
EuP Preparatory Study ENER Lot 26 “Networked Standby”

Stakeholder Meeting 14th February 2011, Brussels

Project team



Nils F. Nissen



Lutz Stobbe

Fraunhofer-Institute for Reliability and Microintegration [IZM]
Gustav-Meyer-Allee 25, 13355 Berlin, Germany

Leader: Dr. Nils F. Nissen

Contact: Dr. Lutz Stobbe

Tel: +49 (0)30 - 46 40 31 39

Email: lutz.stobbe@izm.fraunhofer.de

URL: <http://www.izm.fraunhofer.de>



Shailendra Mudgal



Kurt Muehmel

BIO Intelligence Service S.A.S. [BIO]
20-22 villa Deshayes – 75014 Paris – France

Leader: Shailendra Mudgal

Contact: Kurt Muehmel

Tel: +33 (0)1 - 53 90 11 80

Email: kurt.muehmel@biois.com

URL: <http://www.biois.com>

Stakeholder interaction

- 1250 registered stakeholders
- 25 written comments on the documents
- 50 individual meetings and conference calls

The flowchart on the left illustrates the project structure. It starts with 'Definition' (Task 1) leading to 'Econ. and Market Analysis' (Task 2), 'Consumer Behaviour' (Task 3), and 'Technical Analysis' (Task 4). 'Econ. and Market Analysis' and 'Consumer Behaviour' feed into 'Assessment of Base-case' (Task 5). 'Technical Analysis' feeds into 'Assessment of Base-case' and 'BAT - BNAT analysis' (Task 6). 'Assessment of Base-case' and 'BAT - BNAT analysis' both lead to 'Improvement Potential' (Task 7). 'Improvement Potential' leads to 'Macro Analyses (Policy, Impact, ...)' (Task 8). A legend at the bottom identifies the tasks by color: Task 1 (blue), Task 2 (red), Task 3 (green), Task 4 (blue), Task 5 (purple), Task 6 (blue), Task 7 (orange), and Task 8 (green).

The website screenshot on the right is for 'Ecodesign of EuP' (Networked standby losses DG TREN Lot 26). It features a navigation menu with 'Home', 'Introduction', 'Methodology', 'Project planning', and 'Meetings'. The main content includes a 'Welcome to ecostandby.org' message and text stating: 'This is the project website for the EuP preparatory study on Networked standby DG TREN Lot 26 (TREN/D3/91-2007-Lot26). The study is being carried out for The European Commission (DG TREN) in the context of the Ecodesign Directive. Documents related to DG TREN Lot 6: Standby and off-mode losses can be found [here](#). Stakeholder involvement is a crucial part of the study. You can follow the progress of the study through this website. By [registering](#) as a stakeholder, you can stay informed of the latest additions to this site and download the documents for consultation.'

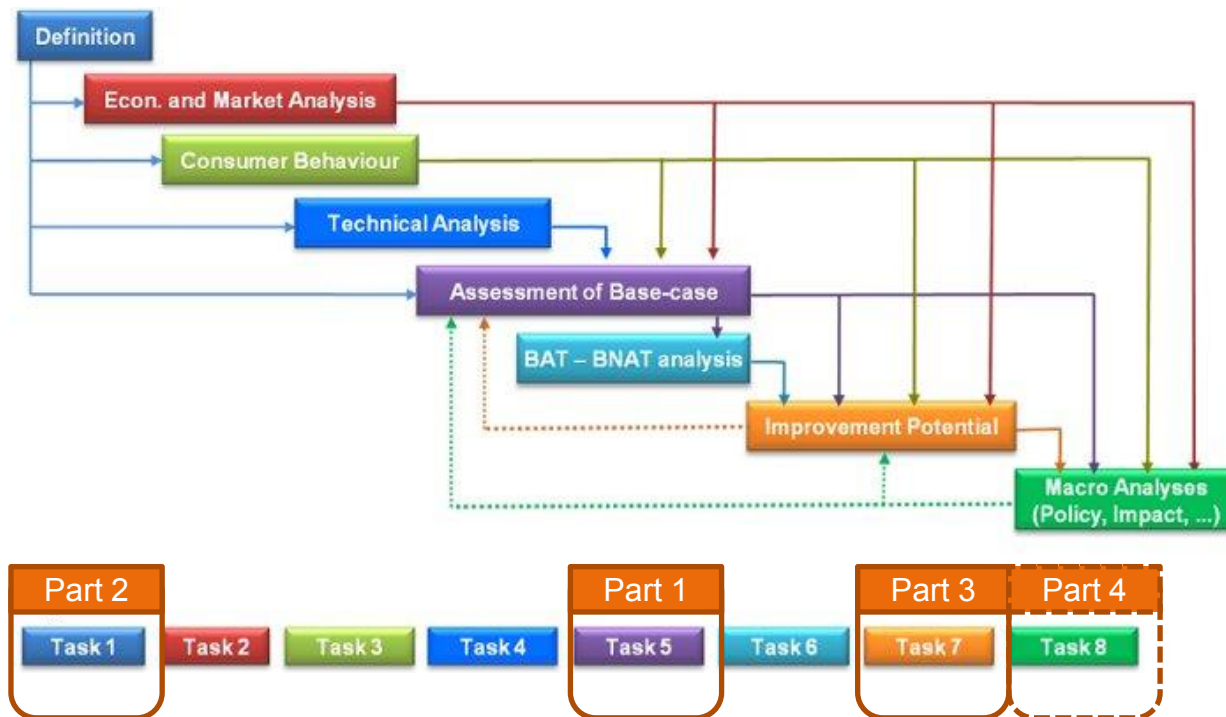
<http://www.ecostandby.org>

Objective and agenda of the meeting

- Summary of eco-impact assessment
 - Definition, basic terminology and key concepts
 - Discussion of improvement options
 - Towards policy recommendations
-
- Please adapt your feedback to fit with the main presentation parts:
 - Feedback on data (T2, T3, T5 mainly)
 - Feedback on definition and „NA“ concepts (T1 mainly)
 - Feedback on improvement options and BAT (T6, T7 mainly)
 - Please place general statements at the end

Outline of presentation

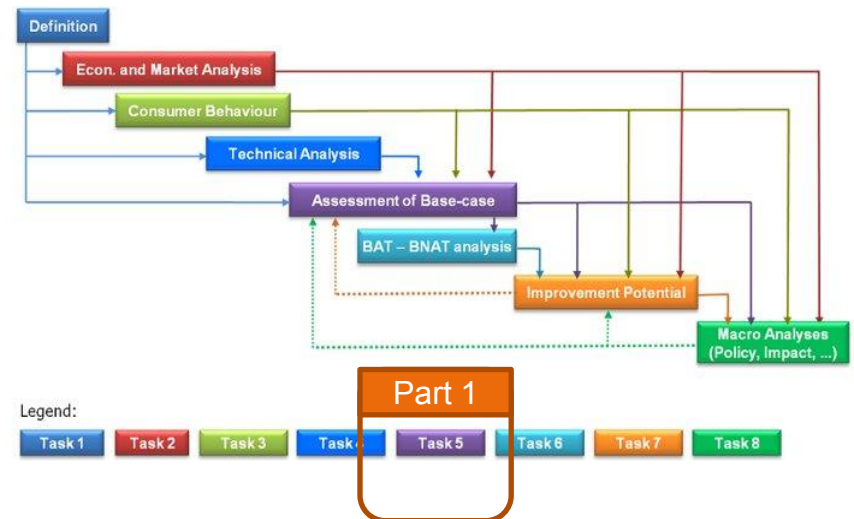
Methodology for Eco-design of Energy-using Products (MEEuP)



Content Part 1

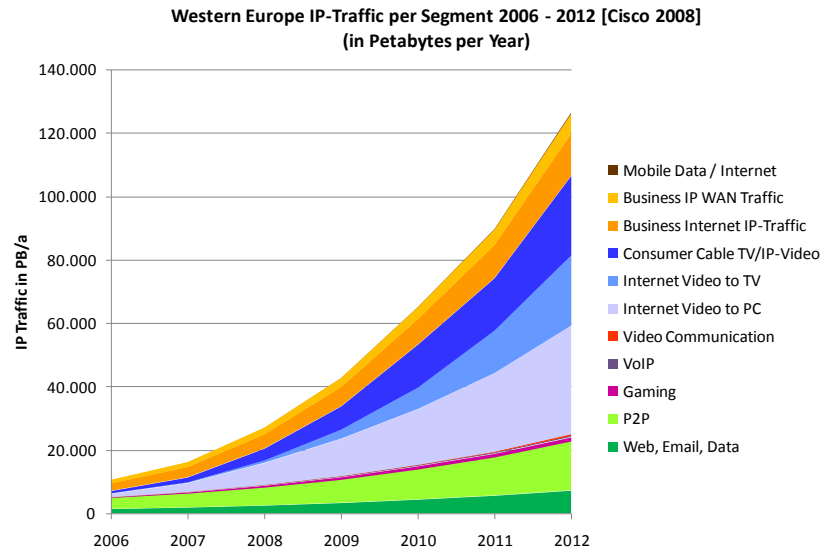
Eco-Assessment:

