0	0,0	0,0	0,0	0,0	0,0	307,2
123 million	TEC Unit/year (kWh/a)	112,1	0,0	0,0	0,0	0,0	0,0	0,0	112,1
	Stock per year (TWh/a)	13,8	0,0	0,0	0,0	0,0	0,0	0,0	13,8

Figure 19: Simple Set Top Box – Comparison of all scenarios TEC

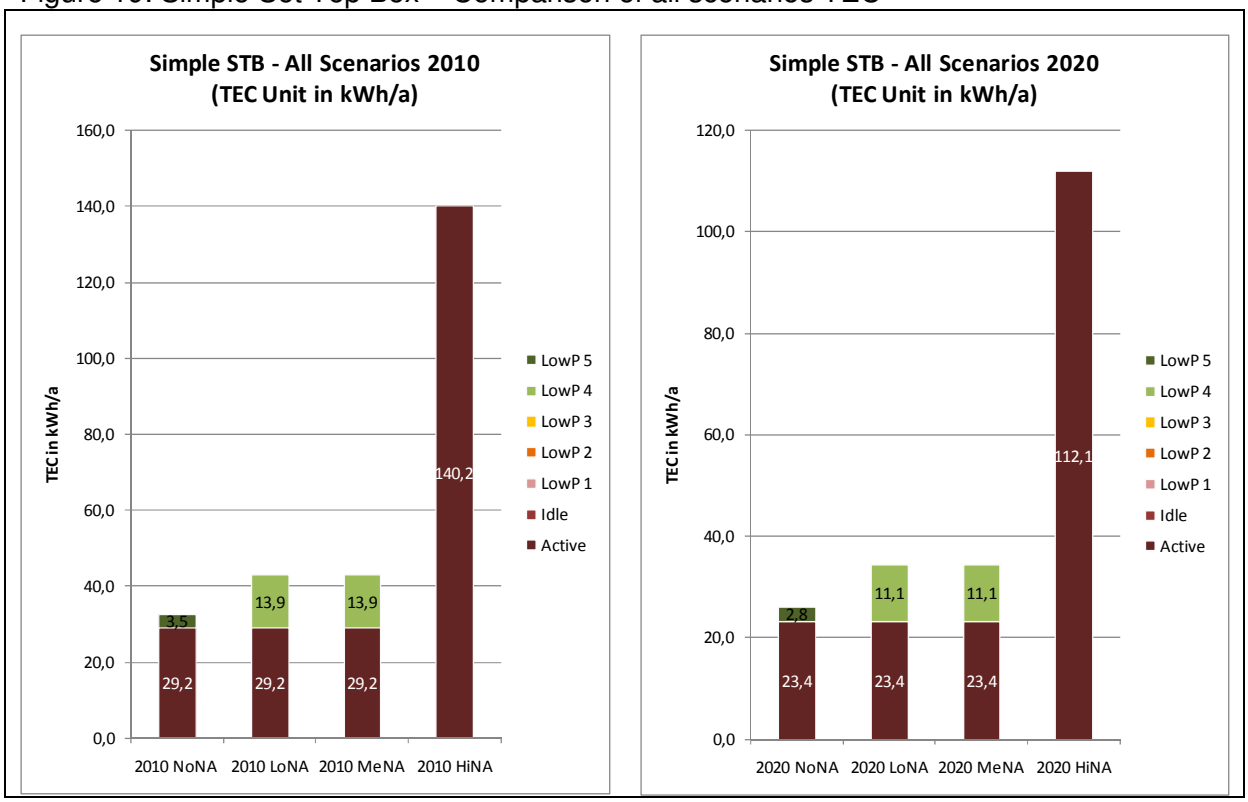
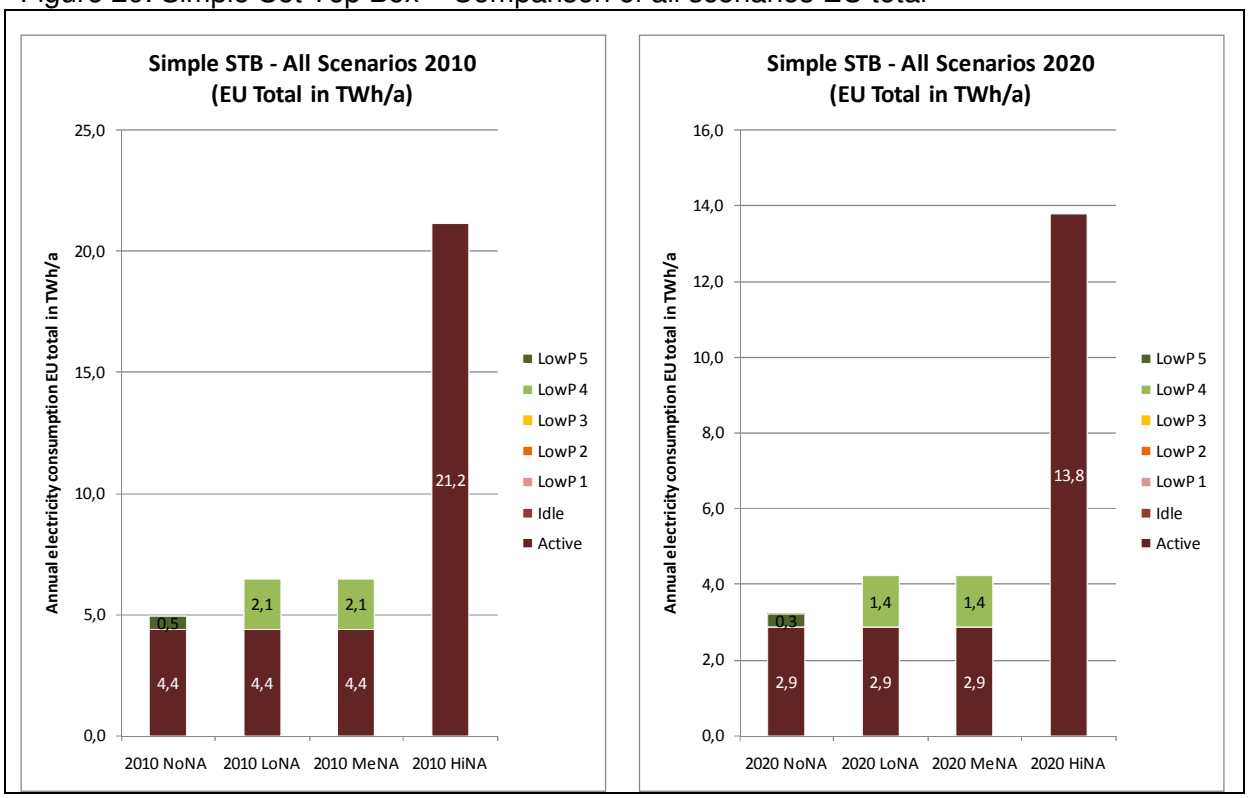


Figure 20: Simple Set Top Box – Comparison of all scenarios EU total



2. Discussion of results

Active mode dominates the energy consumption in all scenarios. Our scenario assumption with the same LoNA and MeNA reflects the difficulty with this product group. Both scenarios undervalue this product group. A real life scenario would need a mix of LoNA and HiNA. In such as case the overall energy consumption would not be only about 5 TWh per year but rather 10 TWh per year or even more. This real life scenario would assume that the user is leaving the device partially in active and is not using passive standby. The 2020 scenarios show the result of the reduced stock. Given the fact that such a product would not need network availability a consequent auto-power-down into standby/off would be the recommended.

Annex 11 Environmental Assessment: Complex TV



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 11 – Complex TV

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Disclaimer

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Input Data

Product definition:

A commercially available electronic product designed primarily for the reception and display of audiovisual signals received from terrestrial, cable, satellite, Internet Protocol TV (IPTV), or other digital or analogue sources. A TV consists of a tuner/receiver and a display encased in a single enclosure. Complex TVs feature and use an integrated DVB tuner/receiver and can allow for conditional access.

Broadly speaking, Complex TVs are state-of-the-art digital HD or 3D TVs with integrated digital tuners, optional decoders and to some extent recording/storage capability (the noise and lifetime reliability of HDD is an issue in that respect). It is technically possible to wake-up the TV over network (HDMI-CEC, WOL or WOWLAN), for example, in conjunction with provider service access or booting of a connected media center.

Product stock assumption:

Overall stock assumptions have been based on TREN Lot 5, 2007. Data was given for years 2005, 2010 and 2020. An interpolation was used for the year 2015 between 2010 and 2020. We assume an average of two devices per household. The number of Complex TVs is expected to over the coming years as the number of Simple TVs and Simple STBs which they replace will decline.

Power Modes and Power Management Options:

Complex TVs have four modes:

- Active mode with 4h use duration per day. Higher power consumption reflects typically larger and more complex full HD/3D display (mid/high end devices).
- LowP2 is equivalent to active standby with medium network availability. Current product's power consumption varies largely between a few Watts and more than 30 W, depending on the functions provided.
- LowP4 is equivalent to active standby. Most products consume less than 1W.
- LowP5 is off-mode with losses.

Explanatory notes 2020:

Power consumption of Complex TV has improved by 20% in all modes. For active mode one might argue that LED backlights and other technologies have a larger improvement potential. This is generally correct, but we have to consider the evolving system requirements, for example, in conjunction with full HD, 4K or 3D. In particular, 3D in conjunction with active

shutter glasses will require higher luminescence setting which results in about 20% more energy demand of the TV. The important aspect is however the networked standby capability which is covered by LowP4. We assume a >20% improvement in that respect but due to the installed base of older TVs further overall improvement until 2010 is not realistic. By 2020, TVs will have multiple network options.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 21: Complex TV – Input data for scenarios of reference year 2010

NoNA	**Complex TV**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	30,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	0,0	20,0	24,0
365 d/a	Mode Power (Wh/d)	600,0	0,0	0,0	0,0	0,0	0,0	10,0	610,0
20 million	TEC Unit/year (kWh/a)	219,0	0,0	0,0	0,0	0,0	0,0	3,7	222,7
	Stock per year (TWh/a)	4,4	0,0	0,0	0,0	0,0	0,0	0,1	4,5

LoNA	Complex TV	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	30,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	600,0	0,0	0,0	0,0	0,0	40,0	0,0	640,0
20 million	TEC Unit/year (kWh/a)	219,0	0,0	0,0	0,0	0,0	14,6	0,0	233,6
	Stock per year (TWh/a)	4,4	0,0	0,0	0,0	0,0	0,3	0,0	4,7

MeNA	Complex TV	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	30,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	10,0	0,0	0,0	0,0	10,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	600,0	300,0	0,0	0,0	0,0	20,0	0,0	920,0
20 million	TEC Unit/year (kWh/a)	219,0	109,5	0,0	0,0	0,0	7,3	0,0	335,8
	Stock per year (TWh/a)	4,4	2,2	0,0	0,0	0,0	0,1	0,0	6,7

HiNA	Complex TV	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	30,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	600,0	600,0	0,0	0,0	0,0	0,0	0,0	1200,0
20 million	TEC Unit/year (kWh/a)	219,0	219,0	0,0	0,0	0,0	0,0	0,0	438,0
	Stock per year (TWh/a)	4,4	4,4	0,0	0,0	0,0	0,0	0,0	8,8

Table 22: Complex TV – Input data for scenarios of forecast year 2020

NoNA	**Complex TV**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	24,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	0,0	20,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	0,0	0,0	0,0	0,0	0,0	8,0	488,0
164 million	TEC Unit/year (kWh/a)	175,2	0,0	0,0	0,0	0,0	0,0	2,9	178,1
	Stock per year (TWh/a)	28,7	0,0	0,0	0,0	0,0	0,0	0,5	29,2

LoNA	Complex TV	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	24,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	0,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	0,0	0,0	0,0	0,0	32,0	0,0	512,0
164 million	TEC Unit/year (kWh/a)	175,2	0,0	0,0	0,0	0,0	11,7	0,0	186,9
	Stock per year (TWh/a)	28,7	0,0	0,0	0,0	0,0	1,9	0,0	30,6

MeNA	Complex TV	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	24,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	10,0	0,0	0,0	0,0	10,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	240,0	0,0	0,0	0,0	16,0	0,0	736,0
164 million	TEC Unit/year (kWh/a)	175,2	87,6	0,0	0,0	0,0	5,8	0,0	268,6
	Stock per year (TWh/a)	28,7	14,4	0,0	0,0	0,0	1,0	0,0	44,1

HiNA	Complex TV	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	24,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	480,0	480,0	0,0	0,0	0,0	0,0	0,0	960,0
164 million	TEC Unit/year (kWh/a)	175,2	175,2	0,0	0,0	0,0	0,0	0,0	350,4
	Stock per year (TWh/a)	28,7	28,7	0,0	0,0	0,0	0,0	0,0	57,5

Figure 21: Complex TV – Comparison of all scenarios TEC

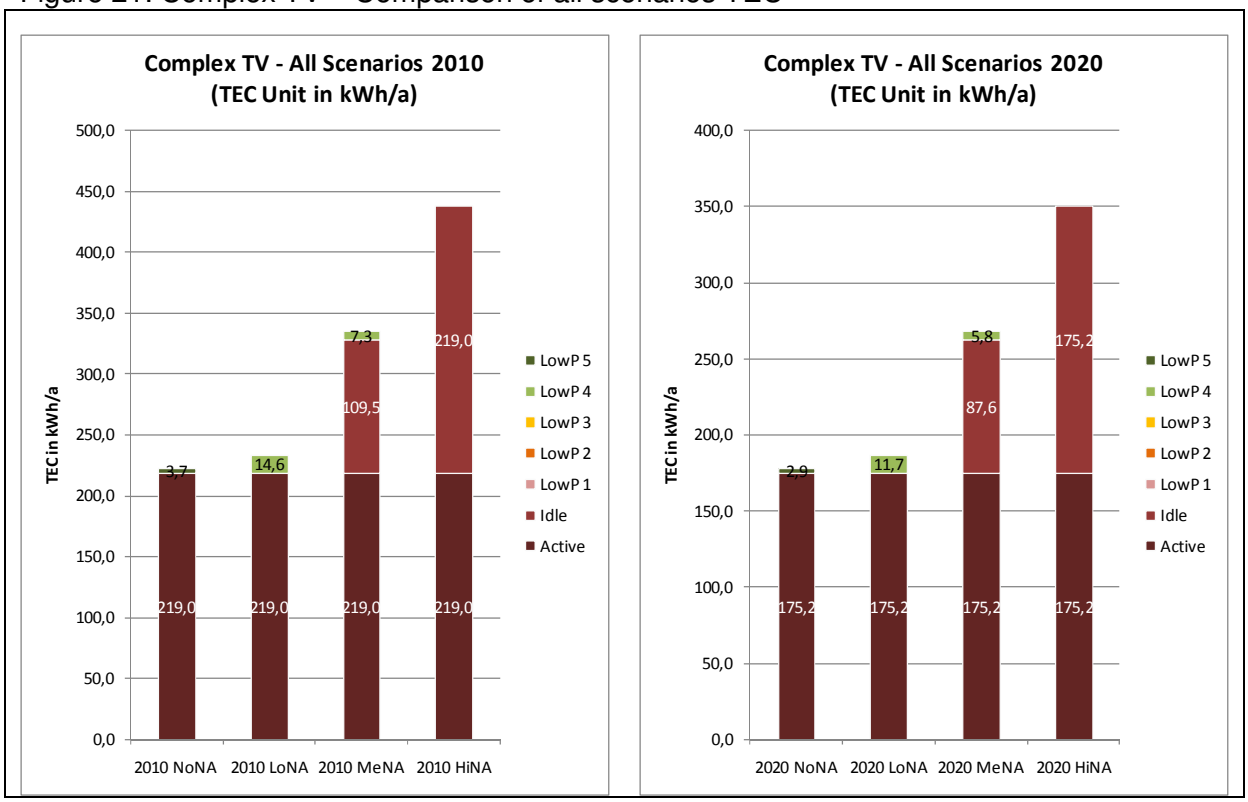
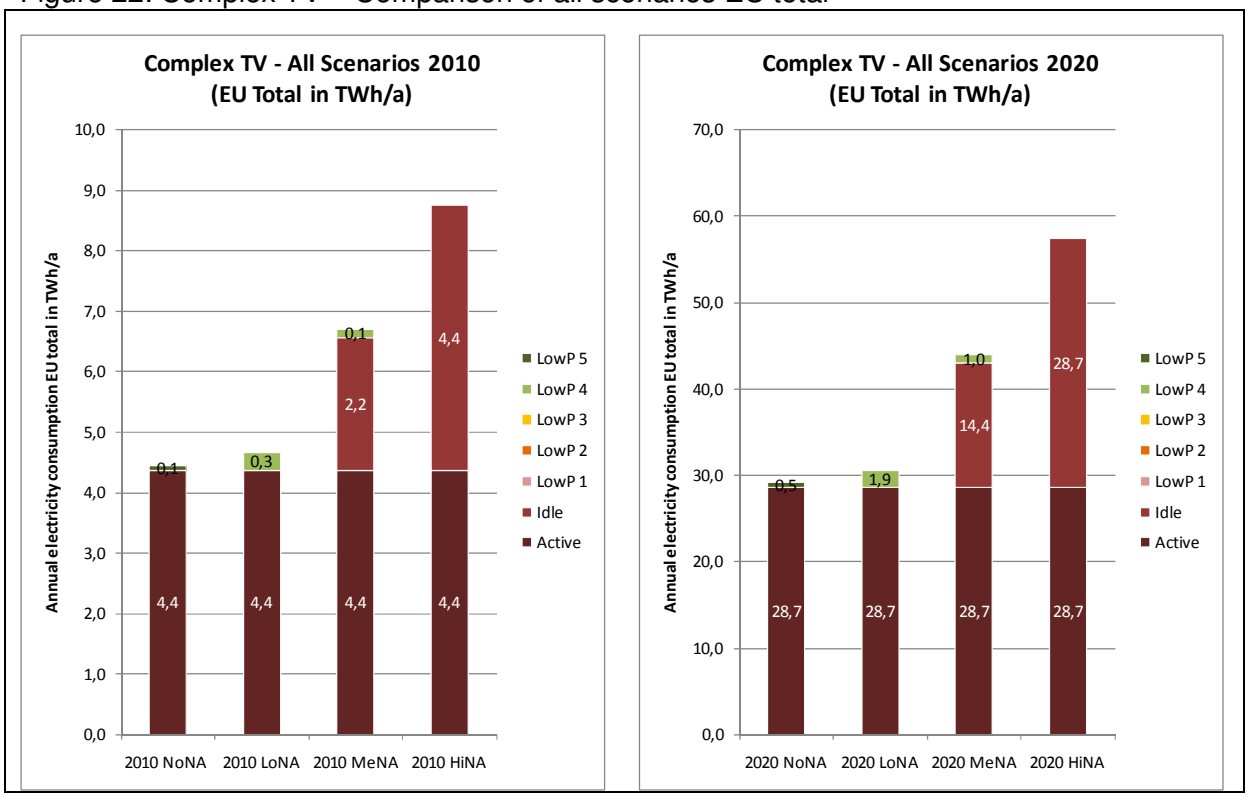


Figure 22: Complex TV – Comparison of all scenarios EU total



2. Discussion of results

The overall development and the significant increase in TEC at the EU-27 level reflects an increasing product stock of complex TVs and has to be seen in conjunction to the decrease in simple TVs. The power consumption of Idle in the MeNA 2020 is with about 14.4 TWh is considerable and needs to be addressed. Network availability would be an important issue for this product group. At the moment we do not have products featuring low power standby in support of possible network initiated wake-ups.

Annex 12 Environmental Assessment: Complex Set Top Box



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 12 – Complex Set Top Box

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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.

Input Data

Product definition:

A complex set-top box is a set-top box that allows conditional access. A set-top box is a stand-alone device, using an integral or dedicated external power supply, for the reception of Standard Definition (SD) or High Definition (HD) digital broadcasting services via IP, cable, satellite and/or terrestrial transmission and their conversion to analogue RF and/or line signals and/or with a digital output signal.[20]

Product stock assumption:

Stock based on TREN Lot 18, 2008.[21]. The data was given for 2010, 2015 and 2020 in the report. In the long term we assume a different trend than the one assumed in Lot 18. We assume that complex STBs and so called Media Centre or Digital Media Receiver are merging. This new converging product group will have a high market penetration. A digital media receiver is a device that connects to a home network using either a wireless or wired connection. It includes a user interface that allows users to navigate through a digital media library, search for, and play back media files. The device is connected to a TV using standard cables.[22]

Power Modes and Power Management Options:

Complex STB (with conditional access, and return path) features four modes:

- Active mode duration correlates with average 4h of TV receiving and 1h recording of TV programmes. Power consumption in active is considerably higher than the simple STB due to integrated recording/storage capability (HDD), the number of digital tuners and decoder.
- LowP 2 is equivalent to active standby (high) which allows remote access and reactivation of the device for the service provider.
- LowP 4 is equivalent to passive standby (time function active). The 0.7W assumption reflects good practice and voluntary agreement compliance in the market.

[20] Product and technology definitions according to TREN Lot 18, 2008.

[21] [TREN Lot 18, 2007] EuP study on Complex Set Top Boxes, 2008. www.ecocomplexstb.org

[22] Modified from http://en.wikipedia.org/wiki/Digital_media_receiver. Accessed 22 Jan 2010

- LowP 5 is off mode with losses.

Explanatory notes 2020:

The product stock is increasing due to the increasing demand and requirements for HD and, later, 3D TV programmes.

Modes and use assumptions are similar to 2010 scenarios with a general power consumption improvement of 20% per mode. With the introduction of more advanced recording/storage technology (e.g. SSD) power consumption could improve even more.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 23: Complex Set Top Box – Input data for scenarios of reference year 2010

NoNA	**Complex STB**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	10,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	150,0	0,0	0,0	0,0	0,0	0,0	9,5	159,5
82 million	TEC Unit/year (kWh/a)	54,8	0,0	0,0	0,0	0,0	0,0	3,5	58,2
	Stock per year (TWh/a)	4,5	0,0	0,0	0,0	0,0	0,0	0,3	4,8

LoNA	Complex STB	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	10,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	150,0	0,0	0,0	0,0	0,0	38,0	0,0	188,0
82 million	TEC Unit/year (kWh/a)	54,8	0,0	0,0	0,0	0,0	13,9	0,0	68,6
	Stock per year (TWh/a)	4,5	0,0	0,0	0,0	0,0	1,1	0,0	5,6

MeNA	Complex STB	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	10,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	5,0	9,5	0,0	0,0	0,0	9,5	0,0	24,0
365 d/a	Mode Power (Wh/d)	150,0	95,0	0,0	0,0	0,0	19,0	0,0	264,0
82 million	TEC Unit/year (kWh/a)	54,8	34,7	0,0	0,0	0,0	6,9	0,0	96,4
	Stock per year (TWh/a)	4,5	2,8	0,0	0,0	0,0	0,6	0,0	7,9

HiNA	Complex STB	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	10,0	0,0	0,0	0,0	2,0	0,5	
Stock	Use hours (h/d)	5,0	19,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	150,0	190,0	0,0	0,0	0,0	0,0	0,0	340,0
82 million	TEC Unit/year (kWh/a)	54,8	69,4	0,0	0,0	0,0	0,0	0,0	124,1
	Stock per year (TWh/a)	4,5	5,7	0,0	0,0	0,0	0,0	0,0	10,2

Table 24: Complex Set Top Box – Input data for scenarios of forecast year 2020

NoNA	**Complex STB**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	8,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	0,0	19,0	24,0
365 d/a	Mode Power (Wh/d)	120,0	0,0	0,0	0,0	0,0	0,0	7,6	127,6
113 million	TEC Unit/year (kWh/a)	43,8	0,0	0,0	0,0	0,0	0,0	2,8	46,6
	Stock per year (TWh/a)	4,9	0,0	0,0	0,0	0,0	0,0	0,3	5,3

LoNA	Complex STB	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	8,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	5,0	0,0	0,0	0,0	0,0	19,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	120,0	0,0	0,0	0,0	0,0	30,4	0,0	150,4
113 million	TEC Unit/year (kWh/a)	43,8	0,0	0,0	0,0	0,0	11,1	0,0	54,9
	Stock per year (TWh/a)	4,9	0,0	0,0	0,0	0,0	1,3	0,0	6,2

MeNA	Complex STB	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	8,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	5,0	9,5	0,0	0,0	0,0	9,5	0,0	24,0
365 d/a	Mode Power (Wh/d)	120,0	76,0	0,0	0,0	0,0	15,2	0,0	211,2
113 million	TEC Unit/year (kWh/a)	43,8	27,7	0,0	0,0	0,0	5,5	0,0	77,1
	Stock per year (TWh/a)	4,9	3,1	0,0	0,0	0,0	0,6	0,0	8,7

HiNA	Complex STB	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	8,0	0,0	0,0	0,0	1,6	0,4	
Stock	Use hours (h/d)	5,0	19,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	120,0	152,0	0,0	0,0	0,0	0,0	0,0	272,0
113 million	TEC Unit/year (kWh/a)	43,8	55,5	0,0	0,0	0,0	0,0	0,0	99,3
	Stock per year (TWh/a)	4,9	6,3	0,0	0,0	0,0	0,0	0,0	11,2

Figure 23: Complex Set Top Box – Comparison of all scenarios TEC

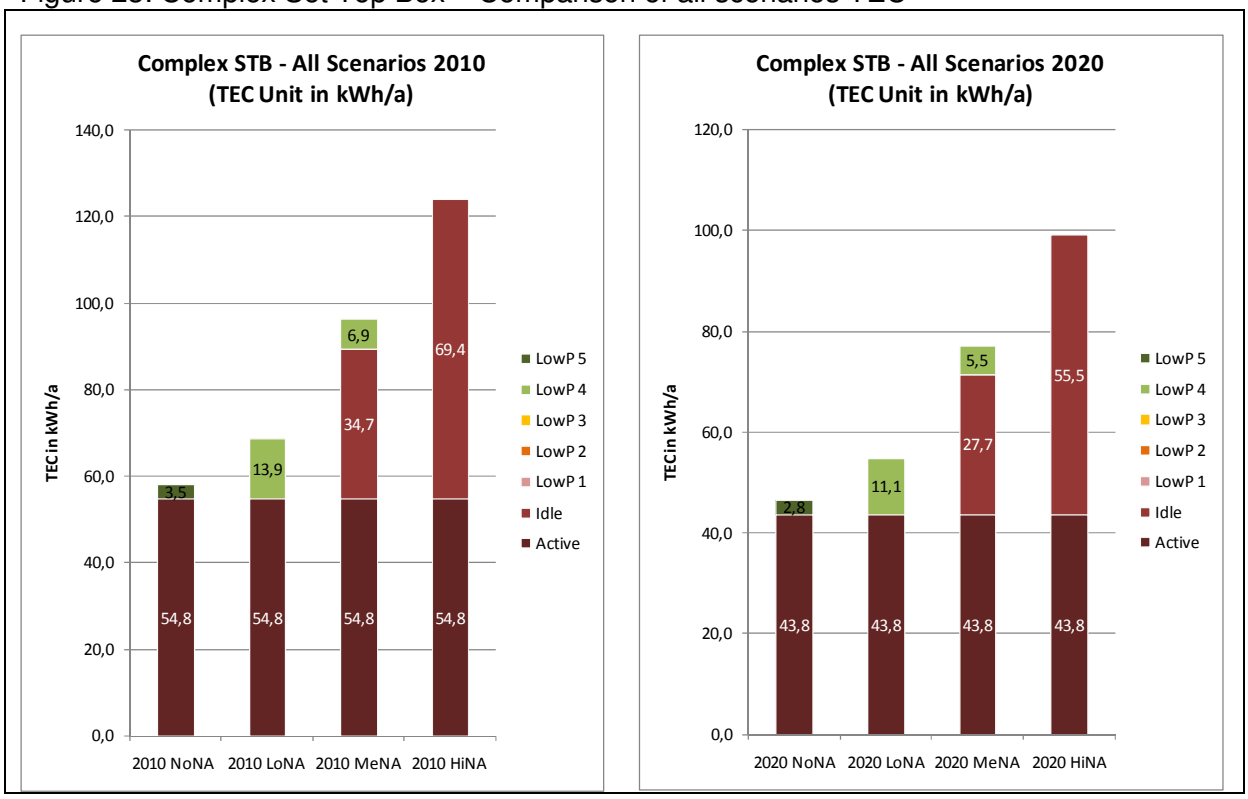
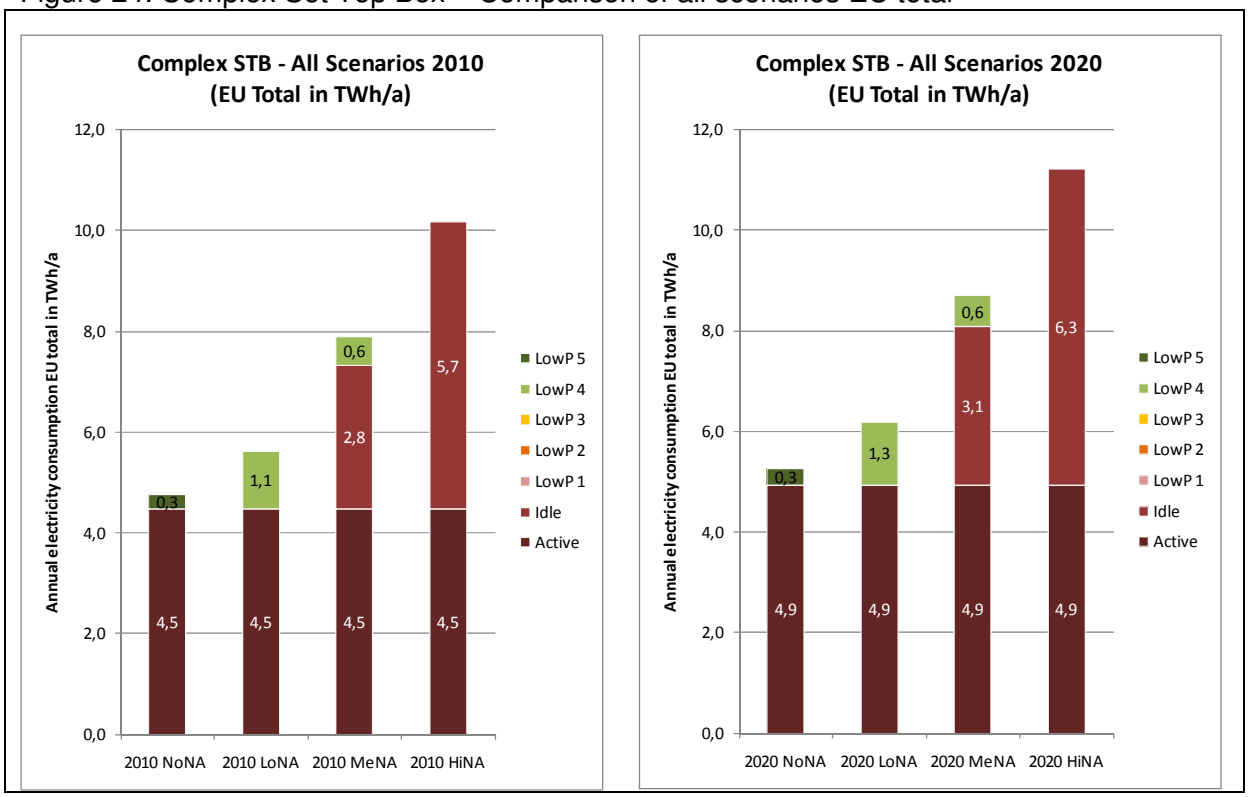


Figure 24: Complex Set Top Box – Comparison of all scenarios EU total



2. Discussion of results:

Active mode is dominant power consumption although Idle (serving in place of a networked or active standby mode) is equally important in the MENA and HiNA scenarios. The overall energy consumption of 5.2 to 11.2 TWh/a is substantial against the growing product stock and probably more intense use patterns in the future. The improvement potential lays in power management and additional reduction of power consumption per mode.

Annex 13 Environmental Assessment: Simple Player/Recorder



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 13 – Simple Player/Recorder

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Disclaimer

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Input Data

Product definition:

A Simple Player/Recorder is a stand-alone device whose primary function is to decode video to an output audio/video signal (from recorded or recordable media via a powered or integrated media interface such as an optical drive, USB or HDD interface), has no tuner unless it records on a removable media in a standard library format, is mains powered, does not have a display for viewing, and is not designed for a broad range of home or office applications.[23]

Product stock assumption:

Stock assumptions are based on Draft ENTR Lot 3, ongoing[24]. The data of the stock of the UK was given in the ENTR Lot 3 report. The UK market for electronics typically represents 18% of the total EU-27 for electronics. The EU totals have been calculated accordingly. It is questionable if this type of media will really decline in the predicted way. We therefore adjusted the figures to a slower decline by a correlation to the household penetration rate.

The product group describes currently installed base of VCR, DVD, BluRay, and HDD (single media) Player/Recorder devices.

Power Modes and Power Management Options:

We consider that such product could feature up to four modes:

- Active mode is actively playing or recording content. We assume an average 1.5h per day (one movie).
- Idle mode is an active mode where the product is ready but no content is played or recorded.
- LowP3 is equivalent to active low or passive standby where a timer is running. The somewhat higher power consumption of 4.5 W reflects the situation that there are still a substantial number of older devices in the market.
- LowP5 is equivalent to off-mode with losses. The assumption of 1W takes into account the number of older devices still on the market.

Explanatory notes 2020:

[23] Product and technology definitions according to ENTR Lot 3 Draft Task 1-5.
[24] [ENTR Lot 3, ongoing] EuP study on sound and imaging equipment www.ecomultimedia.org

Modes and use patterns similar to the reference year 2010. General energy consumption improvement per mode is assumed to be20%.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 25: Simple Player/Recorder – Input data for scenarios of reference year 2010

NoNA	**Simple Player Recorder**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	16,0	0,0	0,0	4,5	0,0	0,5	
Stock	Use hours (h/d)	1,5	0,5	0,0	0,0	0,0	0,0	22,0	24,0
365 d/a	Mode Power (Wh/d)	30,0	8,0	0,0	0,0	0,0	0,0	11,0	49,0
233 million	TEC Unit/year (kWh/a)	11,0	2,9	0,0	0,0	0,0	0,0	4,0	17,9
	Stock per year (TWh/a)	2,6	0,7	0,0	0,0	0,0	0,0	0,9	4,2

LoNA	Simple Player Recorder	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	16,0	0,0	0,0	4,5	0,0	0,5	
Stock	Use hours (h/d)	1,5	0,5	0,0	0,0	22,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	30,0	8,0	0,0	0,0	99,0	0,0	0,0	137,0
233 million	TEC Unit/year (kWh/a)	11,0	2,9	0,0	0,0	36,1	0,0	0,0	50,0
	Stock per year (TWh/a)	2,6	0,7	0,0	0,0	8,4	0,0	0,0	11,7

MeNA	Simple Player Recorder	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	16,0	0,0	0,0	4,5	0,0	0,5	
Stock	Use hours (h/d)	1,5	0,5	0,0	0,0	22,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	30,0	8,0	0,0	0,0	99,0	0,0	0,0	137,0
233 million	TEC Unit/year (kWh/a)	11,0	2,9	0,0	0,0	36,1	0,0	0,0	50,0
	Stock per year (TWh/a)	2,6	0,7	0,0	0,0	8,4	0,0	0,0	11,7

HiNA	Simple Player Recorder	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	16,0	0,0	0,0	4,5	0,0	0,5	
Stock	Use hours (h/d)	1,5	22,5	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	30,0	360,0	0,0	0,0	0,0	0,0	0,0	390,0
233 million	TEC Unit/year (kWh/a)	11,0	131,4	0,0	0,0	0,0	0,0	0,0	142,4
	Stock per year (TWh/a)	2,6	30,6	0,0	0,0	0,0	0,0	0,0	33,2

Table 26: Simple Player/Recorder – Input data for scenarios of forecast year 2020

NoNA	**Simple Player Recorder**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,8	0,0	0,0	3,6	0,0	0,4	
Stock	Use hours (h/d)	1,5	0,5	0,0	0,0	0,0	0,0	22,0	24,0
365 d/a	Mode Power (Wh/d)	24,0	6,4	0,0	0,0	0,0	0,0	8,8	39,2
174 million	TEC Unit/year (kWh/a)	8,8	2,3	0,0	0,0	0,0	0,0	3,2	14,3
	Stock per year (TWh/a)	1,5	0,4	0,0	0,0	0,0	0,0	0,6	2,5

LoNA	Simple Player Recorder	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,8	0,0	0,0	3,6	0,0	0,4	
Stock	Use hours (h/d)	1,5	0,5	0,0	0,0	22,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	24,0	6,4	0,0	0,0	79,2	0,0	0,0	109,6
174 million	TEC Unit/year (kWh/a)	8,8	2,3	0,0	0,0	28,9	0,0	0,0	40,0
	Stock per year (TWh/a)	1,5	0,4	0,0	0,0	5,0	0,0	0,0	7,0