- Initial situation
- Base case assessment
- Interpretation of results

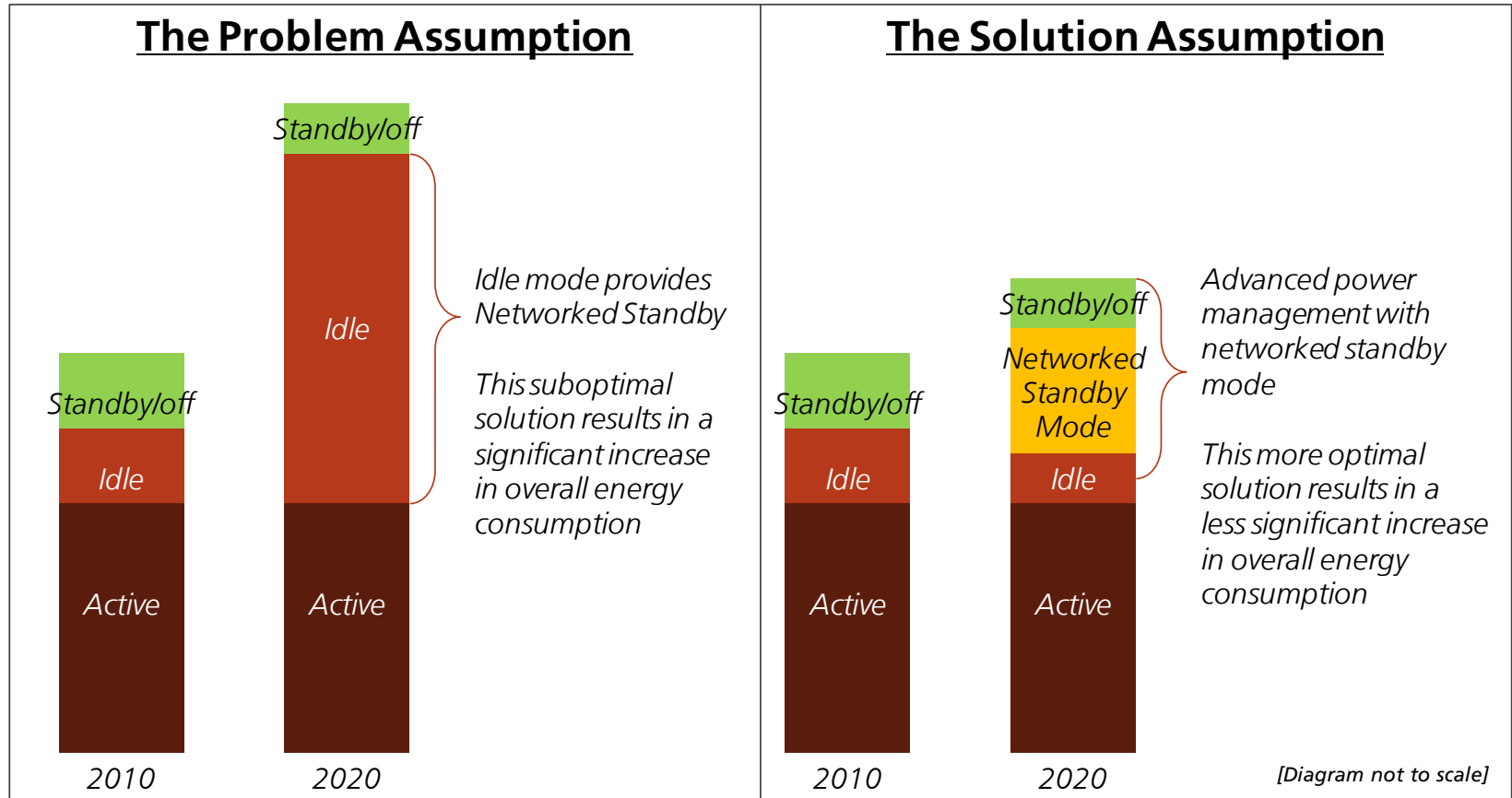


Initial considerations

- Increasing number of networked equipment (interoperability)
- Increasing number of network-based services (traffic / applications)
- EC 1275/2008 does not cover networked standby (but power management)
- Networked standby needs to address not only networked products but services



Problem assumption



Eco-assessment

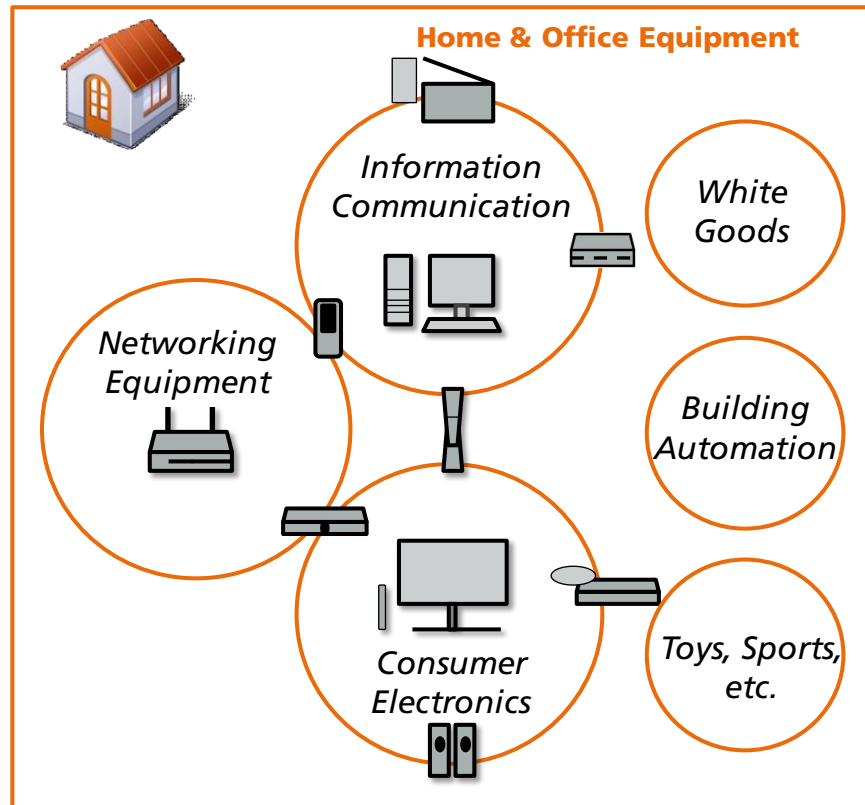
- The eco-assessment is distinguishing product groups:
 - Product level: Typical energy consumption of individual product groups
 - Economy level: Accumulated energy consumption for EU total (stock)

- The eco-assessment is distinguishing use scenarios:
 - Network availability: Allocating low power modes and use patterns
 - Development: Reference year 2010 and prognosis year 2020

- Defining base cases
 - Selecting representative scenarios based on trend analysis
 - Discussion of expected impacts

Representative product groups

Item No.	Product Category
1	Home Desktop PC
2	Home Notebook
3	Home Display
4	Home NAS
5	Home IJ Printer
6	Home EP Printer
7	Home Phones
8	Home Gateway
9	Simple TV
10	Simple STB
11	Complex TV
12	Complex STB
13	Simple Player/Recorder
14	Compl. Player/Recorder
15	Game Consoles
16	Office Desktop PC
17	Office Notebook
18	Office Display
19	Office IJ Printer/MFD
20	Office EP Printer
21	Office Phones



Limiting factor: availability of technical and economical product data ¹⁰

Network availability scenarios

Four different network availability scenarios

Name of product group and year of scenarios

Annual use and EU-27 stock assumptions

INPUT										RESULT
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	

Power modes and daily use patterns

Type of power mode
incl. Various Low Power
Modes

Power consumption per
mode in Watt

Daily use pattern in
hours per mode

INPUT										RESULT
NoNA	Home Desktop PC	2010							Total	
	Value	Active	Idle	LowP 1	LowP 2	LowP 3	LowP 4	LowP 5		
	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							Total	
	Value	Active	Idle	LowP 1	LowP 2	LowP 3	LowP 4	LowP 5		
	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							Total	
	Value	Active	Idle	LowP 1	LowP 2	LowP 3	LowP 4	LowP 5		
	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							Total	
	Value	Active	Idle	LowP 1	LowP 2	LowP 3	LowP 4	LowP 5		
	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	

* 20% general improvement assumption per mode for 2020

Eco-assessment based on development scenarios (2010 – 2020)