MeNA	Simple Player Recorder	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,8	0,0	0,0	3,6	0,0	0,4	
Stock	Use hours (h/d)	1,5	0,5	0,0	0,0	22,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	24,0	6,4	0,0	0,0	79,2	0,0	0,0	109,6
174 million	TEC Unit/year (kWh/a)	8,8	2,3	0,0	0,0	28,9	0,0	0,0	40,0
	Stock per year (TWh/a)	1,5	0,4	0,0	0,0	5,0	0,0	0,0	7,0

HiNA	Simple Player Recorder	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	16,0	12,8	0,0	0,0	3,6	0,0	0,4	
Stock	Use hours (h/d)	1,5	22,5	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	24,0	288,0	0,0	0,0	0,0	0,0	0,0	312,0
174 million	TEC Unit/year (kWh/a)	8,8	105,1	0,0	0,0	0,0	0,0	0,0	113,9
	Stock per year (TWh/a)	1,5	18,3	0,0	0,0	0,0	0,0	0,0	19,8

Figure 25: Simple Player/Recorder – Comparison of all scenarios TEC

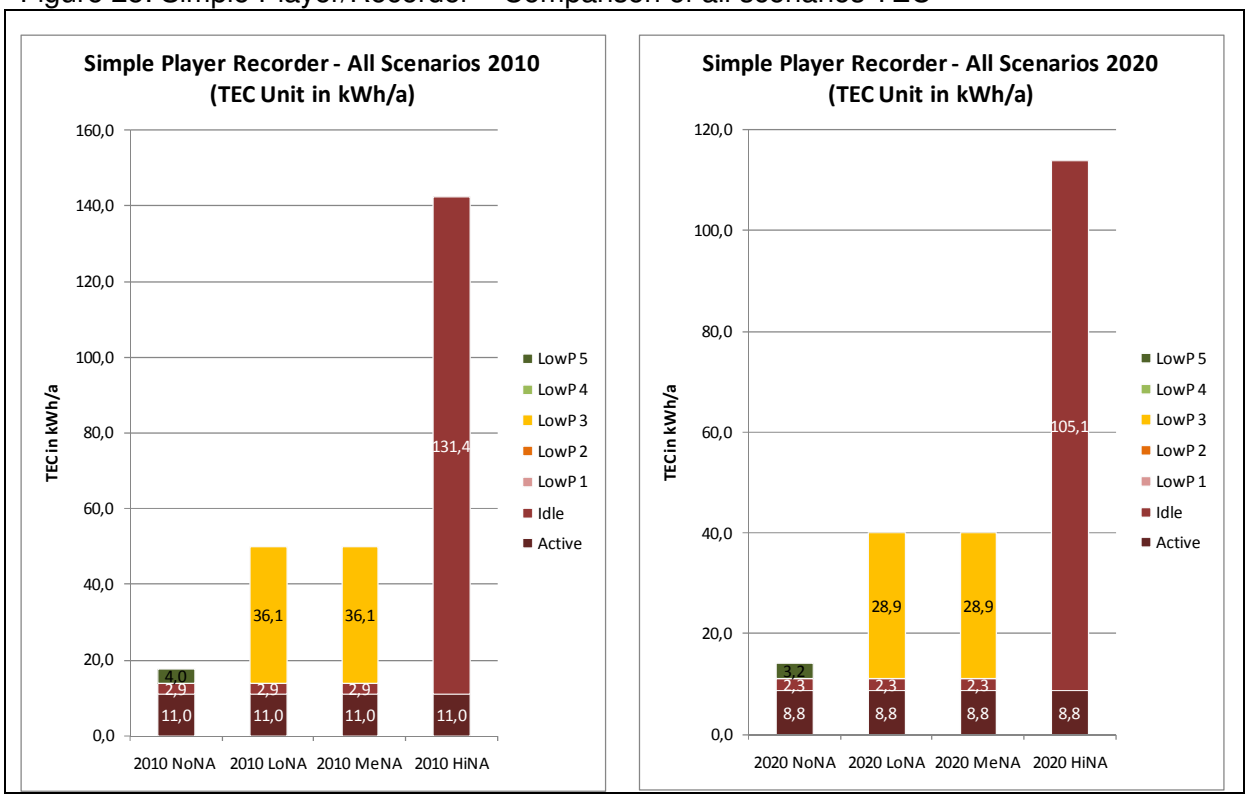
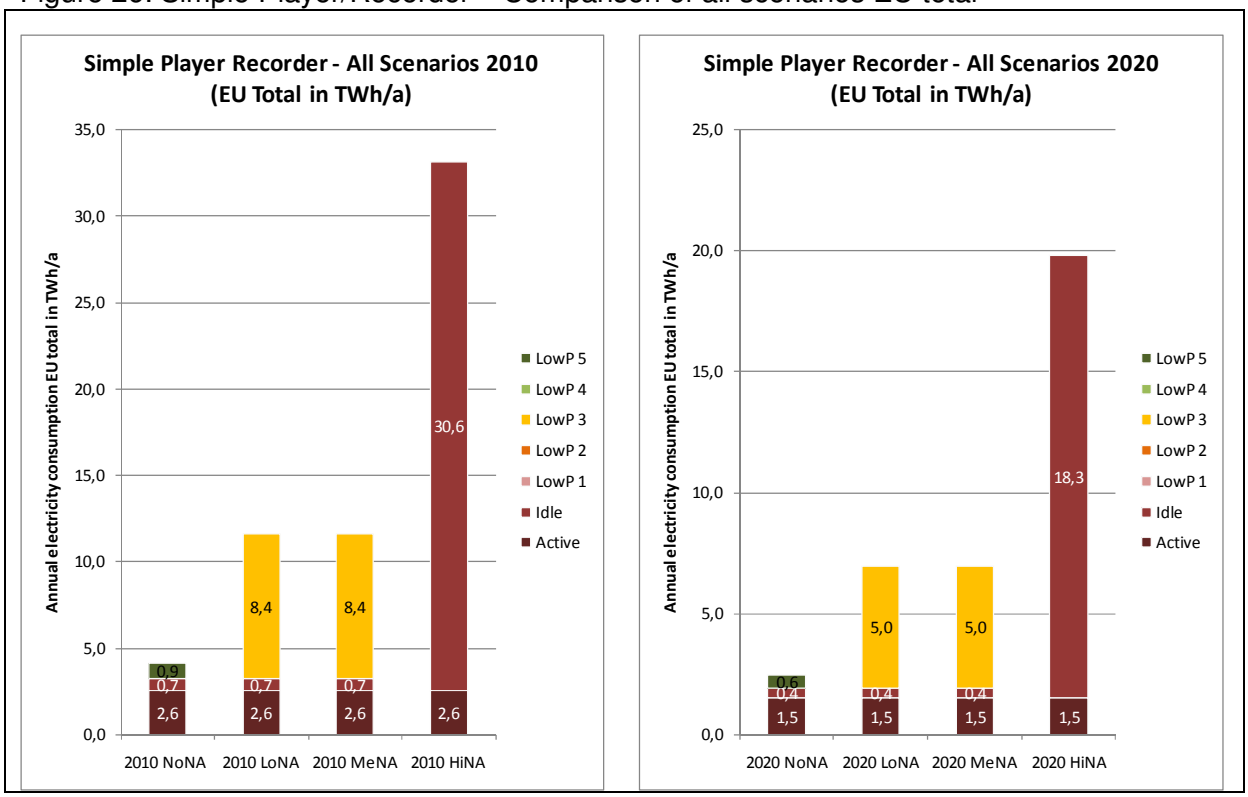


Figure 26: Simple Player/Recorder – Comparison of all scenarios EU total



2. Discussion of results

This product group is to some extend fading out due to more media center-type devices and other media recording/storage options in the market. That said, the energy consumption of the low power modes at approximately 5 TWh in 2020 is still considerable. If this product would be left in idle (very unlikely) considerable energy consumption in an order of 10 to 20 TWh would result.

Annex 14 Environmental Assessment: Complex Player/Recorder



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 14 –
Complex Player/Recorder

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Disclaimer

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.

Input Data

Product definition:

A Complex Player/Recorder is a new product group incorporating a TV receiver and media player/recording capability including DVD, BluRay, HDD or SDD. Stock based on [TREN Lot 18, 2008][25]. The data was given for 2010, 2015 and 2020 in the report. In the long term we assume a different trend than the one assumed in Lot 18. We assume that complex STBs and so called Media Centre or Digital Media Receiver are merging. This new converging product group will have a high market penetration. The Complex Player/Recorder connects to a home network using either a wireless or wired connection. It includes a user interface that allows users to navigate through a digital media library, search for, and play back media files. The device is connected to a TV using standard cables.[26]

Product stock assumption:

Stock assumptions are based on TREN Lot 18, 2008[27]. The data was given for 2010, 2015 and 2020 in the report. In the long term we assume a different trend than the one assumed in Lot 18. We assume that Complex STBs and so called Media Centre or Digital Media Receiver are merging to the new product group, Complex Player/Recorder. This new converging product group will have a high market penetration.

Power Modes and Power Management Options:

The Complex Player/Recorder could feature five modes:

- Active mode wherein the devices is receiving, recoding or playing content. We assume that such a device is more actively used in comparison to single media player/recorder. Active and idle duration is, in total, similar to daily TV use.
- Idle mode is an active mode where the product is ready but no content is played or recorded.
- LowP2 is equivalent to active standby with fast play/quick start option and/or remote activation over network capability. Power consumption level reflects status of current devices in the market.
- LowP3 is equivalent to passive standby where a timer is running. The passive standby reflects already legal compliance with the standby regulation.

[25] [TREN Lot 18, 2007] EuP study on Complex Set Top Boxes, 2008. www.ecocomplexstb.org
[26] Modified from http://en.wikipedia.org/wiki/Digital_media_receiver. Accessed 22 Jan 2010.
[27] [TREN Lot 18, 2007] EuP study on Complex Set Top Boxes, 2008. www.ecocomplexstb.org

- LowP5 is equivalent to off-mode with losses.

Explanatory notes 2020:

Mode and use pattern is similar to reference year 2010. General power consumption improvement per mode is 20%. We assume that product stock could increase more quickly (10% of European households may use such a device in 2020).

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 27: Complex Player/Recorder – Input data for scenarios of reference year 2010

NoNA	**Compl. Player/Recorder**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	35,0	30,0	0,0	10,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	3,0	1,0	0,0	0,0	0,0	0,0	20,0	24,0
365 d/a	Mode Power (Wh/d)	105,0	30,0	0,0	0,0	0,0	0,0	10,0	145,0
20 million	TEC Unit/year (kWh/a)	38,3	11,0	0,0	0,0	0,0	0,0	3,7	52,9
	Stock per year (TWh/a)	0,8	0,2	0,0	0,0	0,0	0,0	0,1	1,1

LoNA	Compl. Player/Recorder	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	35,0	30,0	0,0	10,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	3,0	1,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	105,0	30,0	0,0	0,0	0,0	30,0	0,0	165,0
20 million	TEC Unit/year (kWh/a)	38,3	11,0	0,0	0,0	0,0	11,0	0,0	60,2
	Stock per year (TWh/a)	0,8	0,2	0,0	0,0	0,0	0,2	0,0	1,2

MeNA	Compl. Player/Recorder	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	35,0	30,0	0,0	10,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	3,0	1,0	0,0	20,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	105,0	30,0	0,0	200,0	0,0	0,0	0,0	335,0
20 million	TEC Unit/year (kWh/a)	38,3	11,0	0,0	73,0	0,0	0,0	0,0	122,3
	Stock per year (TWh/a)	0,8	0,2	0,0	1,5	0,0	0,0	0,0	2,4

HiNA	Compl. Player/Recorder	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	35,0	30,0	0,0	10,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	105,0	630,0	0,0	0,0	0,0	0,0	0,0	735,0
20 million	TEC Unit/year (kWh/a)	38,3	230,0	0,0	0,0	0,0	0,0	0,0	268,3
	Stock per year (TWh/a)	0,8	4,6	0,0	0,0	0,0	0,0	0,0	5,4

Table 28: Complex Player/Recorder – Input data for scenarios of forecast year 2020

NoNA	**Compl. Player/Recorder**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	28,0	24,0	0,0	8,0	0,0	1,2	0,4	
Stock	Use hours (h/d)	3,0	1,0	0,0	0,0	0,0	0,0	20,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	24,0	0,0	0,0	0,0	0,0	8,0	116,0
82 million	TEC Unit/year (kWh/a)	30,7	8,8	0,0	0,0	0,0	0,0	2,9	42,3
	Stock per year (TWh/a)	2,5	0,7	0,0	0,0	0,0	0,0	0,2	3,5

LoNA	Compl. Player/Recorder	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	28,0	24,0	0,0	8,0	0,0	1,2	0,4	
Stock	Use hours (h/d)	3,0	1,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	24,0	0,0	0,0	0,0	24,0	0,0	132,0
82 million	TEC Unit/year (kWh/a)	30,7	8,8	0,0	0,0	0,0	8,8	0,0	48,2
	Stock per year (TWh/a)	2,5	0,7	0,0	0,0	0,0	0,7	0,0	4,0

MeNA	Compl. Player/Recorder	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	28,0	24,0	0,0	8,0	0,0	1,2	0,4	
Stock	Use hours (h/d)	3,0	1,0	0,0	20,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	24,0	0,0	160,0	0,0	0,0	0,0	268,0
82 million	TEC Unit/year (kWh/a)	30,7	8,8	0,0	58,4	0,0	0,0	0,0	97,8
	Stock per year (TWh/a)	2,5	0,7	0,0	4,8	0,0	0,0	0,0	8,0

HiNA	Compl. Player/Recorder	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	28,0	24,0	0,0	8,0	0,0	1,2	0,4	
Stock	Use hours (h/d)	3,0	21,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	84,0	504,0	0,0	0,0	0,0	0,0	0,0	588,0
82 million	TEC Unit/year (kWh/a)	30,7	184,0	0,0	0,0	0,0	0,0	0,0	214,6
	Stock per year (TWh/a)	2,5	15,1	0,0	0,0	0,0	0,0	0,0	17,6

Figure 27: Complex Player/Recorder – Comparison of all scenarios TEC

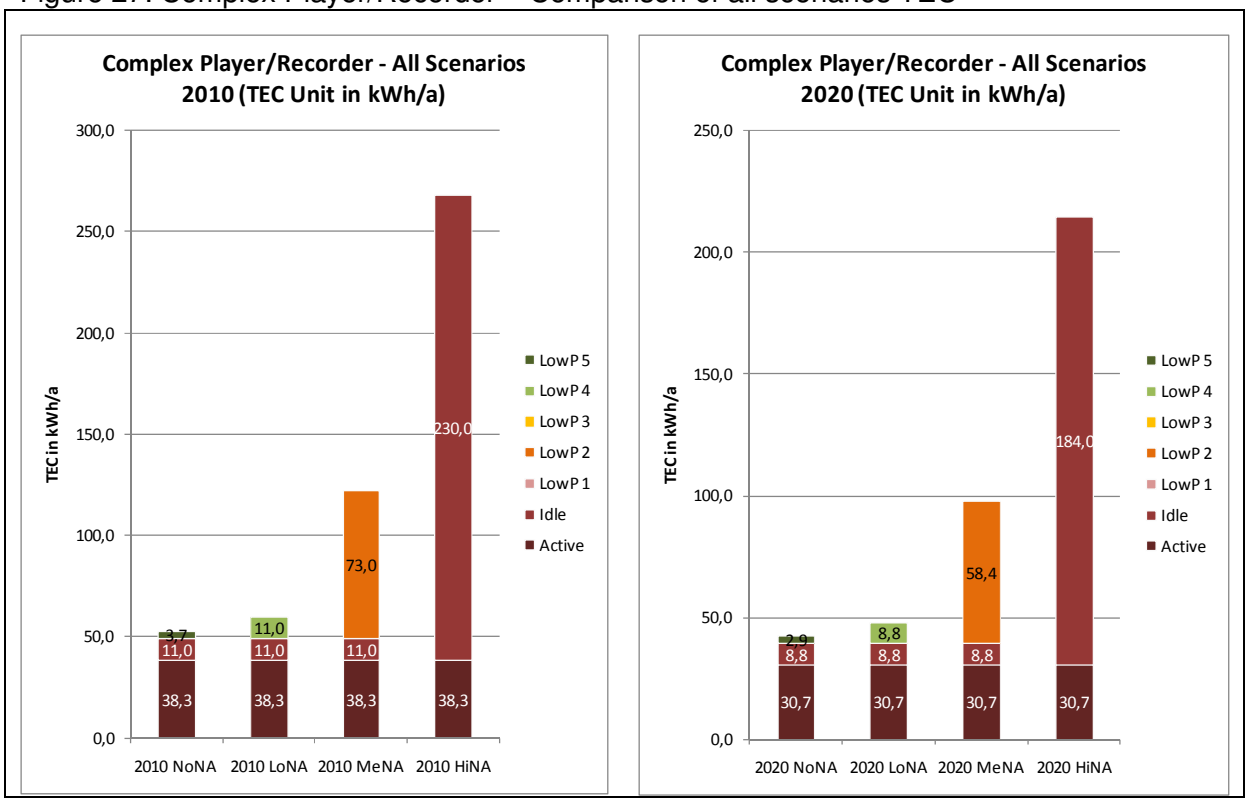
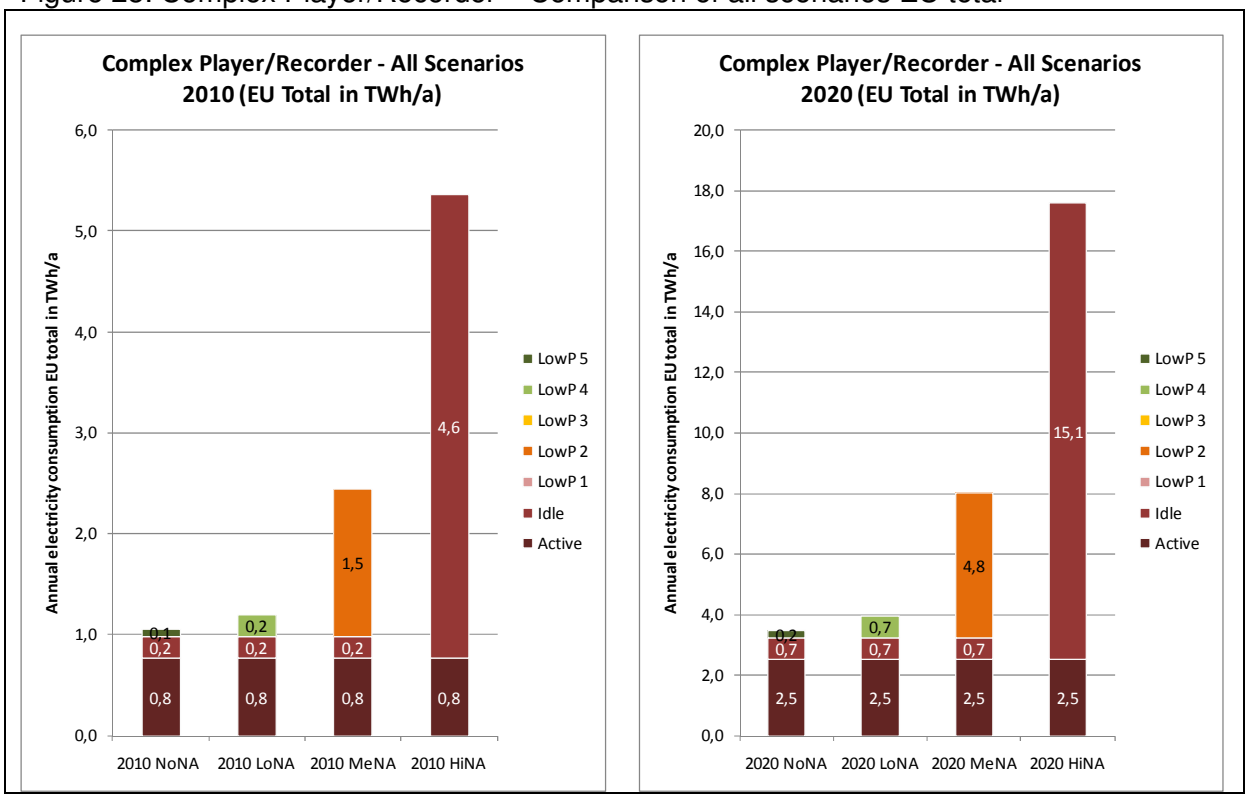


Figure 28: Complex Player/Recorder – Comparison of all scenarios EU total



2. Discussion of results

This new product group, with its growing stock, is potentially relevant for networked standby, depending on its functional configuration and actual utilization. Due to the fact that medium to high network availability could become a likely scenario, annual energy consumption could have with 5 to 15 TWh per year a significant impact. In this case, controlling idle-mode power levels and auto-power down would be a necessary requirements in support of energy saving.

Annex 15 Environmental Assessment: Game Console



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 15 – Game Console

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Dr. Andreas Middendorf, Technische Universität Berlin and Fraunhofer IZM

Disclaimer

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Input Data

Product definition:

Game console is a standalone computer-like device whose primary use is to play video games. Game consoles use a hardware architecture based in part on typical computer components (e.g., processors, system memory, video architecture, optical and/or hard drives, etc.). The primary input for game consoles are special hand held controllers rather than the mouse and keyboard used by more conventional computer types. Game consoles are also equipped with audio visual outputs for use with televisions as the primary display, rather than (or in addition to) an external or integrated display. These devices do not typically use a conventional PC operating system, but often perform a variety of multimedia functions such as: DVD/CD playback, digital picture viewing, and digital music playback. Current and future high-consuming game consoles such as Xbox360 and PS3, contains increasing internal storage and removable media (e.g. DVD, Blu-Ray). It gives the opportunity to stream A/V-media and data to other devices, such as TVs, displays or HiFi-systems and therefore uses wake-up functionality and networked standby.

Handheld gaming devices (Nintendo DS, Sony PSP), typically battery powered and intended for use with an integral display as the primary display, are not covered by this specification.[28]

Product stock assumption:

Based on the market data available from the new ENTR Lot 3 study on audio and video equipment, the XBOX 360 and PS3 account 2010 for about 25 million units in the European market.

Note: For the purpose of this study we assume a highly average product which represents a mixture of the XBOX 360 and PS3. We are therefore under-representing smaller, standard definition systems such as the PS2 (about 25 Watt active) and the Nintendo Wii (about 20 Watt active).

Power Modes and Power Management Options:

Change in performance increase power consumption while technology improvements reduce power consumption from one generation to the next. The game consoles feature effectively only two modes – active and off. Power consumption in active is not constant. It varies according to the technical (chip) generation and supported applications. Video games consume more power than watching a movie on DVD, but the difference is not much. Idle mode is only about 85 % of active mode.

[28] Check ENTR Lot 3 http://www.ecomultimedia.org

The selected power consumption values are based on the results on the NRDC issue paper (2008): “Lowering the cost of play – Improving the Energy Efficiency of Video Game Consoles”. There are also individual measurements available on Tech Blog pages on the internet.

- Active mode is assume to be on average 150 W (190 W to 120 W) for playing 2h per day video games or watching movies.
- Idle mode is an active mode while the device is ready but not running an application (e.g. games or movie). Power consumption is on average 125 W (100 W to 140 W).
- LowP4 is a low power standby/soft-off mode with an average power consumption of 2 W. We assume that devices have a programmable auto-power-down (APD), but on delivery it is not turned on and hard to find in the menu. Our network availability scenarios reflect different type of settings for fast reactivation.

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

The stock data is based on ENTR Lot 3 study in combination with the pragmatic assumption.

Table 29: Game Console – Input data for scenarios of reference year 2010

NoNA	**Game Console**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	125,0	0,0	0,0	0,0	2,0	0,0	
Stock	Use hours (h/d)	2,0	0,0	0,0	0,0	0,0	22,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	300,0	0,0	0,0	0,0	0,0	44,0	0,0	344,0
25 million	TEC Unit/year (kWh/a)	109,5	0,0	0,0	0,0	0,0	16,1	0,0	125,6
	Stock per year (TWh/a)	2,7	0,0	0,0	0,0	0,0	0,4	0,0	3,1

LoNA	Game Console	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	125,0	0,0	0,0	0,0	2,0	0,0	
Stock	Use hours (h/d)	2,0	2,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	300,0	250,0	0,0	0,0	0,0	40,0	0,0	590,0
25 million	TEC Unit/year (kWh/a)	109,5	91,3	0,0	0,0	0,0	14,6	0,0	215,4
	Stock per year (TWh/a)	2,7	2,3	0,0	0,0	0,0	0,4	0,0	5,4

MeNA	Game Console	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	125,0	0,0	0,0	0,0	2,0	0,0	
Stock	Use hours (h/d)	2,0	12,0	0,0	0,0	0,0	10,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	300,0	1500,0	0,0	0,0	0,0	20,0	0,0	1820,0
25 million	TEC Unit/year (kWh/a)	109,5	547,5	0,0	0,0	0,0	7,3	0,0	664,3
	Stock per year (TWh/a)	2,7	13,7	0,0	0,0	0,0	0,2	0,0	16,6

HiNA	Game Console	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	150,0	125,0	0,0	0,0	0,0	2,0	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	300,0	2750,0	0,0	0,0	0,0	0,0	0,0	3050,0
25 million	TEC Unit/year (kWh/a)	109,5	1003,8	0,0	0,0	0,0	0,0	0,0	1113,3
	Stock per year (TWh/a)	2,7	25,1	0,0	0,0	0,0	0,0	0,0	27,8

Table 30: Game Console – Input data for scenarios of forecast year 2020

NoNA	**Game Console**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	100,0	0,0	0,0	0,0	1,6	0,0	
Stock	Use hours (h/d)	2,0	0,0	0,0	0,0	0,0	22,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	240,0	0,0	0,0	0,0	0,0	35,2	0,0	275,2
34 million	TEC Unit/year (kWh/a)	87,6	0,0	0,0	0,0	0,0	12,8	0,0	100,4
	Stock per year (TWh/a)	3,0	0,0	0,0	0,0	0,0	0,4	0,0	3,4

LoNA	Game Console	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	100,0	0,0	0,0	0,0	1,6	0,0	
Stock	Use hours (h/d)	2,0	2,0	0,0	0,0	0,0	20,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	240,0	200,0	0,0	0,0	0,0	32,0	0,0	472,0
34 million	TEC Unit/year (kWh/a)	87,6	73,0	0,0	0,0	0,0	11,7	0,0	172,3
	Stock per year (TWh/a)	3,0	2,5	0,0	0,0	0,0	0,4	0,0	5,9

MeNA	Game Console	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	100,0	0,0	0,0	0,0	1,6	0,0	
Stock	Use hours (h/d)	2,0	12,0	0,0	0,0	0,0	10,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	240,0	1200,0	0,0	0,0	0,0	16,0	0,0	1456,0
34 million	TEC Unit/year (kWh/a)	87,6	438,0	0,0	0,0	0,0	5,8	0,0	531,4
	Stock per year (TWh/a)	3,0	14,9	0,0	0,0	0,0	0,2	0,0	18,1

HiNA	Game Console	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	120,0	100,0	0,0	0,0	0,0	1,6	0,0	
Stock	Use hours (h/d)	2,0	22,0	0,0	0,0	0,0	0,0	0,0	24,0
365 d/a	Mode Power (Wh/d)	240,0	2200,0	0,0	0,0	0,0	0,0	0,0	2440,0
34 million	TEC Unit/year (kWh/a)	87,6	803,0	0,0	0,0	0,0	0,0	0,0	890,6
	Stock per year (TWh/a)	3,0	27,3	0,0	0,0	0,0	0,0	0,0	30,3

Figure 29: Game Console – Comparison of all scenarios TEC

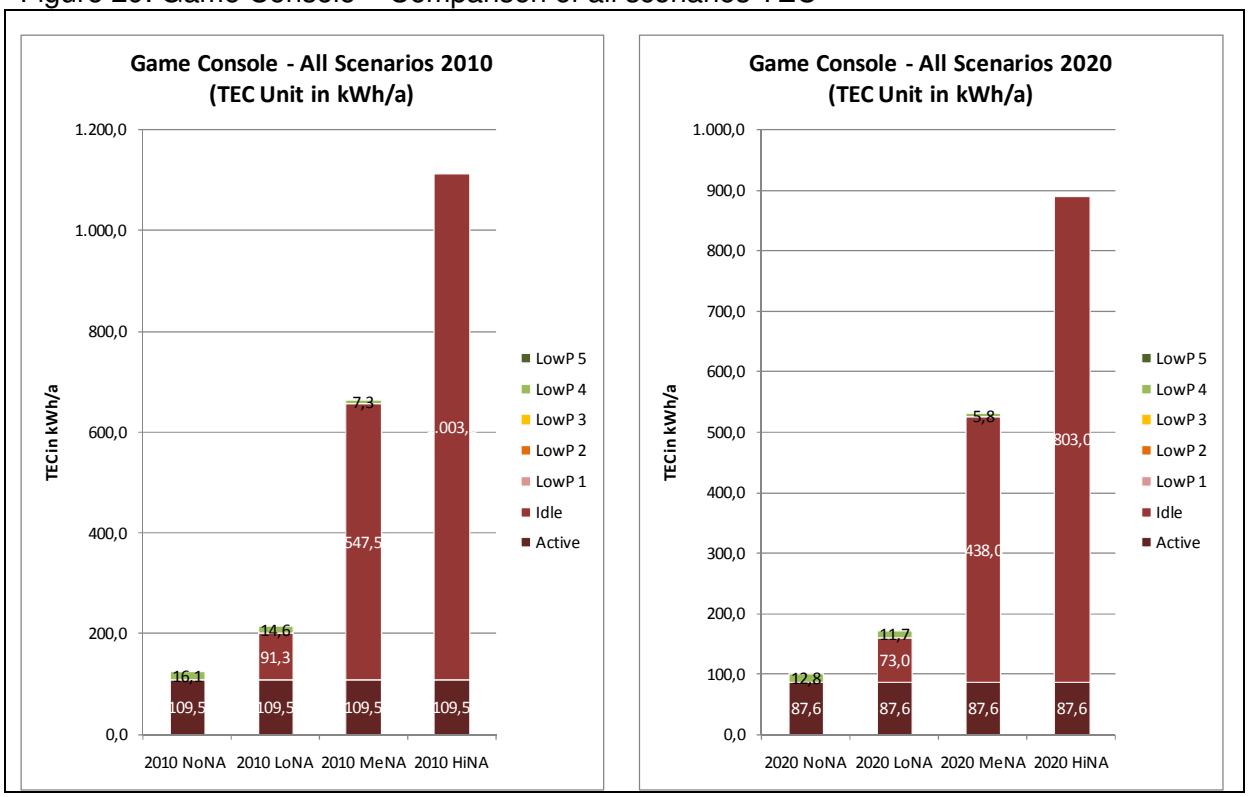
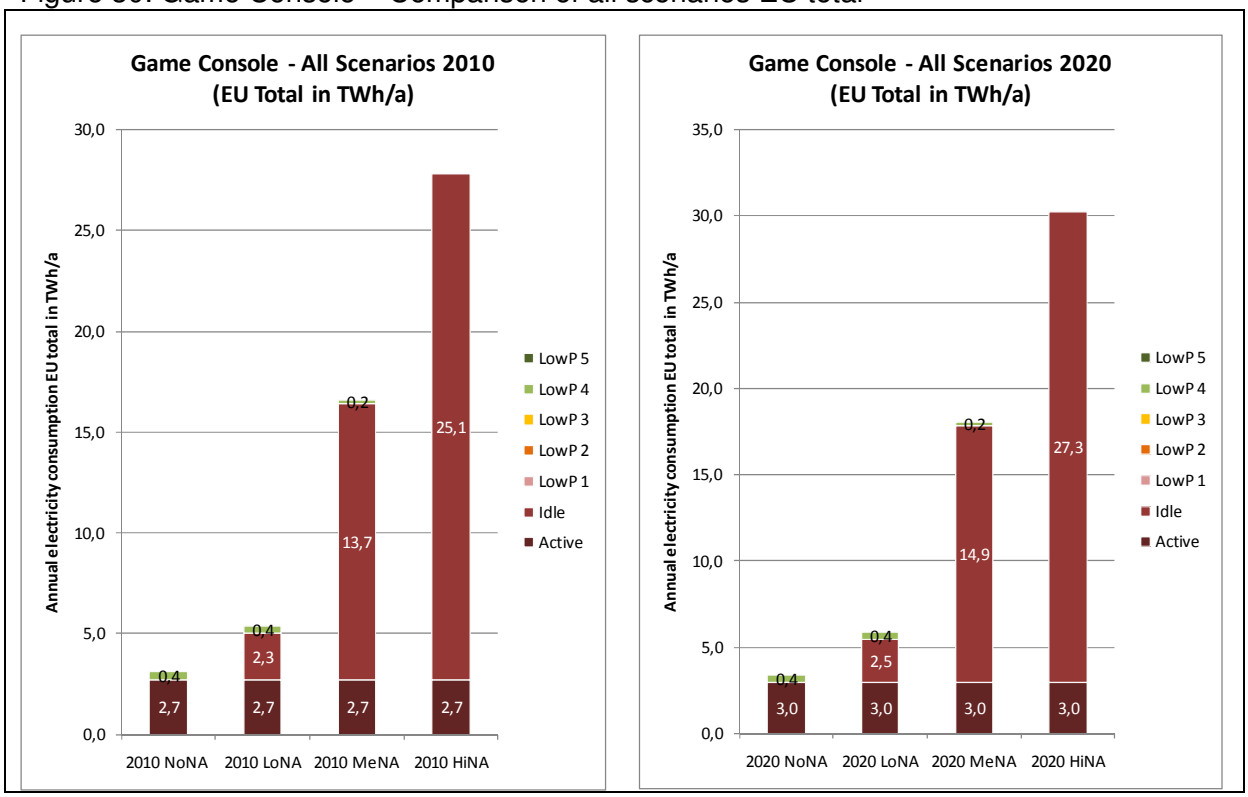


Figure 30: Game Console – Comparison of all scenarios EU total



2. Discussion of results

The annual energy consumption of game consoles is considerable due to the performance in active and therefore also in mode. The development scenario MeNA 2020 is with 18 TWh a considerable impact. In comparison to computers, current game consoles do not feature much scaled power management. The devices are active/idle or standby/off. If the products are kept idle in “Pause” or for faster reactivation then improvement potential is clearly in the reduction of idle mode duration or an advanced power management.

If we take the whole spectrum of game consoles – the smaller products such as Nintendo Wii – the standby power consumption will increase in total. The “WiiConnect24” standby mode indicates a higher level of network availability and consumes about 9.5 Watts in comparison to regular standby of about 1.3 Watts. Let’s assume in a worst case scenario that the 22.5 million Wii consoles in the European market would be in WiiConnect24 standby for 24/7/365. The resulting annual energy consumption would be 1.8 TWh.

Annex 16 Environmental Assessment: Office Desktop PC



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 16 – Office Desktop PC

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

Department Environmental and Reliability Engineering

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Disclaimer

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.

Input Data

Product definition:

Desktop PC is a computer where the main unit is intended to be located in a permanent location, often on a desk or on the floor. Desktops are not designed for portability and utilize an external computer display, keyboard, and mouse.[29]

This product group also contains Integrated Desktop Computer, a desktop system in which the computer and computer display function as a single unit which receives its ac power through a single cable.[30]

Product stock assumption:

Stock assumption has been based on [TREN Lot 3, 2007][31] and [ICTEE, 2008].[32] The forecast assumes a slow increase over time due to increasing number of office work places in the EU-27 (mostly in new member states). In terms of office penetration we assume a decline due to the increasing use of notebooks and thin clients.

Power Modes and Power Management Options:

Desktop PCs are considered to have an integrated power management on the basis for ACPI. The implementation of these power management options are supported by the requirements of the Energy Star Program for Computers. We assume that Desktop PCs are utilizing the existing hardware and software options for reducing idle power and duration and start transitioning into low power sleep modes S3 and S5 according to a default delay time setting. In support of network availability the equipment is utilization Wake-on-LAN in the respective sleep modes.

The following power modes are considered:

Active: Mode is equivalent to G0/S0 (applications are running). According to industry sources average active mode power consumption that is approx. factor 1.2 of idle power.

Idle: Mode is equivalent to G0/S0. No application is running. [HiNA].

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

[29] Definition according to Energy Star Program Requirements for Computers (Version 5.0)
[30] Definition according to Energy Star Program Requirements for Computers (Version 5.0)
[31] [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; http://www.ecocomputer.org
[32] [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

LowP2: Mode is equivalent to G1/S3. Average power consumption is oriented on S3sleep with WOL. [MeNA]

LowP3: Mode is equivalent to G1/S3 (sleep).