INPUT										RESULT
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	

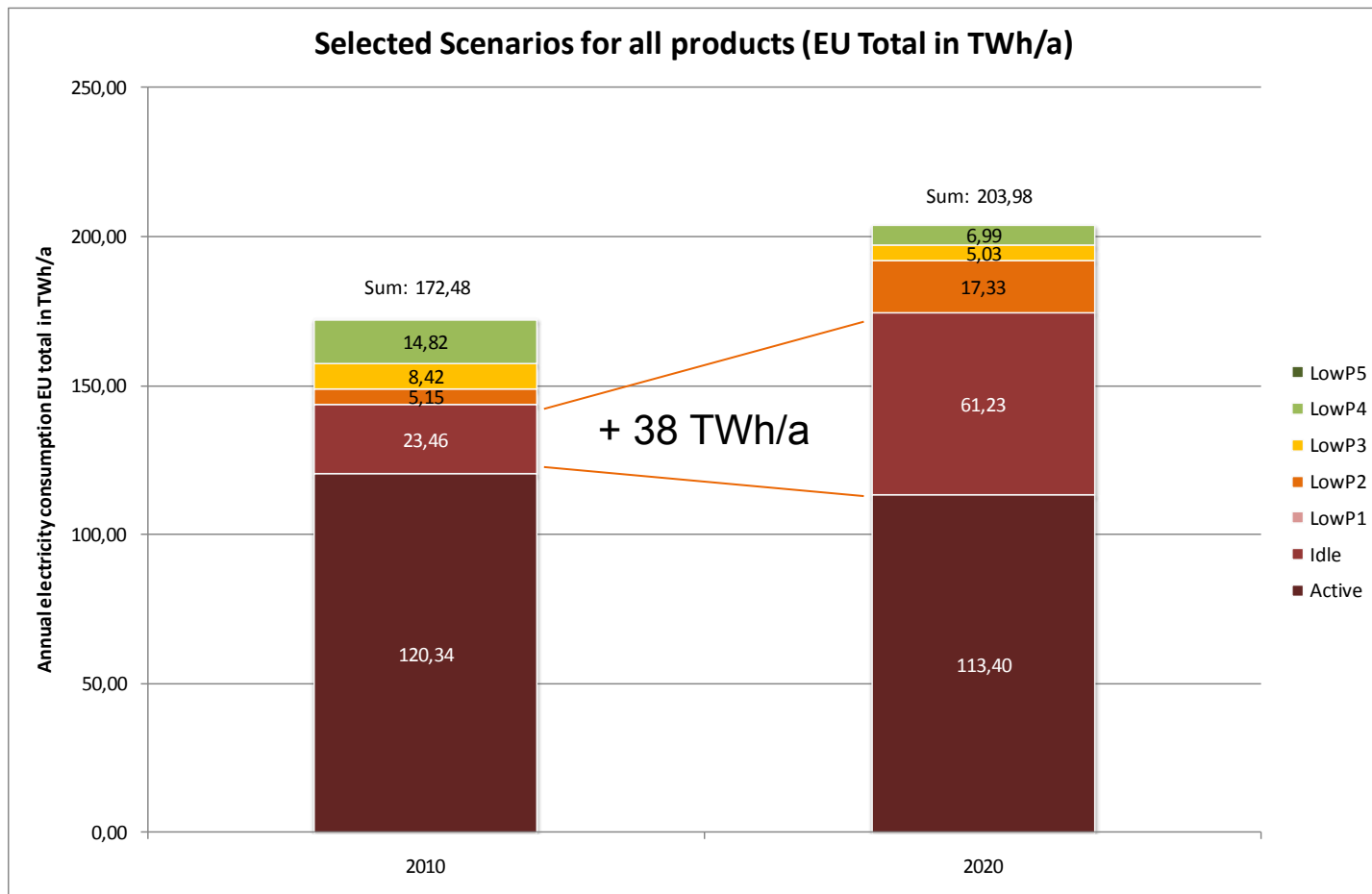
EU-27 stock assumption

Single unit annual power consumption in kWh/a

EU-27 stock annual power consumption in TWh/a

* 20% general improvement assumption per mode for 2020

Base Case indicates significant impact



Resulting energy impact and costs

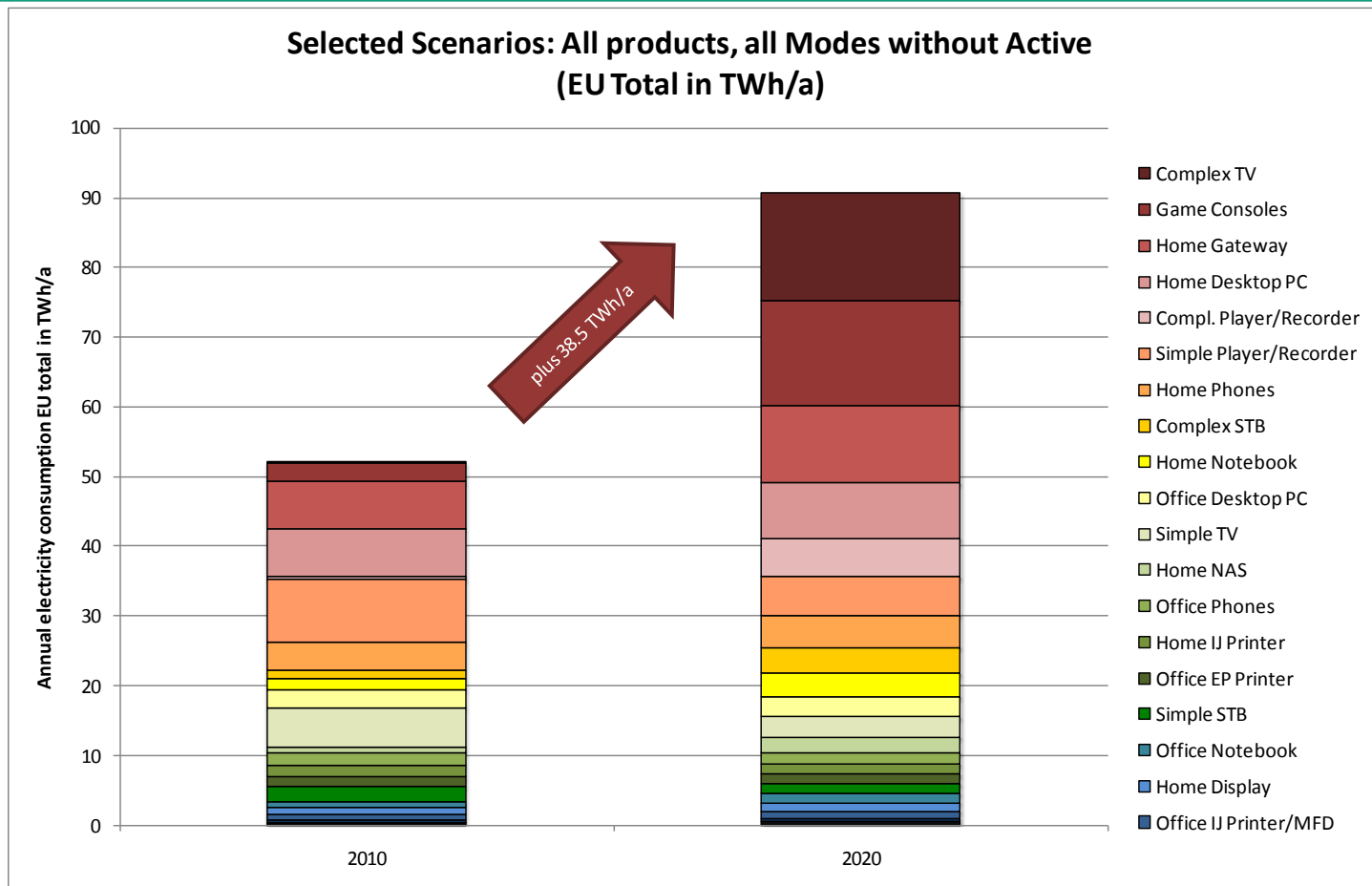
- For the reference year 2010 the energy consumption results in:
 - 34,5 billion € (energy costs)*
 - 80 million tons CO₂ (GWP100)**

- For the development scenario 2020 the estimated energy consumption results in:
 - 40,8 billion € (energy costs)*
 - 95 million tons CO₂ (GWP100) **