LowP4: Mode is equivalent to G2/S5 with WOL [LoNA]

LowP5: Mode is equivalent to G2/S5 (soft off)

G1/S4 (hibernate) is not used for Desktop Computers, because it offers only minor savings in energy consumption while increasing the booting times significantly. For Desktop Computers it is more likely being shut down (soft off with/without WOL).

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 31: Office Desktop PC – Input data for scenarios of reference year 2010

NoNA	**Office Desktop PC**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	420,0	150,0	0,0	0,0	0,0	0,0	22,5	592,5
60 million	TEC Unit/year (kWh/a)	100,8	36,0	0,0	0,0	0,0	0,0	5,4	142,2
	Stock per year (TWh/a)	6,0	2,2	0,0	0,0	0,0	0,0	0,3	8,5

LoNA	Office Desktop PC	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	420,0	150,0	0,0	0,0	0,0	33,0	0,0	603,0
60 million	TEC Unit/year (kWh/a)	100,8	36,0	0,0	0,0	0,0	7,9	0,0	144,7
	Stock per year (TWh/a)	6,0	2,2	0,0	0,0	0,0	0,5	0,0	8,7

MeNA	Office Desktop PC	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	6,0	3,0	0,0	15,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	420,0	150,0	0,0	70,5	0,0	0,0	0,0	640,5
60 million	TEC Unit/year (kWh/a)	100,8	36,0	0,0	16,9	0,0	0,0	0,0	153,7
	Stock per year (TWh/a)	6,0	2,2	0,0	1,0	0,0	0,0	0,0	9,2

HiNA	Office Desktop PC	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	70,0	50,0	25,0	4,7	4,0	2,2	1,5	
Stock	Use hours (h/d)	6,0	18,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	420,0	900,0	0,0	0,0	0,0	0,0	0,0	1320,0
60 million	TEC Unit/year (kWh/a)	100,8	216,0	0,0	0,0	0,0	0,0	0,0	316,8
	Stock per year (TWh/a)	6,0	13,0	0,0	0,0	0,0	0,0	0,0	19,0

Table 32: Office Desktop PC – Input data for scenarios of forecast year 2020

NoNA	**Office Desktop PC**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	2,0	0,0	15,0	26,0
240 d/a	Mode Power (Wh/d)	336,0	120,0	0,0	0,0	6,4	0,0	18,0	480,4
70 million	TEC Unit/year (kWh/a)	80,6	28,8	0,0	0,0	1,5	0,0	4,3	115,3
	Stock per year (TWh/a)	5,6	2,0	0,0	0,0	0,1	0,0	0,3	8,1

LoNA	Office Desktop PC	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	336,0	120,0	0,0	0,0	0,0	26,4	0,0	482,4
70 million	TEC Unit/year (kWh/a)	80,6	28,8	0,0	0,0	0,0	6,3	0,0	115,8
	Stock per year (TWh/a)	5,6	2,0	0,0	0,0	0,0	0,4	0,0	8,1

MeNA	Office Desktop PC	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	6,0	3,0	0,0	15,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	336,0	120,0	0,0	56,4	0,0	0,0	0,0	512,4
70 million	TEC Unit/year (kWh/a)	80,6	28,8	0,0	13,5	0,0	0,0	0,0	123,0
	Stock per year (TWh/a)	5,6	2,0	0,0	0,9	0,0	0,0	0,0	8,6

HiNA	Office Desktop PC	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	56,0	40,0	20,0	3,8	3,2	1,8	1,2	
Stock	Use hours (h/d)	6,0	18,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	336,0	720,0	0,0	0,0	0,0	0,0	0,0	1056,0
70 million	TEC Unit/year (kWh/a)	80,6	172,8	0,0	0,0	0,0	0,0	0,0	253,4
	Stock per year (TWh/a)	5,6	12,1	0,0	0,0	0,0	0,0	0,0	17,7

Figure 31: Office Desktop PC – Comparison of all scenarios TEC

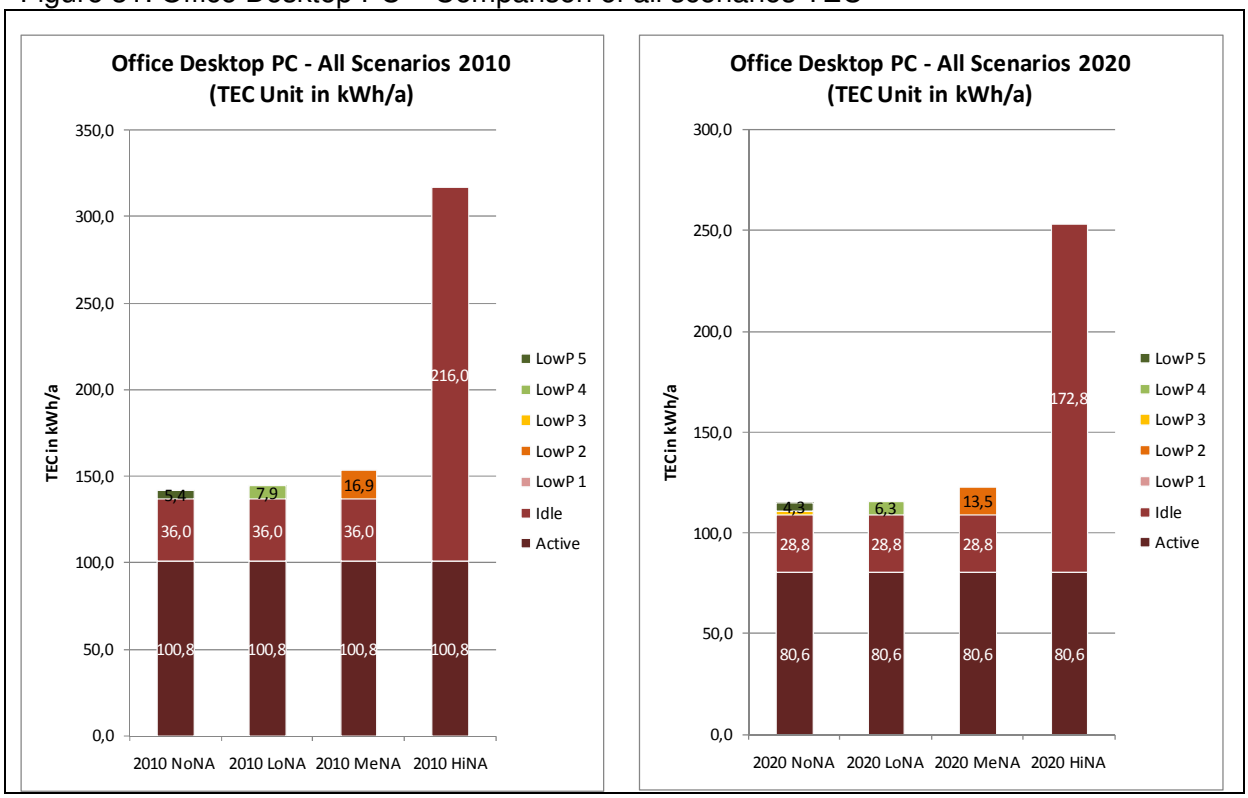
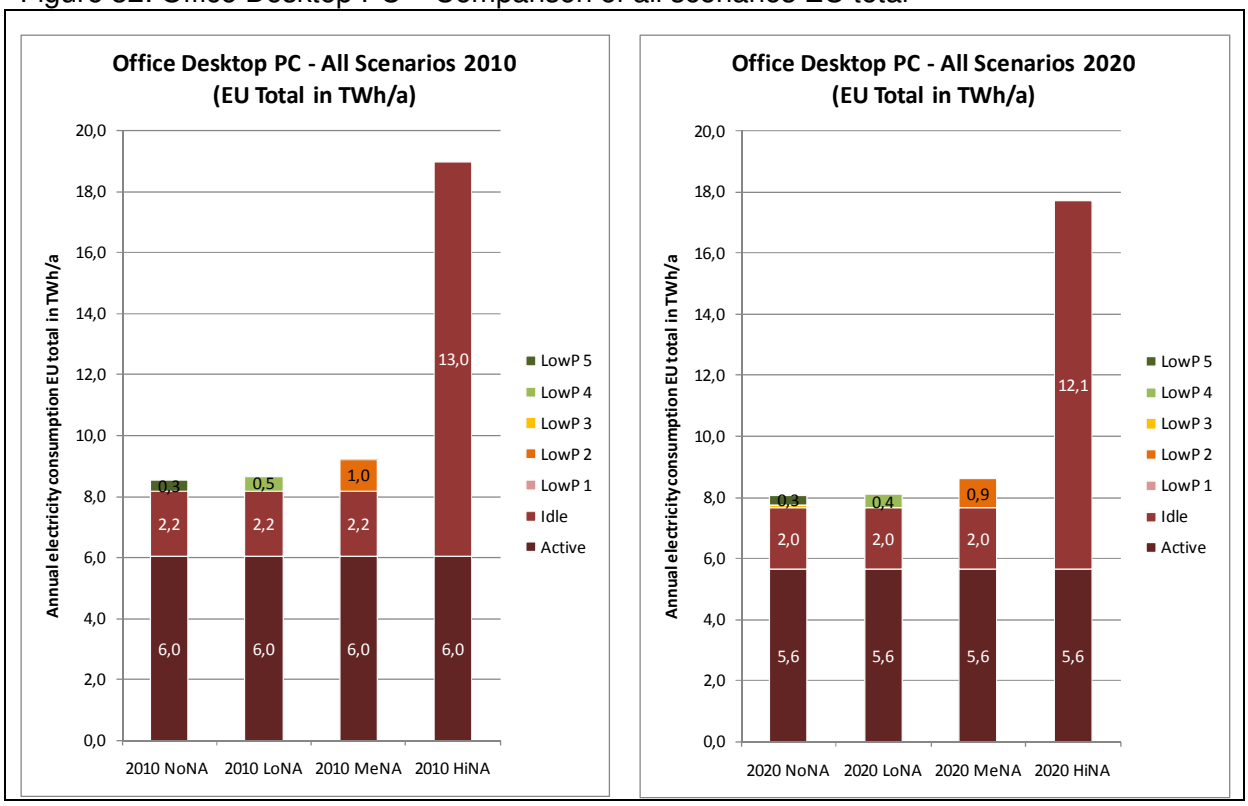


Figure 32: Office Desktop PC – Comparison of all scenarios EU total



2. Discussion of results

The office Desktop PC scenario is to some extent comparable to the home Desktop scenario. The utilization of the product is more intense and results in combined higher active/idle energy consumption. The standby modes are still significant but most important aspect for improving energy efficiency is a fast transition from idle into a medium network availability standby. The HiNA scenario indicates the worst case situation and the considerable environmental impact that would result on the economy level. The scenarios are also based on highly averaged power consumption value per mode. Individual computers could have significantly higher energy consumption in active and idle.

That said, we also need to consider that with Thin Clients and Zero Clients new product energy the market which will shift energy consumption into centralized computing (data center) and necessary networks (WAN and LAN). Most experts assume that this new architectures will improve overall energy efficiency in computing. However, the correlation between centralized computing, increase utilization of networks and resulting Quality-of-Service (QoS) requirements are not well analyzed yet. Particularly the last aspect (QoS) could lead to potential increase in energy consumption due to higher redundancy

requirements. The office Desktop PC market is changing. The new concepts will require a focus on overall energy efficiency including end-user devices and large computing and network infrastructures. Advanced power management on all levels as well as networked standby modes on the end-user level are important aspects that need to be addressed.

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Annex 17 Environmental Assessment: Office Notebook



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 17 – Office Notebook

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Disclaimer

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Input Data

Product definition:

A Notebook is a computer designed specifically for portability and to be operated for extended periods of time either with or without a direct connection to an ac power source. Notebooks must utilize an integrated computer display and be capable of operation off of an integrated battery or other portable power source. In addition, most notebooks use an external power supply and have an integrated keyboard and pointing device. Notebook computers are typically designed to provide similar functionality to desktops, including operation of software similar in functionality as that used in desktops.[33]

Note: Thin clients and zero clients are not considered under this product category. Industry and commercially available market surveys suggest that zero clients and thin clients are a fast growing product segments which will impact not only the enterprise market but also the end-user market. The utilization of such products is to some extent different from Notebooks and Desktop PCs due to the necessary software-as-a-service platforms.

Product stock assumption:

Stock data are considering only to some extent [TREN Lot 3, 2007]. The numbers provided by the older study are not fully plausible. We therefore considered a moderate office penetration rate of 60% for the reference year 2010 and further increase.

Power Modes and Power Management Options:

Notebooks are considered to have an advanced integrated power management on the basis for ACPI. They are optimized for mobile (battery) use and therefore reduce power (e.g. display dimming, shut down devices) whenever possible. The implementation of these power management options are supported by the requirements of the Energy Star Program for Computers. We assume that Notebooks are utilizing the existing hardware and software options for reducing idle power and duration and start transitioning rapidly into low power sleep modes S3, S4 or S5 according to a default delay time setting. In support of network availability the equipment is utilization Wake-on-LAN in the respective sleep modes.

The following power modes are considered:

Active: Mode is equivalent to G0/S0 (applications are running). According to industry sources average active mode power consumption that is approx. factor 1.2 of idle power.

[33] Definition according to Energy Star Program Requirements for Computers (Version 5.0)

Idle: Mode is equivalent to G0/S0. No application is running. [HiNA].

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is equivalent to G1/S3. Average power consumption is oriented on S3sleep with WOL. [MeNA]

LowP3: Mode is equivalent to G1/S3 (sleep).

LowP4: Mode is equivalent to G1/S4 hibernate with WOL [LoNA]

LowP5: Mode is equivalent to G2/S5 (soft off)

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

Recent data suggest that power consumption might further improve depending on the performance, configuration, and selected technologies of an individual product. It is feasible to assume that a combination of LoNA and MeNA is the most realistic real life scenario.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 33: Office Notebook – Input data for scenarios of reference year 2010

NoNA	**Office Notebook**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	180,0	60,0	0,0	0,0	0,0	0,0	12,0	252,0
45 million	TEC Unit/year (kWh/a)	43,2	14,4	0,0	0,0	0,0	0,0	2,9	60,5
	Stock per year (TWh/a)	1,9	0,6	0,0	0,0	0,0	0,0	0,1	2,7

LoNA	Office Notebook	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	180,0	60,0	0,0	0,0	0,0	22,5	0,0	262,5
45 million	TEC Unit/year (kWh/a)	43,2	14,4	0,0	0,0	0,0	5,4	0,0	63,0
	Stock per year (TWh/a)	1,9	0,6	0,0	0,0	0,0	0,2	0,0	2,8

MeNA	Office Notebook	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	6,0	3,0	0,0	15,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	180,0	60,0	0,0	40,5	0,0	0,0	0,0	280,5
45 million	TEC Unit/year (kWh/a)	43,2	14,4	0,0	9,7	0,0	0,0	0,0	67,3
	Stock per year (TWh/a)	1,9	0,6	0,0	0,4	0,0	0,0	0,0	3,0

HiNA	Office Notebook	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	30,0	20,0	10,0	2,7	2,0	1,5	0,8	
Stock	Use hours (h/d)	6,0	18,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	180,0	360,0	0,0	0,0	0,0	0,0	0,0	540,0
45 million	TEC Unit/year (kWh/a)	43,2	86,4	0,0	0,0	0,0	0,0	0,0	129,6
	Stock per year (TWh/a)	1,9	3,9	0,0	0,0	0,0	0,0	0,0	5,8

Table 34: Office Notebook – Input data for scenarios of forecast year 2020

NoNA	**Office Notebook**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	144,0	48,0	0,0	0,0	0,0	0,0	9,0	201,0
68 million	TEC Unit/year (kWh/a)	34,6	11,5	0,0	0,0	0,0	0,0	2,2	48,2
	Stock per year (TWh/a)	2,4	0,8	0,0	0,0	0,0	0,0	0,1	3,3

LoNA	Office Notebook	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	6,0	3,0	0,0	0,0	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	144,0	48,0	0,0	0,0	0,0	18,0	0,0	210,0
68 million	TEC Unit/year (kWh/a)	34,6	11,5	0,0	0,0	0,0	4,3	0,0	50,4
	Stock per year (TWh/a)	2,4	0,8	0,0	0,0	0,0	0,3	0,0	3,4

MeNA	Office Notebook	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	6,0	3,0	0,0	15,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	144,0	48,0	0,0	33,0	0,0	0,0	0,0	225,0
68 million	TEC Unit/year (kWh/a)	34,6	11,5	0,0	7,9	0,0	0,0	0,0	54,0
	Stock per year (TWh/a)	2,4	0,8	0,0	0,5	0,0	0,0	0,0	3,7

HiNA	Office Notebook	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	24,0	16,0	8,0	2,2	1,6	1,2	0,6	
Stock	Use hours (h/d)	6,0	18,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	144,0	288,0	0,0	0,0	0,0	0,0	0,0	432,0
68 million	TEC Unit/year (kWh/a)	34,6	69,1	0,0	0,0	0,0	0,0	0,0	103,7
	Stock per year (TWh/a)	2,4	4,7	0,0	0,0	0,0	0,0	0,0	7,1

Figure 33: Office Notebook – Comparison of all scenarios TEC

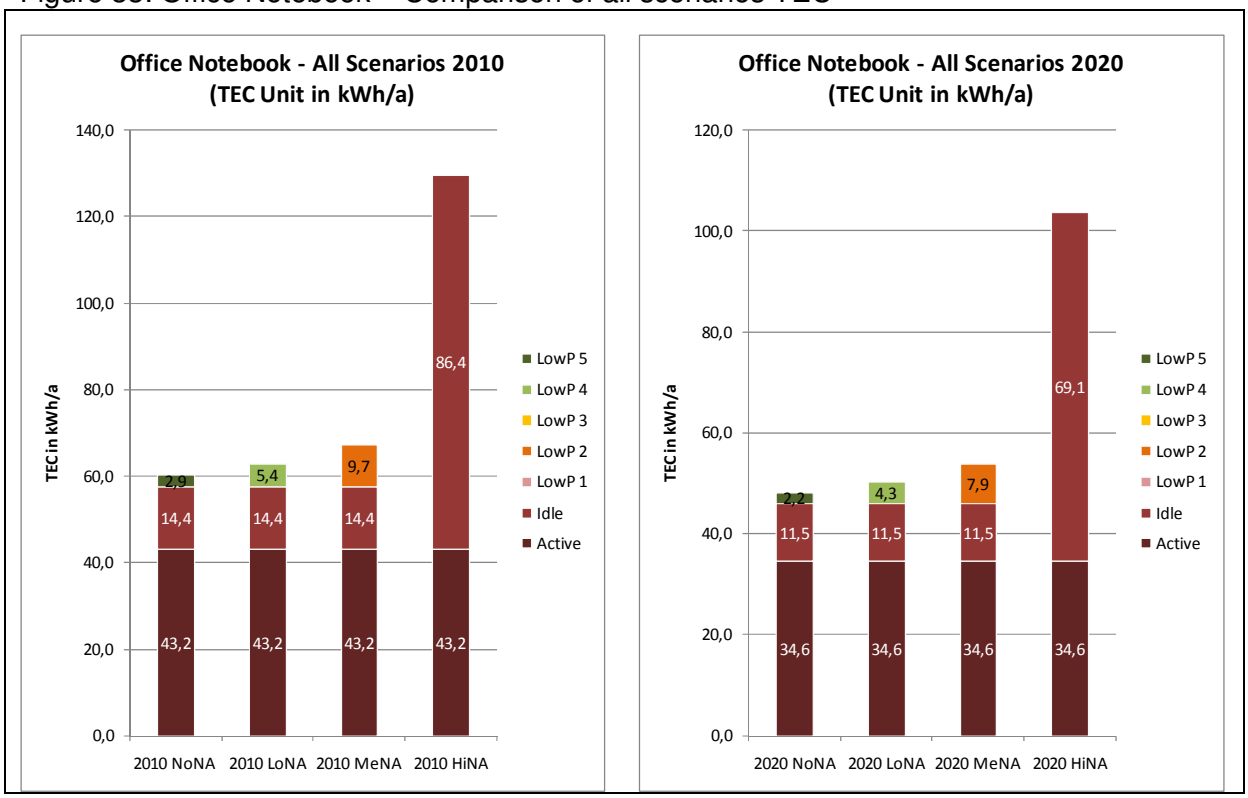
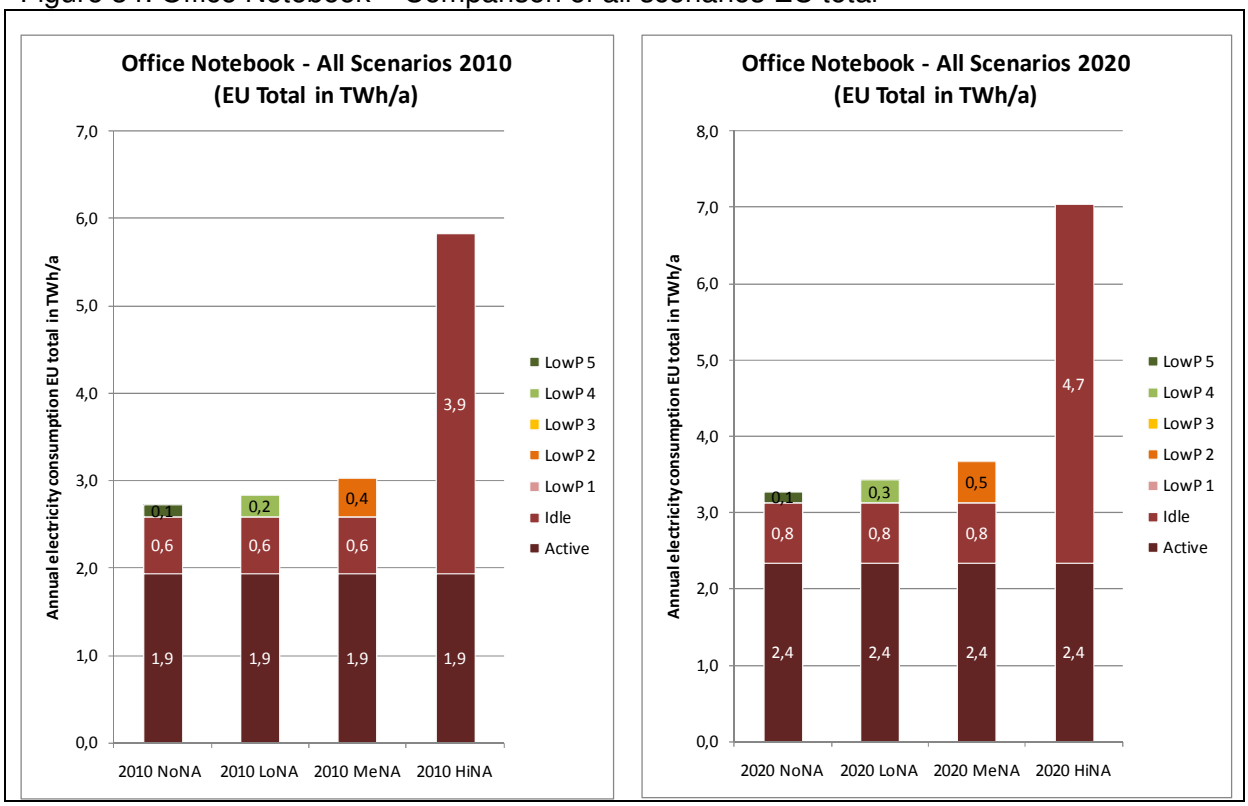


Figure 34: Office Notebook – Comparison of all scenarios EU total



2. Discussion of results

Similar to the home notebooks this product group shows in the low and medium network availability scenarios a high level of energy efficiency. The general improvement assumption leads on the unit level to an overall improvement from LoNA 2010 (63 kWh/a) to MeNA 2020 (54 kWh/a). Networked standby relevant energy consumption is on an aggregated economy level about 1 TWh per year and slightly increasing due to the still growing product stock. HiNA is an unrealistic scenario for this product group.

Annex 18 Environmental Assessment: Office Display



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 18 – Office Display

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Disclaimer

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.

Input Data

Product definition:

A display screen and its associated electronics encased in a single housing, or within the computer housing (e.g., notebook or integrated desktop computer), that is capable of displaying output information from a computer via one or more inputs, such as a VGA, DVI, Display Port, and/or IEEE 1394.[34]

We consider mostly LCD-based displays with CCFL or LED backlight. OLED displays are an emerging technology with better energy efficiency.

Product stock assumption:

Stock assumption has been based on [TREN Lot 3, 2007][35] and [ICTEE, 2008][36].

Power Modes and Power Management Options:

The display features an active mode and two low power modes.

Active: Mode in which the equipment provides a picture according to the input from the computer. Energy consumption could vary according to the display technology, dynamic backlight adjustment and selected brightness setting.

LowP2: Mode is equivalent to sleep with wake-up over network.

LowP5: Mode is equivalent to soft off.

Product mode assumptions are similar to the home computer displays. The active-mode duration (daily use pattern) correlates to the average use of office desktop PCs.

Explanatory notes 2020:

The general mode and use assumption is similar to the reference year 2010. General improvement of power consumption per mode: 20%

Further reduction in on-mode power (W/cm²) is feasible. However, we assume that the average screen size will increase over time and compensate the improvement to some extent.

[34] Definition according to Energy Star Program Requirements for Computers (Version 5.0)
[35] [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; http://www.ecocomputer.org
[36] [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

Table 35: Office Display – Input data for scenarios of reference year 2010

NoNA	**Office Display 22"**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,5	0,0	0,0	0,5	
Stock	Use hours (h/d)	6,0	0,0	0,0	3,0	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	150,0	0,0	0,0	4,5	0,0	0,0	7,5	162,0
60 million	TEC Unit/year (kWh/a)	36,0	0,0	0,0	1,1	0,0	0,0	1,8	38,9
	Stock per year (TWh/a)	2,2	0,0	0,0	0,1	0,0	0,0	0,1	2,3

LoNA	Office Display 22"	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,5	0,0	0,0	0,5	
Stock	Use hours (h/d)	6,0	0,0	0,0	9,0	0,0	0,0	9,0	24,0
240 d/a	Mode Power (Wh/d)	150,0	0,0	0,0	13,5	0,0	0,0	4,5	168,0
60 million	TEC Unit/year (kWh/a)	36,0	0,0	0,0	3,2	0,0	0,0	1,1	40,3
	Stock per year (TWh/a)	2,2	0,0	0,0	0,2	0,0	0,0	0,1	2,4

MeNA	Office Display 22"	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,5	0,0	0,0	0,5	
Stock	Use hours (h/d)	6,0	0,0	0,0	18,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	150,0	0,0	0,0	27,0	0,0	0,0	0,0	177,0
60 million	TEC Unit/year (kWh/a)	36,0	0,0	0,0	6,5	0,0	0,0	0,0	42,5
	Stock per year (TWh/a)	2,2	0,0	0,0	0,4	0,0	0,0	0,0	2,5

HiNA	Office Display 22"	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	25,0	0,0	0,0	1,5	0,0	0,0	0,5	
Stock	Use hours (h/d)	6,0	0,0	0,0	18,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	150,0	0,0	0,0	27,0	0,0	0,0	0,0	177,0
60 million	TEC Unit/year (kWh/a)	36,0	0,0	0,0	6,5	0,0	0,0	0,0	42,5
	Stock per year (TWh/a)	2,2	0,0	0,0	0,4	0,0	0,0	0,0	2,5

Table 36: Office Display – Input data for scenarios of forecast year 2020

NoNA	**Office Display 22"**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	6,0	0,0	0,0	3,0	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	120,0	0,0	0,0	3,6	0,0	0,0	6,0	129,6
85 million	TEC Unit/year (kWh/a)	28,8	0,0	0,0	0,9	0,0	0,0	1,4	31,1
	Stock per year (TWh/a)	2,4	0,0	0,0	0,1	0,0	0,0	0,1	2,6

LoNA	Office Display 22"	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	6,0	0,0	0,0	9,0	0,0	0,0	9,0	24,0
240 d/a	Mode Power (Wh/d)	120,0	0,0	0,0	10,8	0,0	0,0	3,6	134,4
85 million	TEC Unit/year (kWh/a)	28,8	0,0	0,0	2,6	0,0	0,0	0,9	32,3
	Stock per year (TWh/a)	2,4	0,0	0,0	0,2	0,0	0,0	0,1	2,7

MeNA	Office Display 22"	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	6,0	0,0	0,0	18,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	120,0	0,0	0,0	21,6	0,0	0,0	0,0	141,6
85 million	TEC Unit/year (kWh/a)	28,8	0,0	0,0	5,2	0,0	0,0	0,0	34,0
	Stock per year (TWh/a)	2,4	0,0	0,0	0,4	0,0	0,0	0,0	2,9

HiNA	Office Display 22"	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	20,0	0,0	0,0	1,2	0,0	0,0	0,4	
Stock	Use hours (h/d)	6,0	0,0	0,0	18,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	120,0	0,0	0,0	21,6	0,0	0,0	0,0	141,6
85 million	TEC Unit/year (kWh/a)	28,8	0,0	0,0	5,2	0,0	0,0	0,0	34,0
	Stock per year (TWh/a)	2,4	0,0	0,0	0,4	0,0	0,0	0,0	2,9

Figure 35: Office Display – Comparison of all scenarios TEC

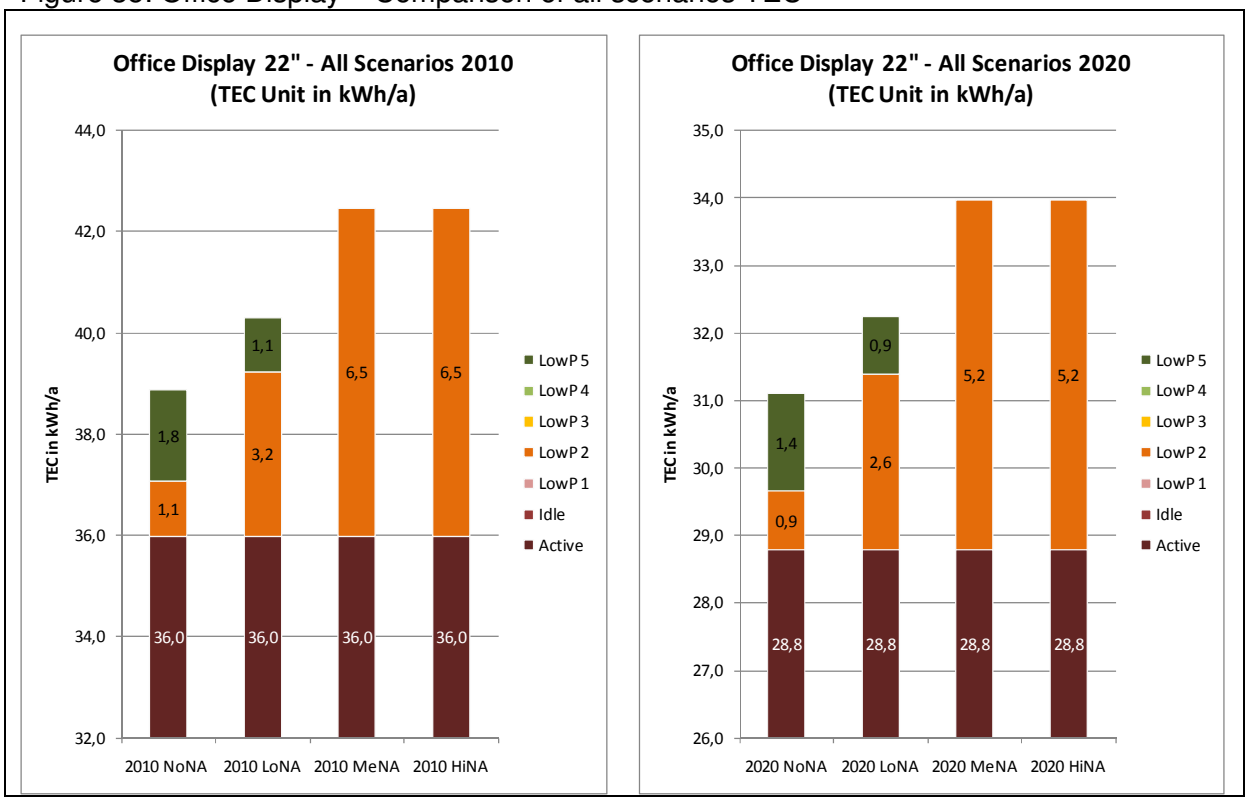
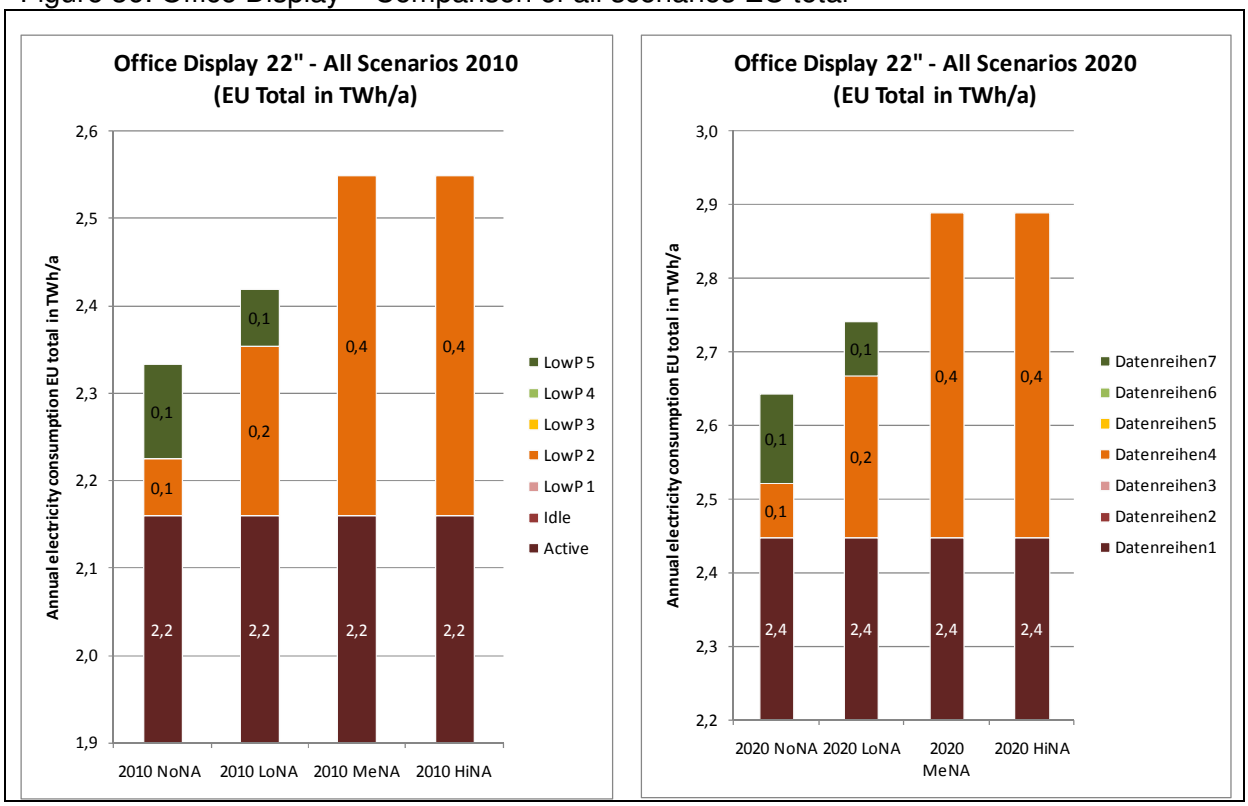


Figure 36: Office Display – Comparison of all scenarios EU total



2. Discussion of results

The further growing utilization of PCs (stock increase) results in an overall increase in energy consumption related to office displays. In the future this would include Thin and Zero Clients. The considerable improvements in display technologies are (LED/OLED) have a positive impact of the energy efficiency. Nevertheless, the screen size is an important aspect with respect to energy consumption. That means that with larger displays the overall energy consumption could increase again. The low power energy consumption on the economy level is about half a TWh per year. This seems rather small. It indicates the however the importance of an advanced power management. Prolonged active phases (display on) would result in significant energy impact.

Annex 19 Environmental Assessment: Office Inkjet Printer/MFD



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 19 –
Office Inkjet Printer/MFD

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Input Data

Product definition:

The product and technology definitions are according to Energy Star Program Requirements for Imaging Equipment. This product category combines single function printer, copier or multifunctional devices with Ink-Jet (IJ) marking technology. In support of network availability the equipment is utilization different network options including wired (LAN, USB) and as a growing application wireless (WLAN, Bluetooth).

Product stock assumption:

Stock data have been again slightly modified from [TREN Lot 4, 2007][37] and [ICTEE, 2008] in order to distinguish between home and office use.