* An average electricity cost of 0.20 €/kWh is assumed

* *Calculated based on MEEuP EcoReport 2005

Energy consumption of low power modes



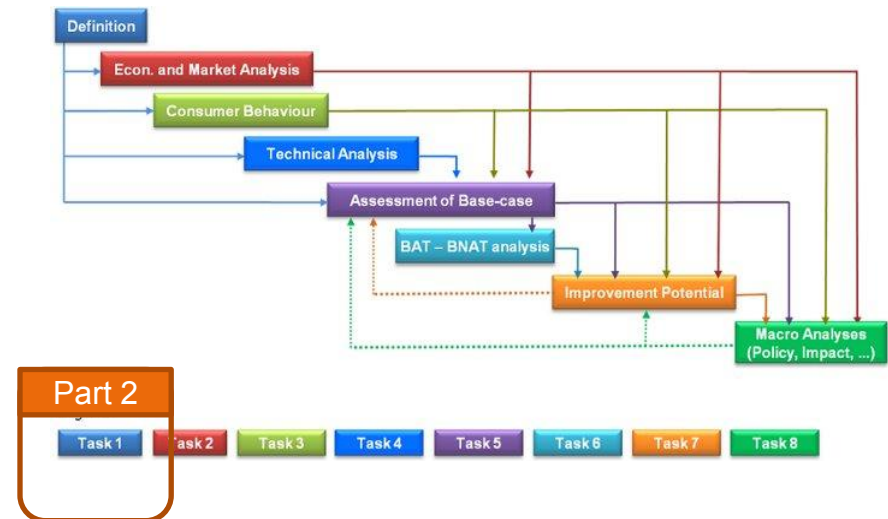
Summary of eco-assessment

- 21 product groups (covering 2010: 1.9 billion units; and 2020: 2.3 billion units)
 - 7 different power modes per product (Active to LowP5)
 - 4 different use-scenarios (LoNA to HiNA) individually chosen for each product group
 - The base case assessment for 2010 and 2020 results in:
 - Plus 32 TWh energy consumption for EU total
 - Plus 6.3 billion € energy costs for EU total
 - Plus 15 million tons CO₂ for EU total
- Idle and low power modes in support of network services contribute significantly to overall energy consumption
- Power management in conjunction with specific energy requirements are eco-design options to counter-balance this negative trend

Content Part 2

Definition:

- Networked Standby
- Basic Terminology
- Key concept “Network Availability”



Definition

Networked standby modes are conditions, in which the equipment provides reduced functionality, but retains the capability to resume applications through a remotely initiated trigger via network connection.

Networked standby modes may distinguish different levels of network availability and by that different resume-times-to-application as well as power consumption.

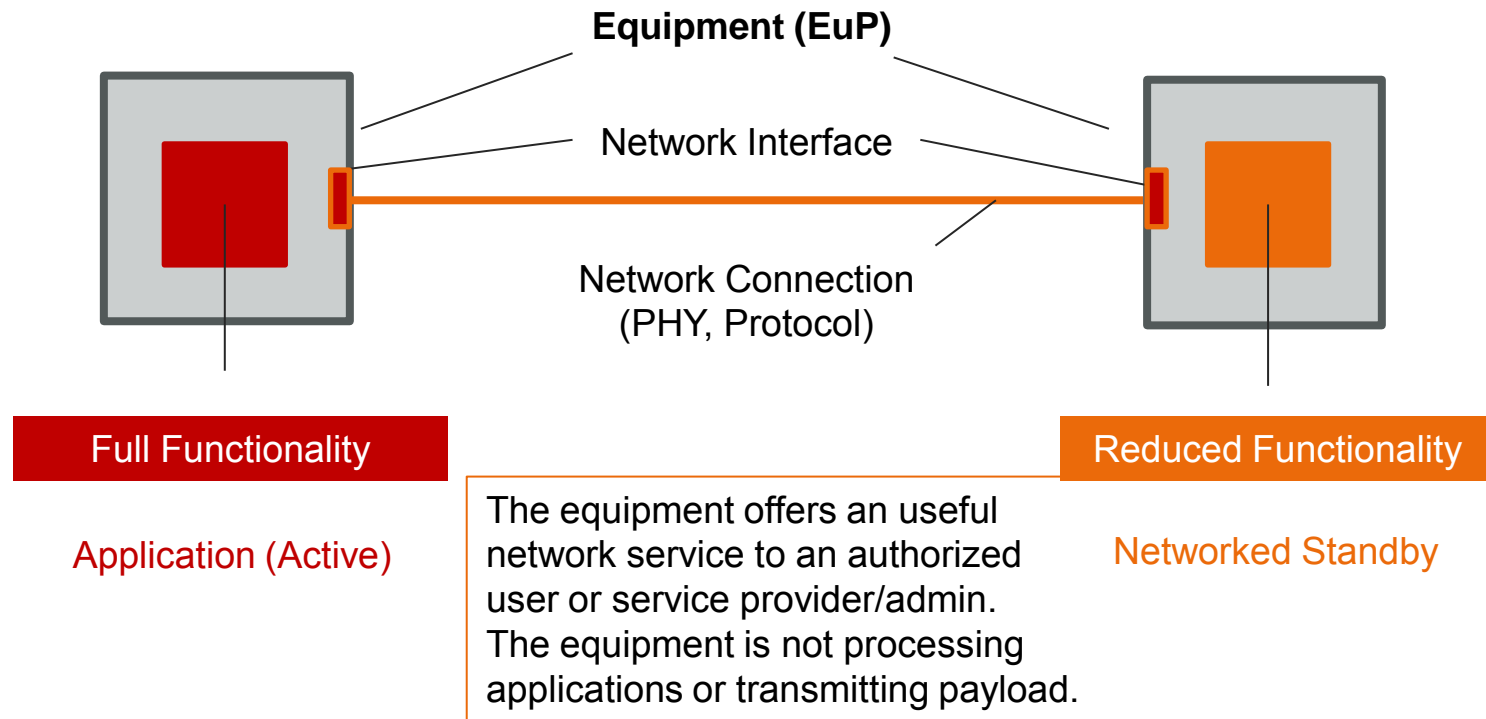
Terminology

Networked standby modes are conditions, in which the equipment provides **reduced functionality**, but retains the **capability to resume applications** through a remotely initiated **trigger via network connection**.

Networked standby modes may distinguish different levels of **network availability** and by that different **resume-times-to-application** as well as power consumption.

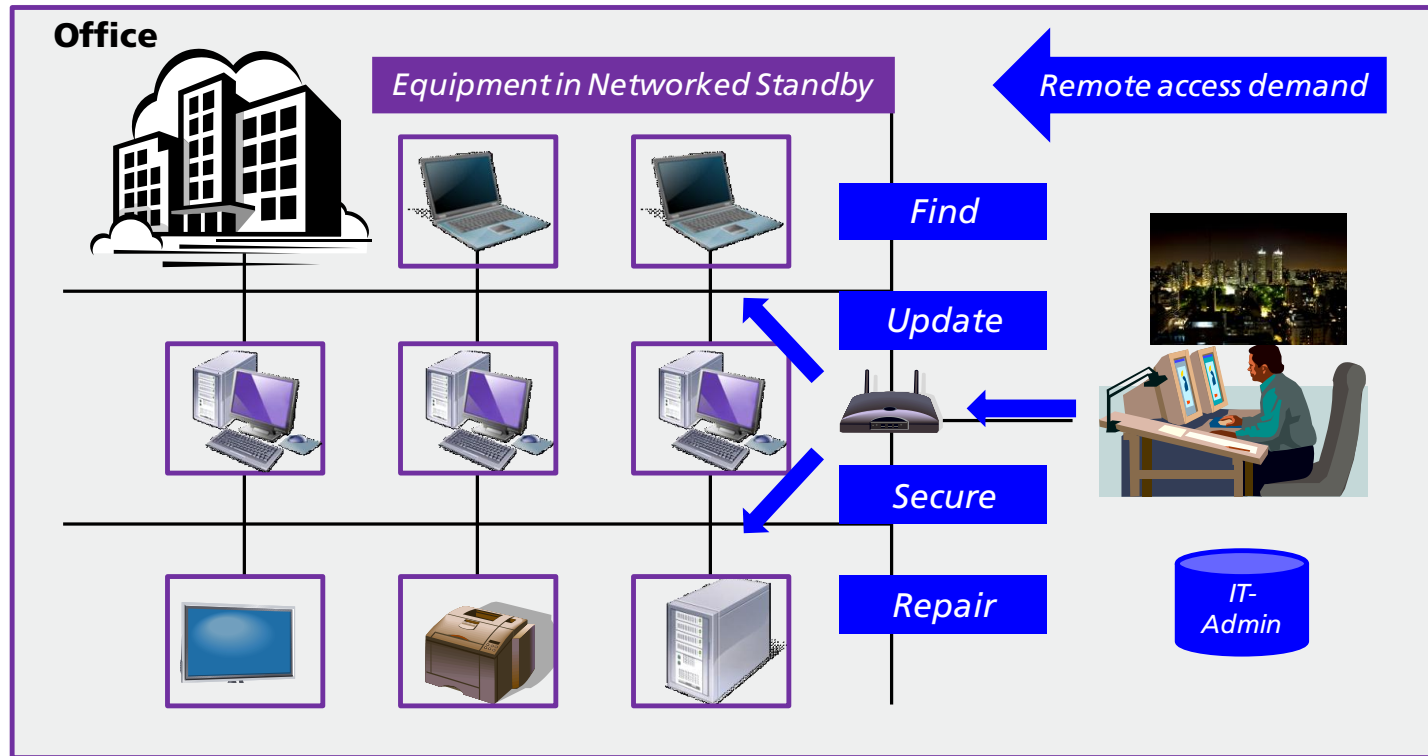
Reduced functionality

Networked standby modes are conditions, in which the equipment provides **reduced functionality**, but retains the capability to resume **applications** through a remotely initiated trigger via network connection.



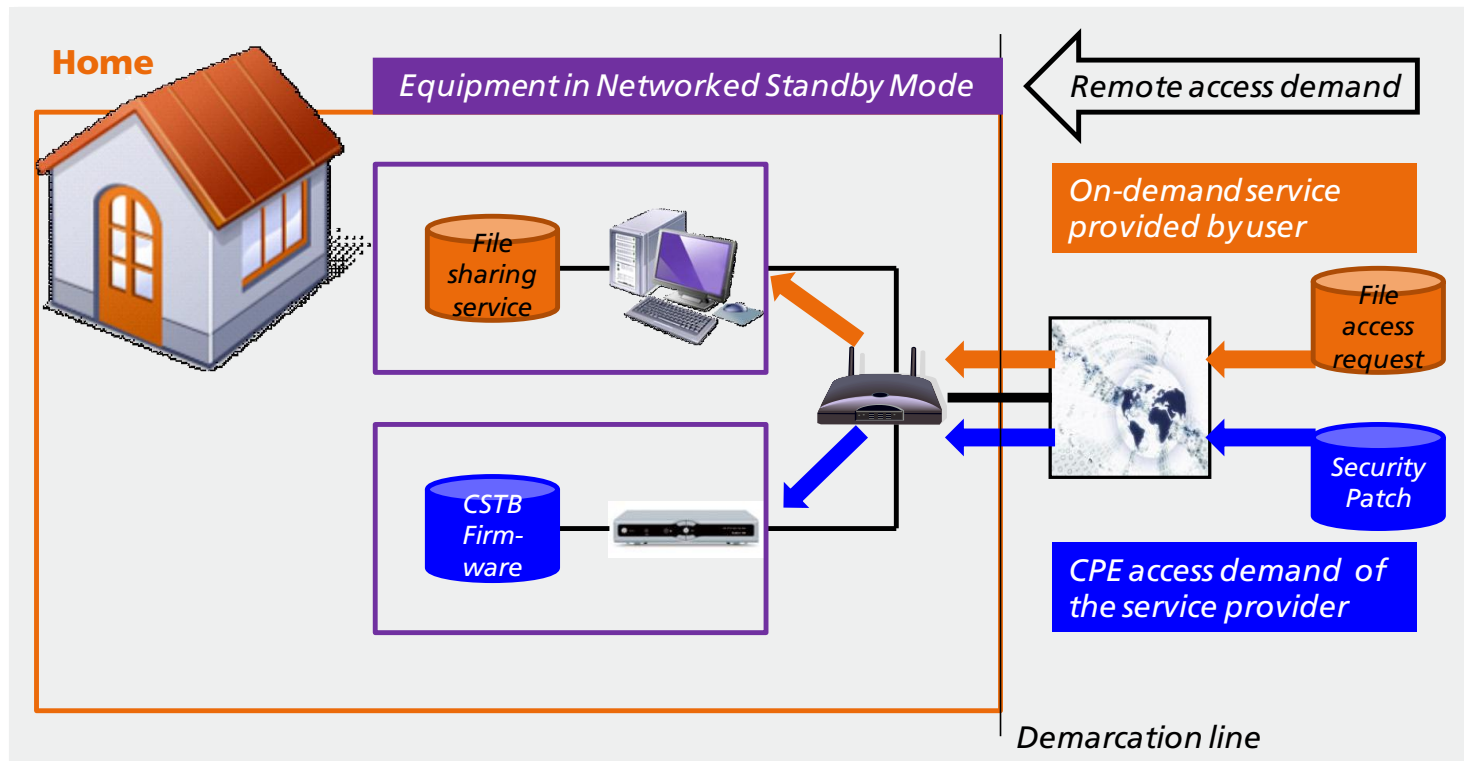
Network Services (Office)

IT-Administration



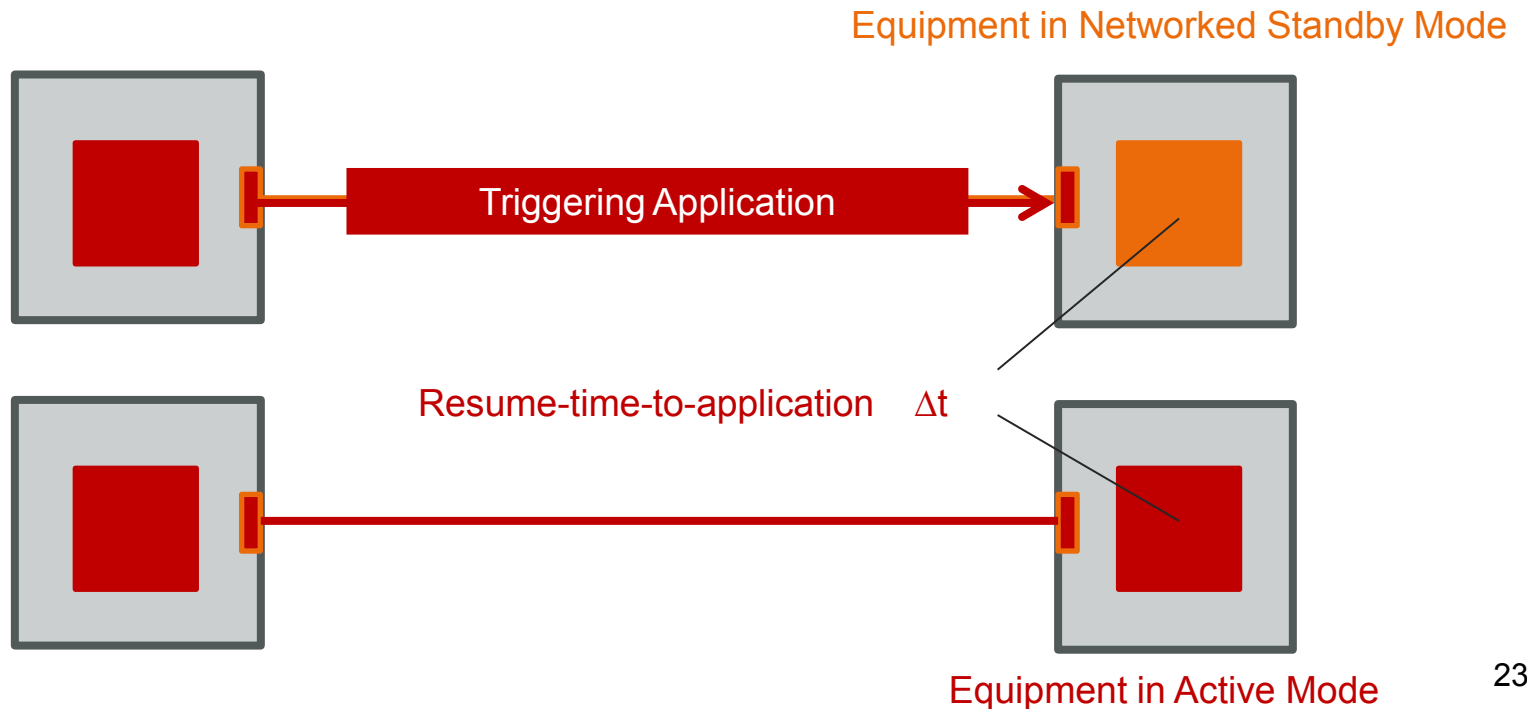
Network Services (Home)

CPE / File Sharing




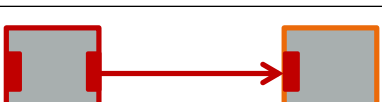

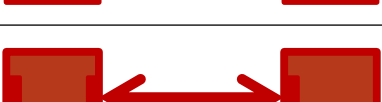


Capability to resume application

Networked standby modes are conditions, in which the equipment provides reduced functionality, but **retains the capability** to **resume applications** through a remotely initiated **trigger via network connection**.