Power Modes and Power Management Options:

Imaging equipment such as IJ-Printer/MFD is considered to have an integrated power management. The implementation of these power management options are supported by the requirements of the Energy Star Program for Imaging Equipment although the so called functional added approach seems to be less ambitious. We assume that IJ-Printer/MFD are utilizing the existing hardware and software options for reducing idle power and duration and start transitioning into a low power sleep mode according to a default delay time setting.

The following power modes are considered:

Active: Mode is equivalent to G0/S0 (applications are running).

Idle: Mode is equivalent to “ready mode” (imaging equipment industry terminology). The delay time after the print job is assumed to be no more than 5 to 10 minutes [HiNA]. Then the device shifts into LowP2. A prolonged idle mode is not assumed in the HiNA scenario due to the existing power management.

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is a sleep mode from which the product can resume operation within 10 to 20 seconds depending on the device. In this mode the product is fax capable (MeNA).

LowP4: Mode is equivalent to soft-off with WOL [LoNA]

LowP5: Mode is equivalent to soft-off

[37] [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; http://www.ecoimaging.org

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

Product mode assumptions are similar to the home IJ Printer/MFDs. The average utilization is more intensive.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020. This selected scenario considers best practice and the implementation of advanced power management (about 80% of products fulfill Energy Star Program Requirements). The MeNA scenario (e.g. the assumption that the equipment is use with wireless LAN interface) would increase overall energy consumption considerably. Again, we try to show a tendency in the market. For an individual environmental assessment the reader should consider mixed scenarios including prolonged medium network availability phases.

Table 37: Office Inkjet Printer/MFD – Input data for scenarios of reference year 2010

NoNA	**Office IJ Printer/MFD**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	17,0	34,0	0,0	26,0	0,0	0,0	7,5	84,5
46 million	TEC Unit/year (kWh/a)	4,1	8,2	0,0	6,2	0,0	0,0	1,8	20,3
	Stock per year (TWh/a)	0,2	0,4	0,0	0,3	0,0	0,0	0,1	0,9

LoNA	Office IJ Printer/MFD	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	17,0	34,0	0,0	26,0	0,0	22,5	0,0	99,5
46 million	TEC Unit/year (kWh/a)	4,1	8,2	0,0	6,2	0,0	5,4	0,0	23,9
	Stock per year (TWh/a)	0,2	0,4	0,0	0,3	0,0	0,2	0,0	1,1

MeNA	Office IJ Printer/MFD	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	17,0	34,0	0,0	86,0	0,0	0,0	0,0	137,0
46 million	TEC Unit/year (kWh/a)	4,1	8,2	0,0	20,6	0,0	0,0	0,0	32,9
	Stock per year (TWh/a)	0,2	0,4	0,0	0,9	0,0	0,0	0,0	1,5

HiNA	Office IJ Printer/MFD	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	34,0	17,0	0,0	4,0	0,0	1,5	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	17,0	34,0	0,0	86,0	0,0	0,0	0,0	137,0
46 million	TEC Unit/year (kWh/a)	4,1	8,2	0,0	20,6	0,0	0,0	0,0	32,9
	Stock per year (TWh/a)	0,2	0,4	0,0	0,9	0,0	0,0	0,0	1,5

Table 38: Office Inkjet Printer/MFD – Input data for scenarios of forecast year 2020

NoNA	**Office IJ Printer/MFD**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	13,6	27,2	0,0	20,8	0,0	0,0	6,0	67,6
46 million	TEC Unit/year (kWh/a)	3,3	6,5	0,0	5,0	0,0	0,0	1,4	16,2
	Stock per year (TWh/a)	0,2	0,3	0,0	0,2	0,0	0,0	0,1	0,7

LoNA	Office IJ Printer/MFD	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	13,6	27,2	0,0	20,8	0,0	18,0	0,0	79,6
46 million	TEC Unit/year (kWh/a)	3,3	6,5	0,0	5,0	0,0	4,3	0,0	19,1
	Stock per year (TWh/a)	0,2	0,3	0,0	0,2	0,0	0,2	0,0	0,9

MeNA	Office IJ Printer/MFD	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	13,6	27,2	0,0	68,8	0,0	0,0	0,0	109,6
46 million	TEC Unit/year (kWh/a)	3,3	6,5	0,0	16,5	0,0	0,0	0,0	26,3
	Stock per year (TWh/a)	0,2	0,3	0,0	0,8	0,0	0,0	0,0	1,2

HiNA	Office IJ Printer/MFD	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	27,2	13,6	0,0	3,2	0,0	1,2	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	13,6	27,2	0,0	68,8	0,0	0,0	0,0	109,6
46 million	TEC Unit/year (kWh/a)	3,3	6,5	0,0	16,5	0,0	0,0	0,0	26,3
	Stock per year (TWh/a)	0,2	0,3	0,0	0,8	0,0	0,0	0,0	1,2

Figure 37: Office Inkjet Printer/MFD – Comparison of all scenarios TEC

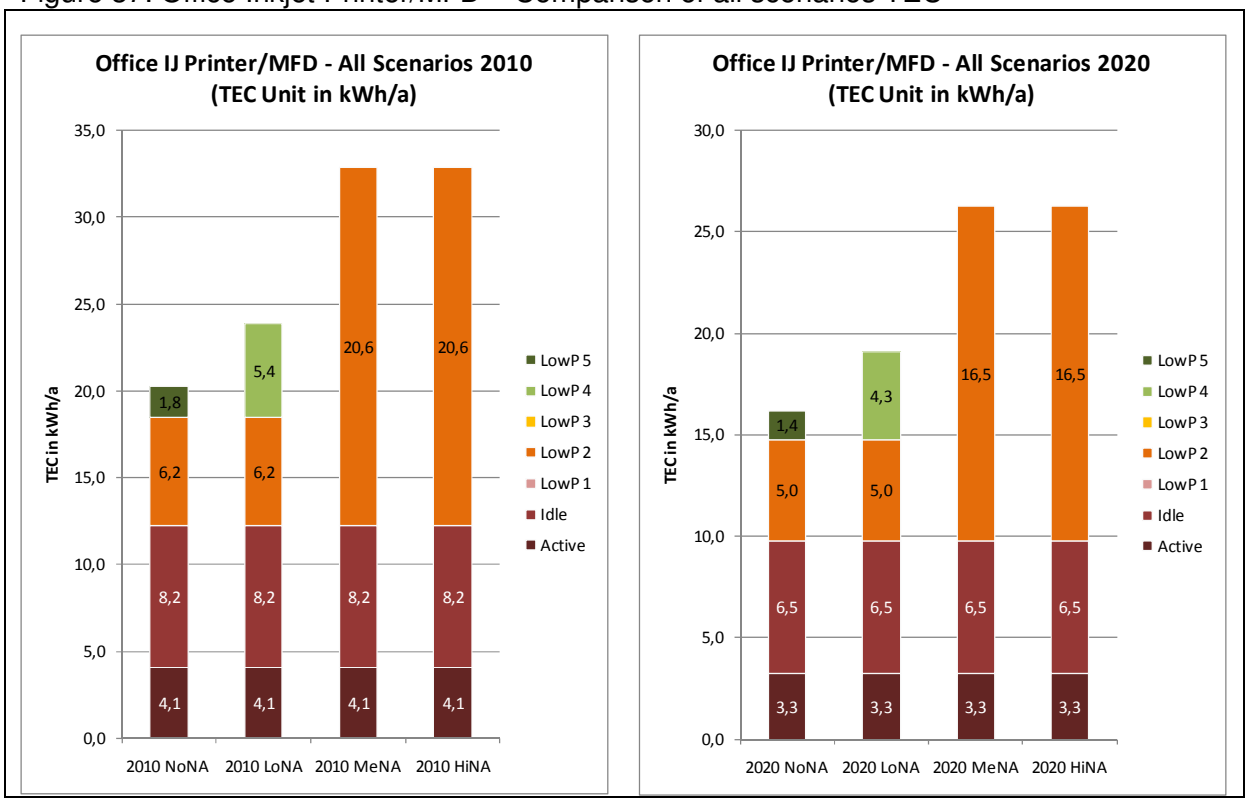
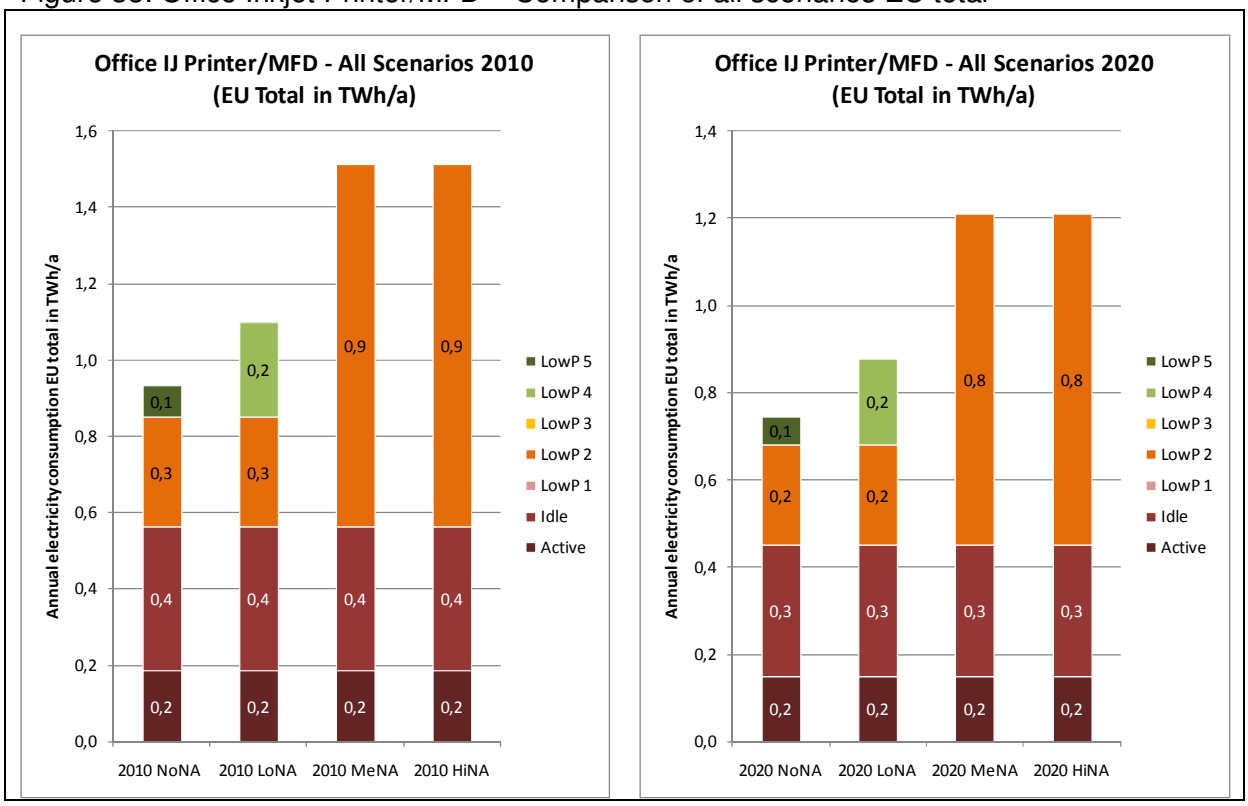


Figure 38: Office Inkjet Printer/MFD – Comparison of all scenarios EU total



2. Discussion of results

The environmental assessment of office IJ-Printer/MDF considered the implementation of power management, more intense use in comparison to home equipment, as well as a further general 20% improvement of power consumption per mode. A mix of LoNA and MeNA should be also in this case considered a real life scenario. The MeNA scenario is insofar realistic due to the growing application of wireless network technology. Against that background economy level energy consumption could increase again. Active use is not dominant. Idle could be underestimated talking into account that some of the devices are used in front desk environments (e.g. reception desk) with disabled power management. This type of application indicates the importance of power management and the utilization of low power modes. The LowP2 energy consumption is with about 1 TWh per year the single most important energy consumption (MeNA scenario). New network options (wireless) in conjunction with larger data volumes could easily increase the overall energy consumptions. The product group should be considered for networked standby.

Annex 20 Environmental Assessment: Office EP Printer



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 20 – Office EP Printer

Contractor: Fraunhofer Institute for Reliability and Microintegration, IZM

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Dr. Andreas Middendorf, Technische Universität Berlin and Fraunhofer IZM

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Input Data

Product definition:

The product and technology definitions are according to Energy Star Program Requirements for Imaging Equipment. This product category combines single function printer, copier or multifunctional devices with Electro-Photography (EP) marking technology. In support of network availability the equipment is utilization different network options including wired (LAN, USB) and as a growing application wireless (WLAN). This product group represents a typical workgroup laser printer with output of about 40 images per minute.

Product stock assumption:

Stock data have been again slightly modified from [TREN Lot 4, 2007][38] and [ICTEE, 2008] in order to distinguish between home and office use. The installed base seems again a little bit low.

Power Modes and Power Management Options:

Imaging equipment such as EP-Printer/MFD is considered to have a highly advanced power management. The implementation of these power management options are supported by the requirements of the Energy Star Program for Imaging Equipment based on the Typical Energy Consumption (TEC) approach. We assume that EP-Printer/MFD are utilizing the existing hardware and software options for reducing idle power and duration immediately and start transitioning into a low power sleep mode according to a default delay time setting.

The following power modes are considered:

Active: Mode is equivalent to G0/S0 (applications are running).

Idle: Mode is equivalent to “ready mode” (imaging equipment industry terminology). The delay time after the print job is assumed to be no more than 5 to 10 minutes [HiNA]. Then the device shifts into LowP2. A prolonged idle mode is not assumed in the HiNA scenario due to the existing power management.

LowP1: Mode not yet existent (low power idle, power about 50% of G0/S0 idle)

LowP2: Mode is a sleep mode from which the product can resume operation within 10 to 20 seconds depending on the device. In this mode the product is fax capable (MeNA).

LowP4: Mode is equivalent to soft-off with WOL [LoNA]

[38] [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; http://www.ecoimaging.org

LowP5: Mode is equivalent to soft-off

Explanatory notes 2020:

Mode and use assumptions are similar to the reference scenarios 2010. Improvement of power consumption per mode: 20%

During the investigation of exemplary products we observed that products featuring Energy Star Label or the Blue Angel Label have considerably lower ready and sleep mode power consumption and feature strict power management settings. For example idle mode for a similar product could be 50 Watt or 120 Watt. Such differences are influencing the impact of this product group to a large extent.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020. This selected scenario considers best practice and the implementation of advanced power management (about 80% of products fulfill Energy Star Program Requirements). The MeNA scenario assumes an increasing utilization of the wireless LAN interface for data input. With the selected scenario we try to show a tendency in the market. For an individual environmental assessment the reader should consider mixed scenarios including prolonged medium and high network availability phases. A consequent HiNA scenario with prolonged idle mode is not considered.

Table 39: Office EP Printer – Input data for scenarios of reference year 2010

NoNA	**Office EP Printer**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	800,0	80,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	400,0	160,0	0,0	65,0	0,0	0,0	7,5	632,5
18 million	TEC Unit/year (kWh/a)	96,0	38,4	0,0	15,6	0,0	0,0	1,8	151,8
	Stock per year (TWh/a)	1,7	0,7	0,0	0,3	0,0	0,0	0,0	2,7

LoNA	Office EP Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	800,0	80,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	400,0	160,0	0,0	65,0	0,0	105,0	0,0	730,0
18 million	TEC Unit/year (kWh/a)	96,0	38,4	0,0	15,6	0,0	25,2	0,0	175,2
	Stock per year (TWh/a)	1,7	0,7	0,0	0,3	0,0	0,5	0,0	3,2

MeNA	Office EP Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	800,0	80,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	400,0	160,0	0,0	215,0	0,0	0,0	0,0	775,0
18 million	TEC Unit/year (kWh/a)	96,0	38,4	0,0	51,6	0,0	0,0	0,0	186,0
	Stock per year (TWh/a)	1,7	0,7	0,0	0,9	0,0	0,0	0,0	3,3

HiNA	Office EP Printer	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	800,0	80,0	0,0	10,0	0,0	7,0	0,5	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	400,0	160,0	0,0	215,0	0,0	0,0	0,0	775,0
18 million	TEC Unit/year (kWh/a)	96,0	38,4	0,0	51,6	0,0	0,0	0,0	186,0
	Stock per year (TWh/a)	1,7	0,7	0,0	0,9	0,0	0,0	0,0	3,3

Table 40: Office EP Printer – Input data for scenarios of forecast year 2020

NoNA	**Office EP Printer**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	640,0	64,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	0,0	15,0	24,0
240 d/a	Mode Power (Wh/d)	320,0	128,0	0,0	52,0	0,0	0,0	6,0	506,0
19 million	TEC Unit/year (kWh/a)	76,8	30,7	0,0	12,5	0,0	0,0	1,4	121,4
	Stock per year (TWh/a)	1,5	0,6	0,0	0,2	0,0	0,0	0,0	2,3

LoNA	Office EP Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	640,0	64,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	6,5	0,0	15,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	320,0	128,0	0,0	52,0	0,0	84,0	0,0	584,0
19 million	TEC Unit/year (kWh/a)	76,8	30,7	0,0	12,5	0,0	20,2	0,0	140,2
	Stock per year (TWh/a)	1,5	0,6	0,0	0,2	0,0	0,4	0,0	2,7

MeNA	Office EP Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	640,0	64,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	320,0	128,0	0,0	172,0	0,0	0,0	0,0	620,0
19 million	TEC Unit/year (kWh/a)	76,8	30,7	0,0	41,3	0,0	0,0	0,0	148,8
	Stock per year (TWh/a)	1,5	0,6	0,0	0,8	0,0	0,0	0,0	2,8

HiNA	Office EP Printer	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	640,0	64,0	0,0	8,0	0,0	5,6	0,4	
Stock	Use hours (h/d)	0,5	2,0	0,0	21,5	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	320,0	128,0	0,0	172,0	0,0	0,0	0,0	620,0
19 million	TEC Unit/year (kWh/a)	76,8	30,7	0,0	41,3	0,0	0,0	0,0	148,8
	Stock per year (TWh/a)	1,5	0,6	0,0	0,8	0,0	0,0	0,0	2,8