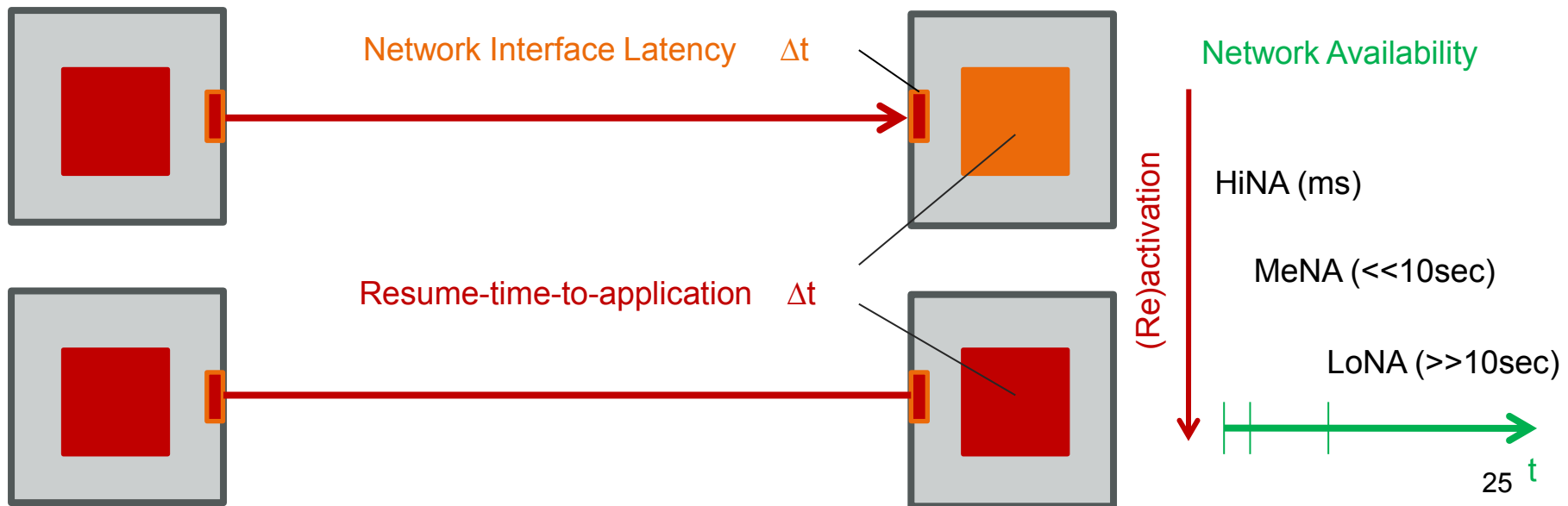
Network Type and Network Status

Diagram		Network Status		Comments
Network	Equipment			
		Lost or No	Link	Network interface enabled, Link detection active, No link,
		Establishing	Link	Link detected, Change status from no link to link established, No network traffic
		Maintaining	Link	Link established (PHY), Traffic detection active, No connection
		Establishing	Connection	Traffic detected, Change status from no connection to connection, Low level traffic (protocol)
		Maintaining	Connection	Low level communication PHY and MAC established No traffic with payload
		Traffic with Payload	Connection	Network connection fully active

Resume time to application

Networked standby modes are conditions, in which the equipment provides reduced functionality, but retains the capability to resume applications through a remotely initiated trigger via network connection.

Networked standby modes may distinguish different levels of **network availability** and by that different **resume-times-to-application** as well as power consumption.



Network Availability

■ High Network Availability (HiNA):

- Resume time to application is milliseconds

■ Medium Network Availability (MeNA):

- Resume time to application is $\ll 10$ sec.

■ Low Network Availability (LoNA):

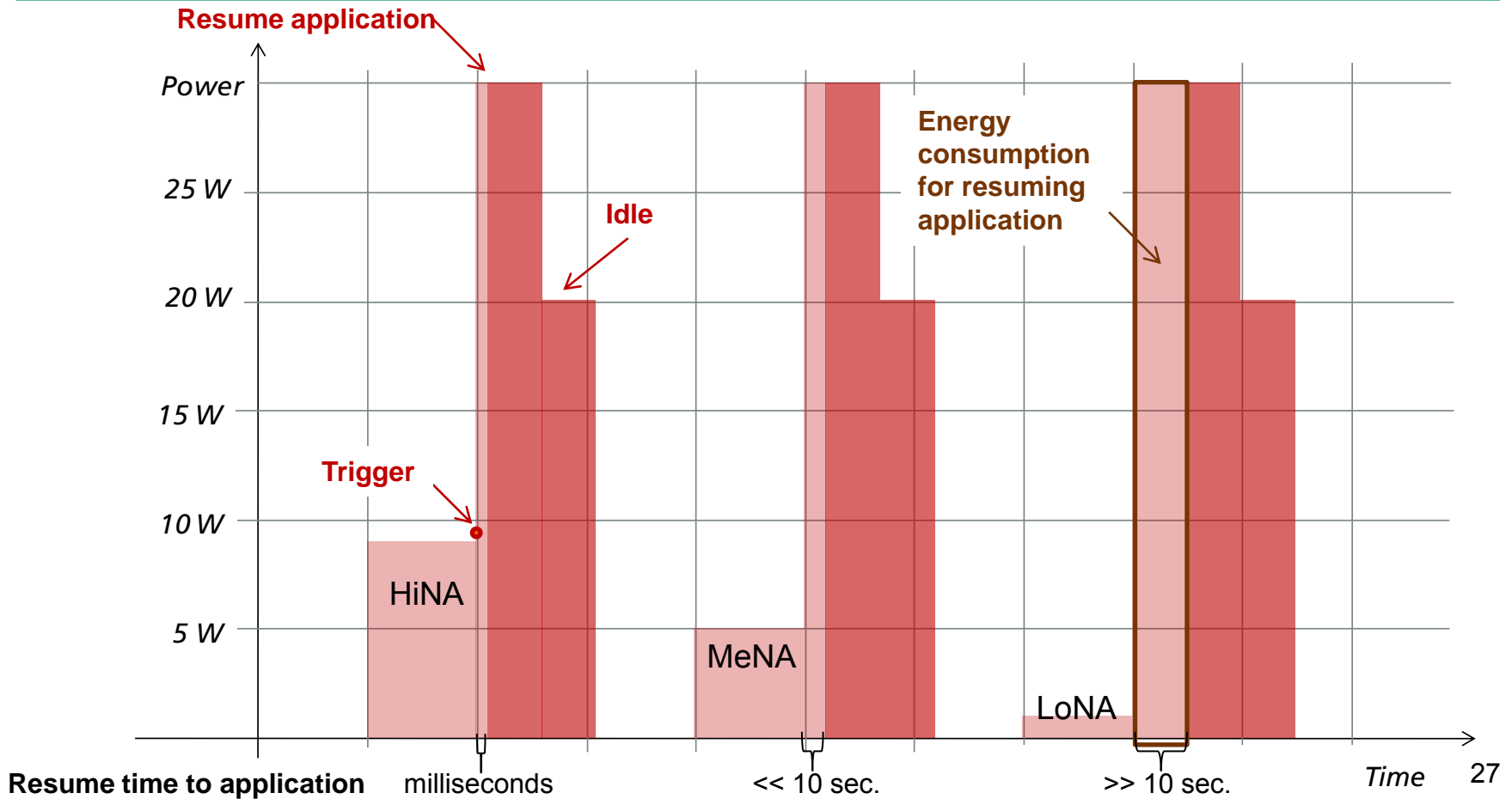
- Resume time to application is $\gg 10$ seconds

■ No Network Availability (NoNA):

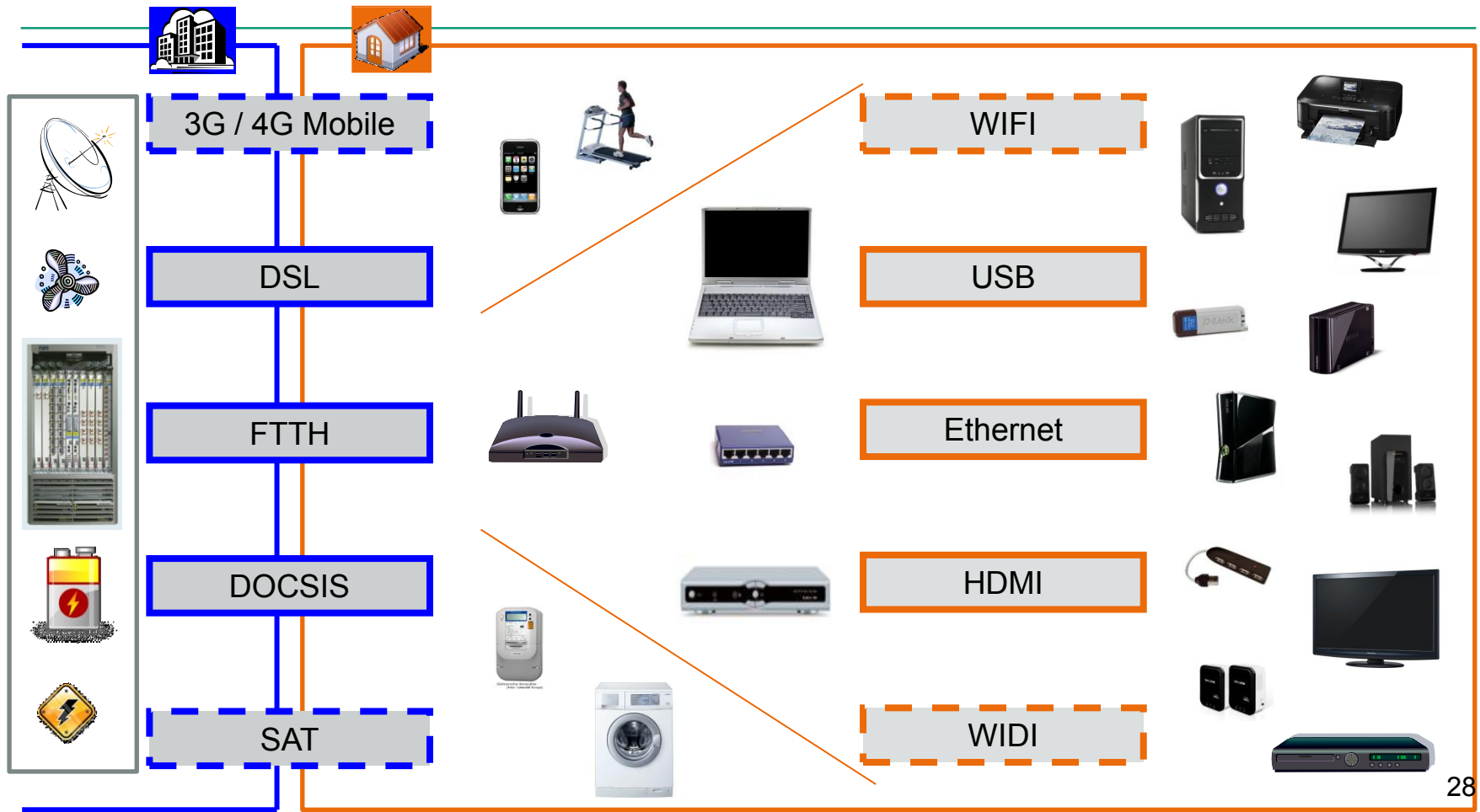
- *Resuming application via network command is not always possible*