Figure 39: Office EP Printer – Comparison of all scenarios TEC

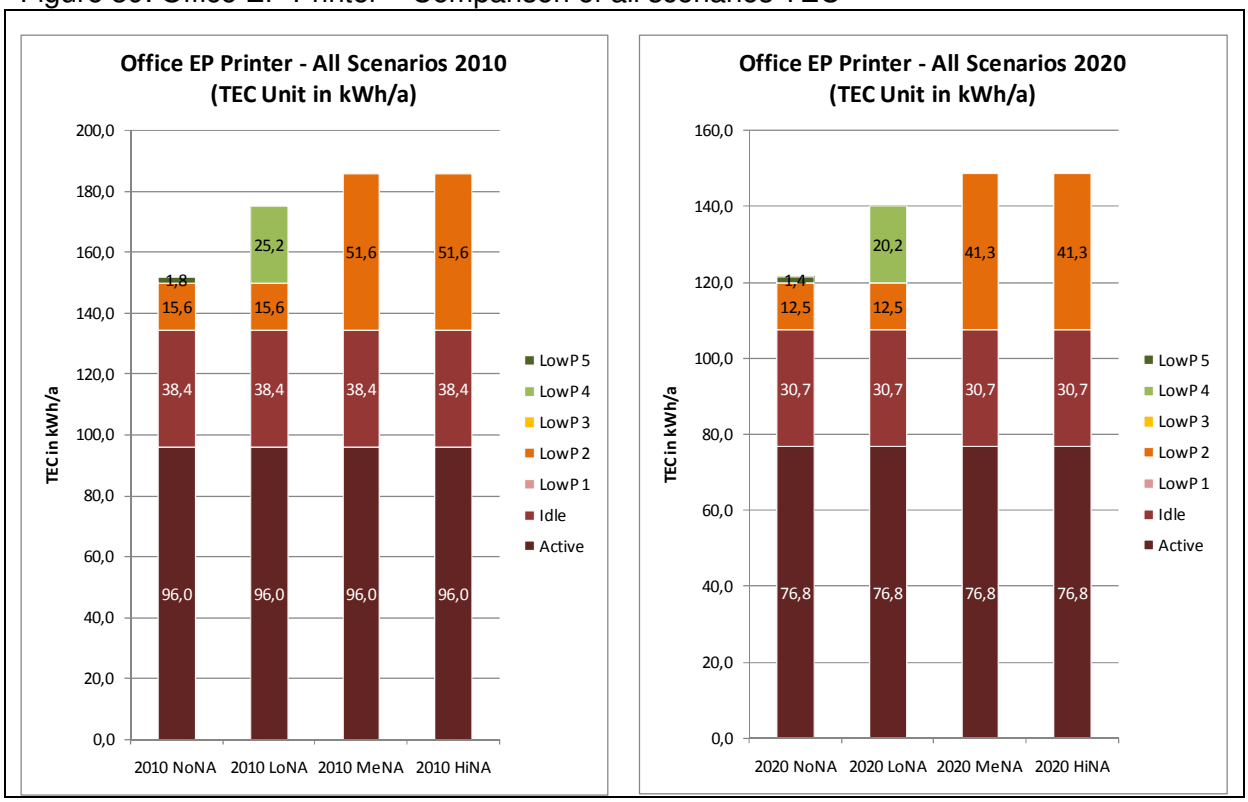
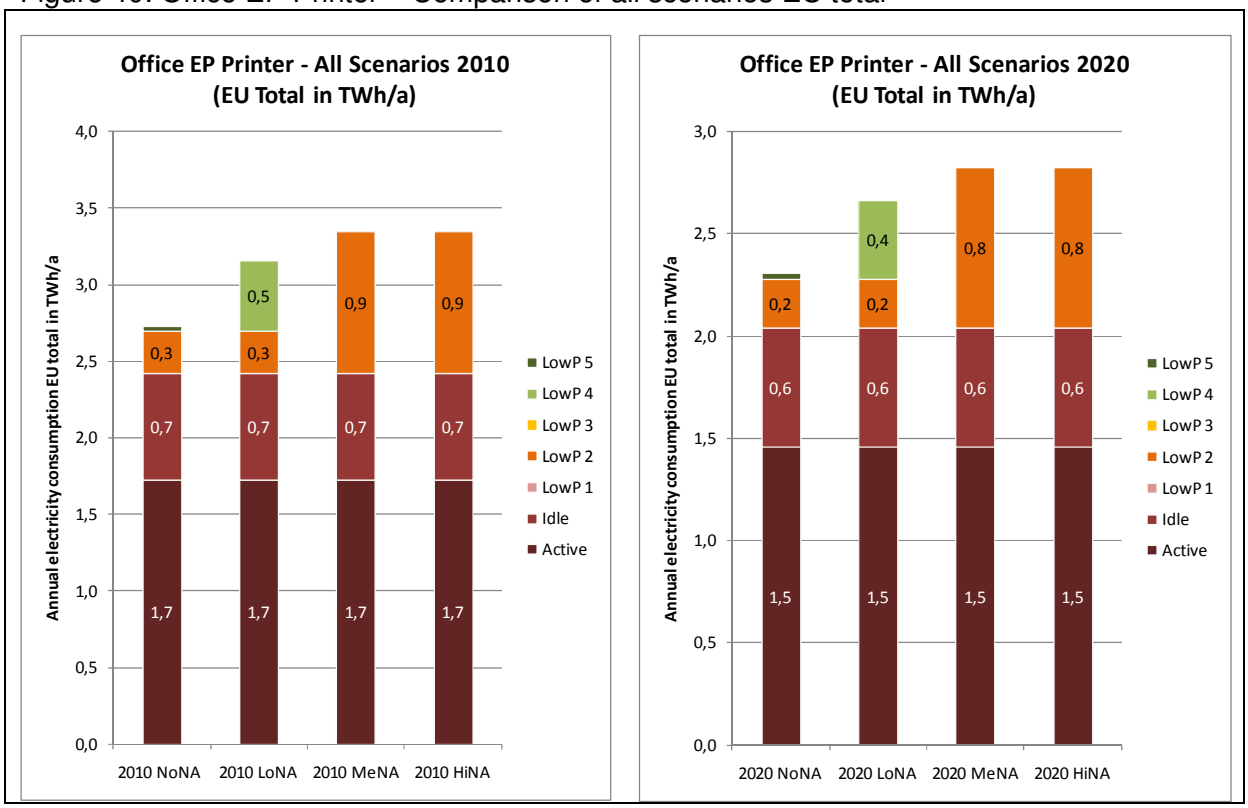


Figure 40: Office EP Printer – Comparison of all scenarios EU total



2. Discussion of results

The overall energy impact of this product groups (about 3 TWh/a) depends on the actual utilization. Active mode and ready (idle) are highly considerable. The industry has displayed in the past years great awareness for power management. This resulted in an improvement of the product's overall energy efficiency. A mix of LoNA and MeNA should be considered a real life scenario. The MeNA scenario is insofar realistic due to the growing application of wireless network technology. The LoNA 2010 to MeNA 2020 scenario displays good practice leading to an overall reduction in energy consumption including networked standby of about 1 TWh per year.

Annex 21 Environmental Assessment: Office Phones



TREN/D3/91-2007/Lot 26

Preparatory Studies for Eco-design Requirements of EuP

Study funded by the European Commission

EuP Preparatory Studies
Lot 26: Networked Standby Losses

Final Report Task 5
Annex 21 – Office Phones

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Disclaimer

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.

Input Data

Product definition:

Office phone is a commercially available electronic product with a base station and a handset whose purpose is to convert sound into electrical impulses for transmission. Most of these devices require an external power supply for power, are plugged into an AC power outlet for 24 hours per day, and do not have a power switch to turn them off. To qualify, the base station of the cordless phone or its power supply must be designed to plug into a wall outlet and there must not be a physical connection between the portable handset and the phone jack.[39]

The product group is represented by an average DECT telephone.

Product stock assumption:

Stock based on ICTEE, 2008. Data given for 2010 and 2020, interpolated for 2015

Power Modes and Power Management Options:

The telephone is ether active or idle. Own measurements indicate that some telephones actually consume more power in idle, because the display is on when the device is in the cradle. Product is always online (HiNA). We therefore made no use distinction in the scenarios. The utilization of the phones in the office environment is more intensive in comparison to home use.

Explanatory notes 2020:

Energy consumption per mode is assumed to decrease by 20% across all modes.

1. Input and result tables

The following tables present the input assumptions and results according to the selected assessment methodology. A distinction is made between:

- Product level assessment (TEC unit)
- Economy level assessment (EU stock)

Selected Scenarios for Base Case:

The selected scenarios for the base case are LoNA 2010 to MeNA 2020.

[39] Product and technology definitions according to Energy Start Program Requirements for Telephony.

Table 41: Office Phones – Input data for scenarios of reference year 2010

NoNA	**Office Phones**	**2010**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	6,0	5,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	24,0	100,0	0,0	0,0	0,0	0,0	0,0	124,0
75 million	TEC Unit/year (kWh/a)	5,8	24,0	0,0	0,0	0,0	0,0	0,0	29,8
	Stock per year (TWh/a)	0,4	1,8	0,0	0,0	0,0	0,0	0,0	2,2

LoNA	Office Phones	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	6,0	5,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	24,0	100,0	0,0	0,0	0,0	0,0	0,0	124,0
75 million	TEC Unit/year (kWh/a)	5,8	24,0	0,0	0,0	0,0	0,0	0,0	29,8
	Stock per year (TWh/a)	0,4	1,8	0,0	0,0	0,0	0,0	0,0	2,2

MeNA	Office Phones	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	6,0	5,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	24,0	100,0	0,0	0,0	0,0	0,0	0,0	124,0
75 million	TEC Unit/year (kWh/a)	5,8	24,0	0,0	0,0	0,0	0,0	0,0	29,8
	Stock per year (TWh/a)	0,4	1,8	0,0	0,0	0,0	0,0	0,0	2,2

HiNA	Office Phones	2010							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	6,0	5,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	24,0	100,0	0,0	0,0	0,0	0,0	0,0	124,0
75 million	TEC Unit/year (kWh/a)	5,8	24,0	0,0	0,0	0,0	0,0	0,0	29,8
	Stock per year (TWh/a)	0,4	1,8	0,0	0,0	0,0	0,0	0,0	2,2

Table 42: Office Phones – Input data for scenarios of forecast year 2020

NoNA	**Office Phones**	**2020**							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,8	4,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	19,2	80,0	0,0	0,0	0,0	0,0	0,0	99,2
85 million	TEC Unit/year (kWh/a)	4,6	19,2	0,0	0,0	0,0	0,0	0,0	23,8
	Stock per year (TWh/a)	0,4	1,6	0,0	0,0	0,0	0,0	0,0	2,0

LoNA	Office Phones	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,8	4,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	19,2	80,0	0,0	0,0	0,0	0,0	0,0	99,2
85 million	TEC Unit/year (kWh/a)	4,6	19,2	0,0	0,0	0,0	0,0	0,0	23,8
	Stock per year (TWh/a)	0,4	1,6	0,0	0,0	0,0	0,0	0,0	2,0

MeNA	Office Phones	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,8	4,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	19,2	80,0	0,0	0,0	0,0	0,0	0,0	99,2
85 million	TEC Unit/year (kWh/a)	4,6	19,2	0,0	0,0	0,0	0,0	0,0	23,8
	Stock per year (TWh/a)	0,4	1,6	0,0	0,0	0,0	0,0	0,0	2,0

HiNA	Office Phones	2020							
	Value	*Active*	*Idle*	*LowP 1*	*LowP 2*	*LowP 3*	*LowP 4*	*LowP 5*	*Total*
	Power (W)	4,8	4,0	0,0	0,0	0,0	0,0	0,0	
Stock	Use hours (h/d)	4,0	20,0	0,0	0,0	0,0	0,0	0,0	24,0
240 d/a	Mode Power (Wh/d)	19,2	80,0	0,0	0,0	0,0	0,0	0,0	99,2
85 million	TEC Unit/year (kWh/a)	4,6	19,2	0,0	0,0	0,0	0,0	0,0	23,8
	Stock per year (TWh/a)	0,4	1,6	0,0	0,0	0,0	0,0	0,0	2,0

Figure 41: Office Phones – Comparison of all scenarios TEC

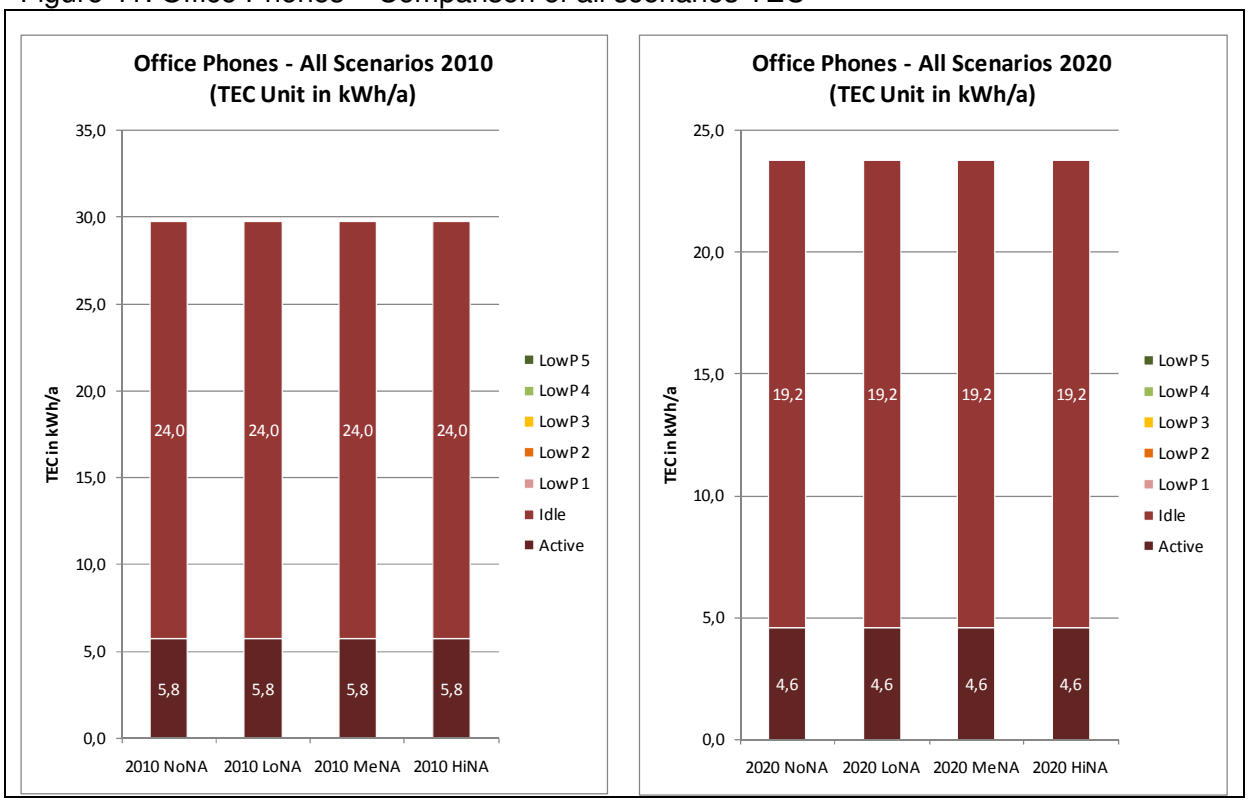
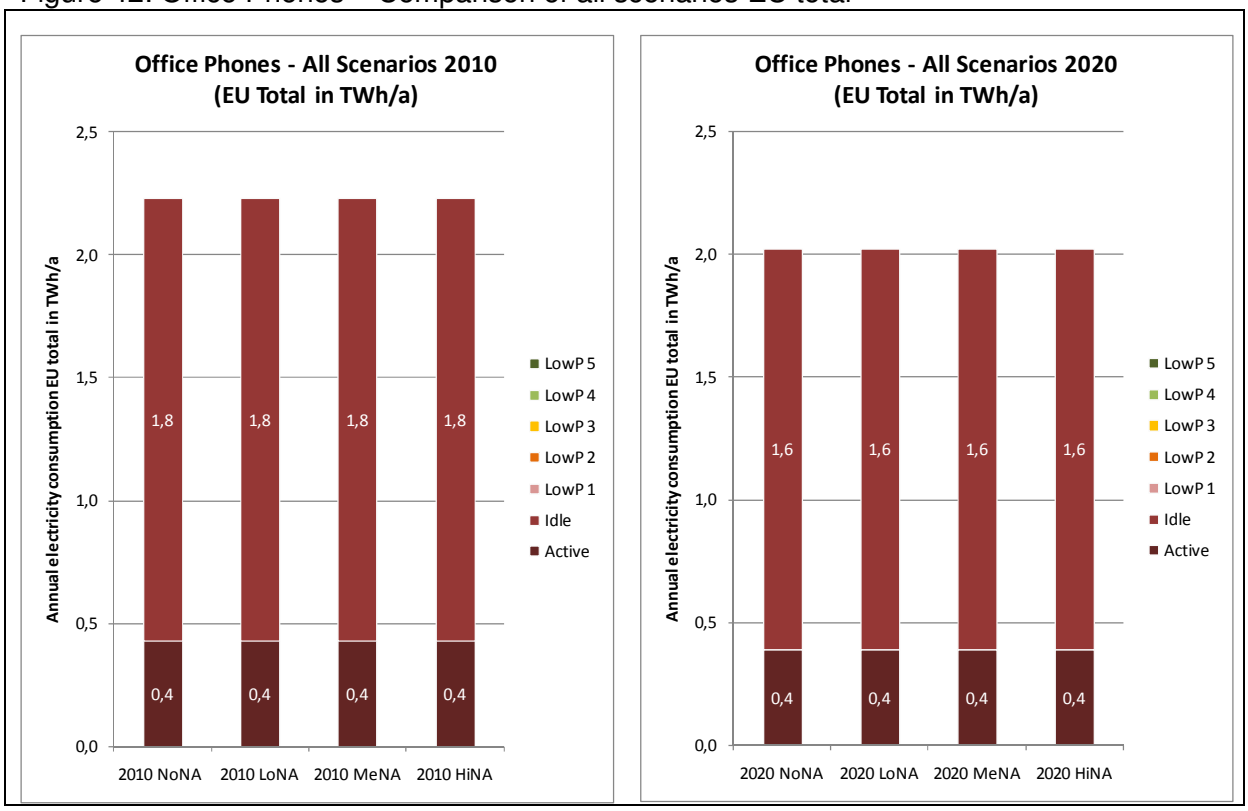


Figure 42: Office Phones – Comparison of all scenarios EU total



2. Discussion of results

As the device is always on, there is no change in annual energy consumption at the EU-27 level across the different scenarios. The overall energy consumption is decreasing form 2.2 TWh in 2010 to 2.0 TWh in 2020 due to the assumed general improvement scenario. The idle mode dominates the overall energy consumption in all scenarios presenting a possible target for improvement.

The 2020 scenarios show slightly increasing overall energy consumption due to growing number of devices, despite increasing efficiency.