Network Availability

High (HiNA), Medium (MeNA), Low (LoNA)



Product scope



In scope: basically home & small office equipment

■ General criteria:

- Typical B2C devices (could be further defined by certain functionality)
- Warranty issues
- Standalone (fixed housing, integrated interfaces)

■ Power supply:

- Mains-powered (e.g. internal PSU, external PSU incl. Rechargeable Battery)
- T.b.d.: Rated power (e.g. power cap)
- T.b.d.: Direct DC-powered, network powered devices,

■ Network capability & services:

- EMC Class B (ICT devices)
- Wired and Wireless WAN access, LAN (no network management function)
- T.b.d.: Maximum number / type of interfaces / network management

- Note: Building automation products, white goods, toys & sports equipment matching the criteria to be included (t.b.d.)

29

Out of scope?

Distinction of professional equipment

■ General criteria:

- Typical B2B devices (e.g. proprietary services, defined quality-of-service)
- Warranty issues
- Typical rack-mount, outdoor cabinet
- Modular design (e.g. cooling infrastructure)

■ Power supply:

- Modular design (PSU, UPS, Direct DC)
- T.b.d.: Rated power (e.g. power cap)
- T.b.d.: Direct DC-powered, network powered devices,

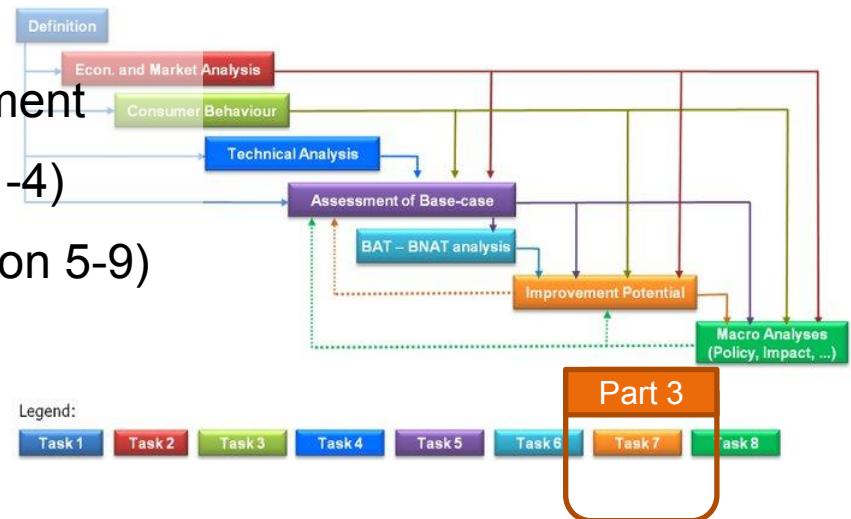
■ Network capability & services:

- EMC Class A (ICT devices)
- functionality that is mission critical (e.g. control, medical, safety, security)
- T.b.d.: Minimum number of interfaces

Content Part 3:

Improvement Options:

- Power consumption & power management
- Enabling power management (option 1-4)
- Power down routine, values, BAT (option 5-9)



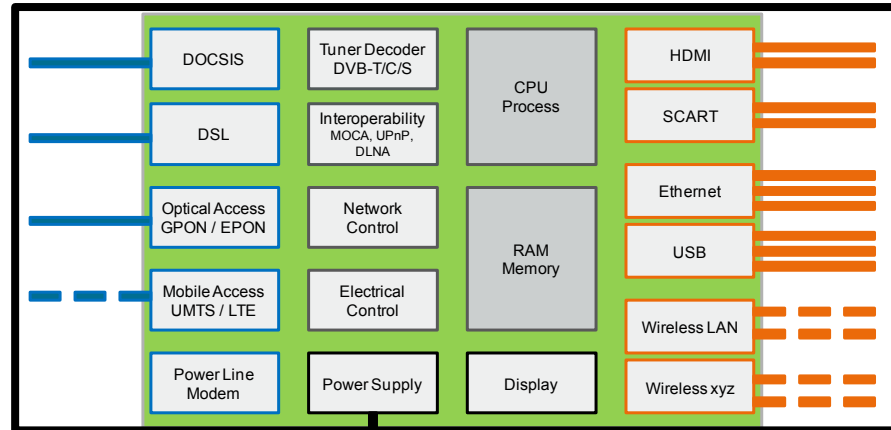
What determines energy consumption?

Up-stream (Service)

Power management support by WAN infrastructure (e.g. protocols)

Service provider interaction (e.g. CPE control)

System energy consumption (scalability)



Down-stream (User)

Power management support by LAN (e.g. protocols)

User interaction (e.g. manual settings)

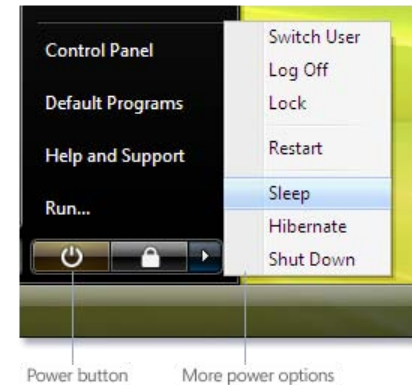
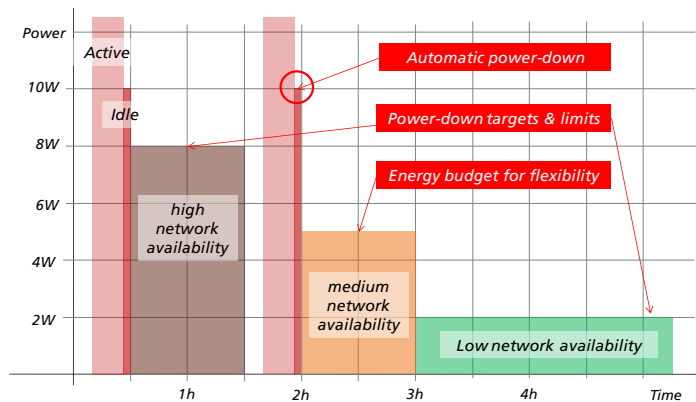
Network topology and configuration (distance, medium, interoperability)

Product Configuration:

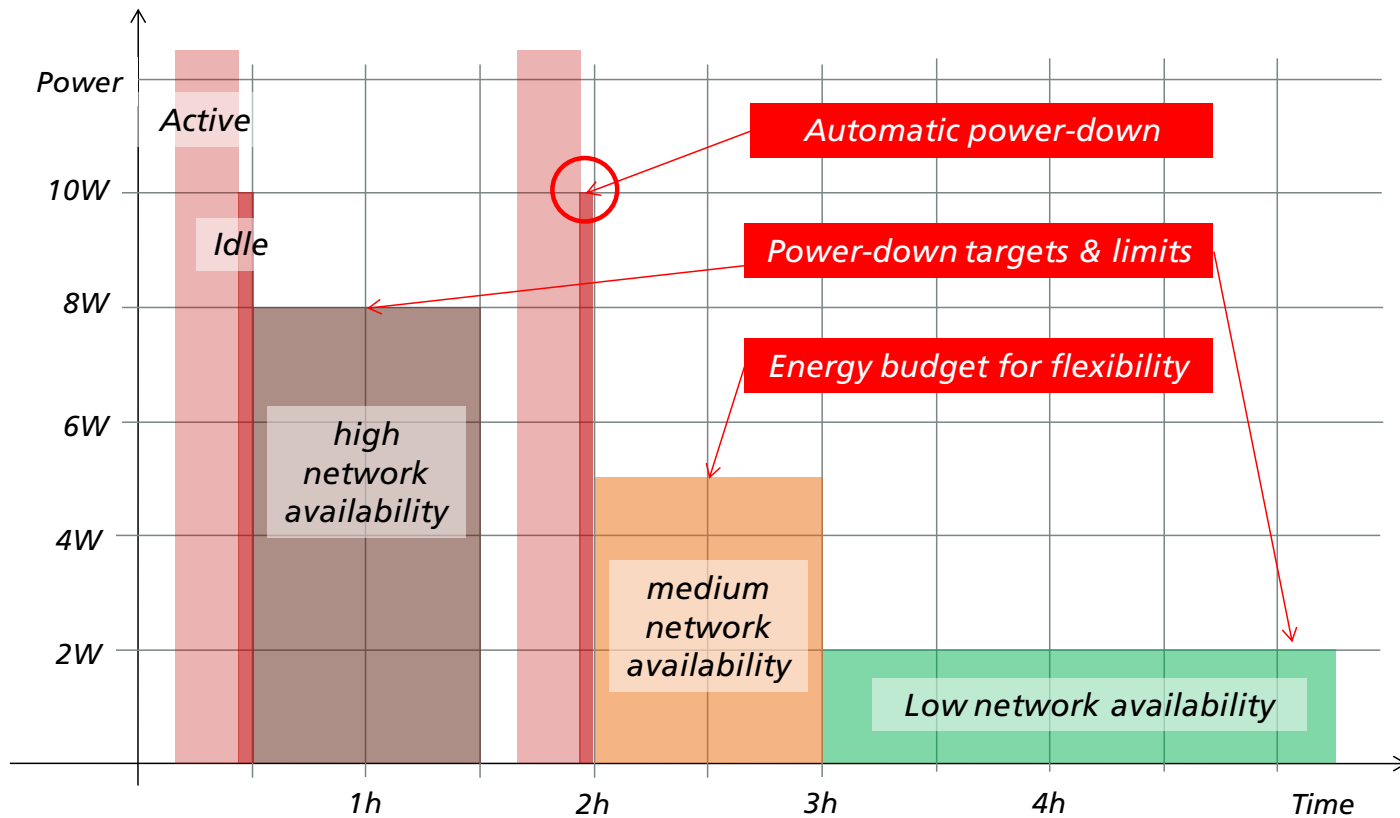
- Number, type, setup of network interfaces
- Hardware/software Integration (standards)
- Power modes and interoperability
- Power supply (main function)
- Modular components (add-ons)

Enabling power management

- Option 1: Manual and automated standby/off
- Option 2: Manual activation of power-down routine
- Option 3: Automatic activation of power-down
- Option 4: Individual power management settings



NA concept: Blueprint for power management



EC 1275/2008 (Auto Power Down)

EC 1275/2008, Annex II, § 2d “Power Management”

When equipment is not providing the main function, or when other energy-using product(s) are not dependent on its functions, equipment shall, unless inappropriate for the intended use, offer a power management function, or a similar function, that switches equipment after the shortest possible period of time appropriate for the intended use of the equipment, automatically into:

- standby mode, or
- off mode, or
- another condition which does not exceed the applicable power consumption requirements for off mode and/or standby mode

when the equipment is connected to the mains power source. The power management function shall be activated before delivery.

Option 1:

Manual and automated standby/off

- Scope: All equipment
- Hardware-specification:
 - standby/off-button
 - sensor pad
- Software-specification:
 - appropriate shutdown routine
 - required user interaction such as instruction for file saving via respective top-level-menu
 - optional timer settings
- Problems:
 - additional costs, stability of handling, optical design

Option 2:

Manual activation of power-down routine

- Scope: All equipment
- Hardware-specification:
 - ADDITIONAL power-save button on the remote control or equipment
 - Direct input via keypad or touch screen panel
- Software-specification:
 - Activation must be provided on the highest level in the menu
 - Shipment setting must allow instant use of this option
- Problems:
 - Harmonization of the software menu (top-level) including terminology, sequence, icons, activation feedback (display), coloring, etc.

Option 3:

Automatic activation of power-down

- Scope: All equipment
- Specification:
 - Shipment setting with automatic power down activated.
 - 15 minutes maximum default delay time for shifting from idle to first low power mode. More ambitious settings 5 or 10 minutes recommended (if resume time to application is fast)
 - Power management menu on the top of the setup-hierarchy
- Problems:
 - “Pause”-modes must be considered as an idle state
 - Development of conformity testing and measurement procedures

Option 4:

Individual power management settings

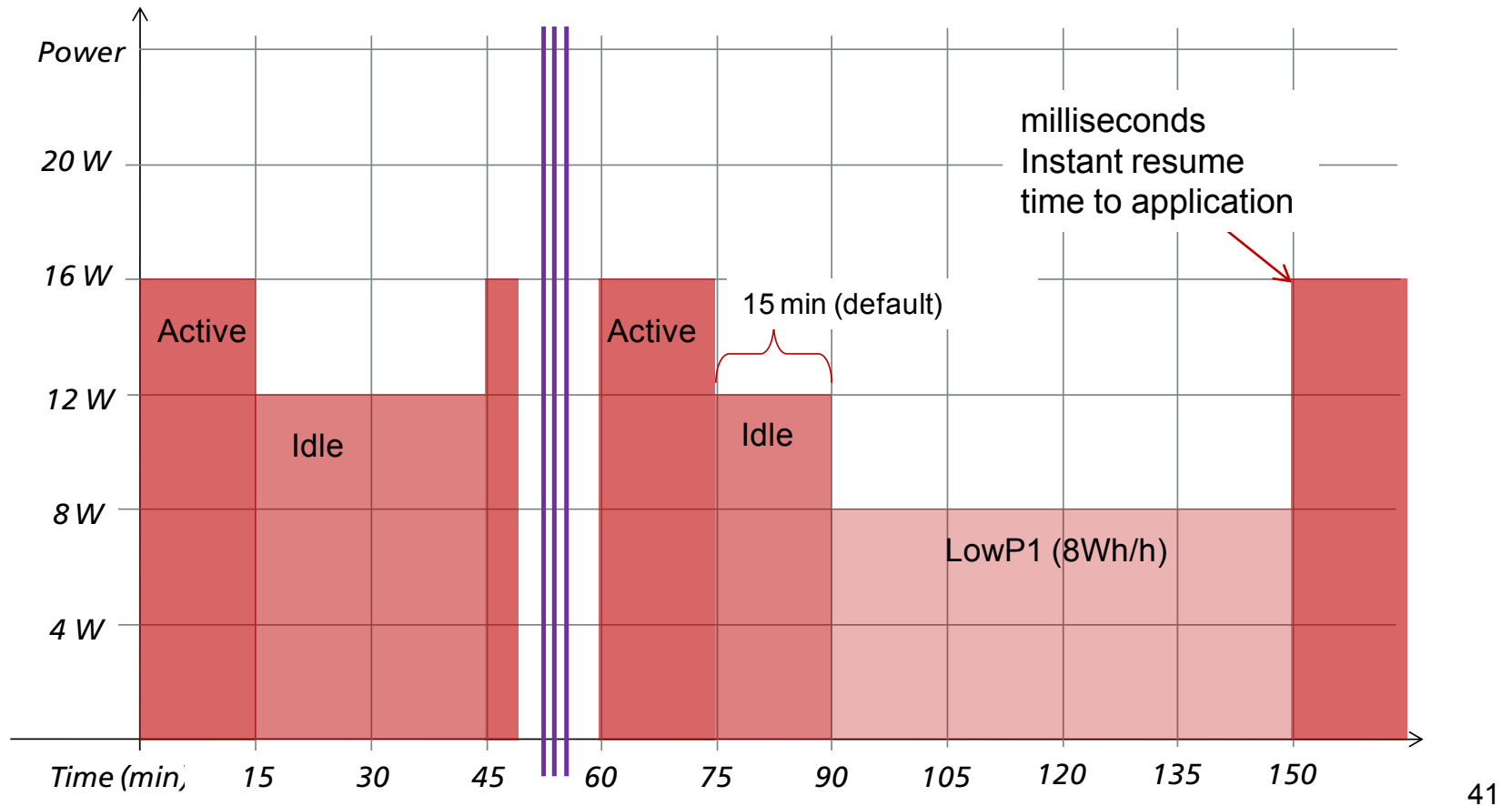
- Scope: All equipment
- Specification:
 - Top-level menu setting for more ambitious power management:
 - Deactivation of functions or ports the user does not need
 - Timer-based night routines
 - Installation / first initialization set-up
 - Eco-rating of power management options (Green – best, Yellow – sufficient, Red – critical)
 - Average power consumption value as information in the menu
- Problems:
 - Address the issue of “Fast Play” or “Quick Start”

High Network Availability

High Network Availability

- Option 5: Power-down for networking equipment (Delay time: 15 minutes)
- Option 6: LowP1 average power consumption limit
- Technical Analysis and BAT

High Network Availability

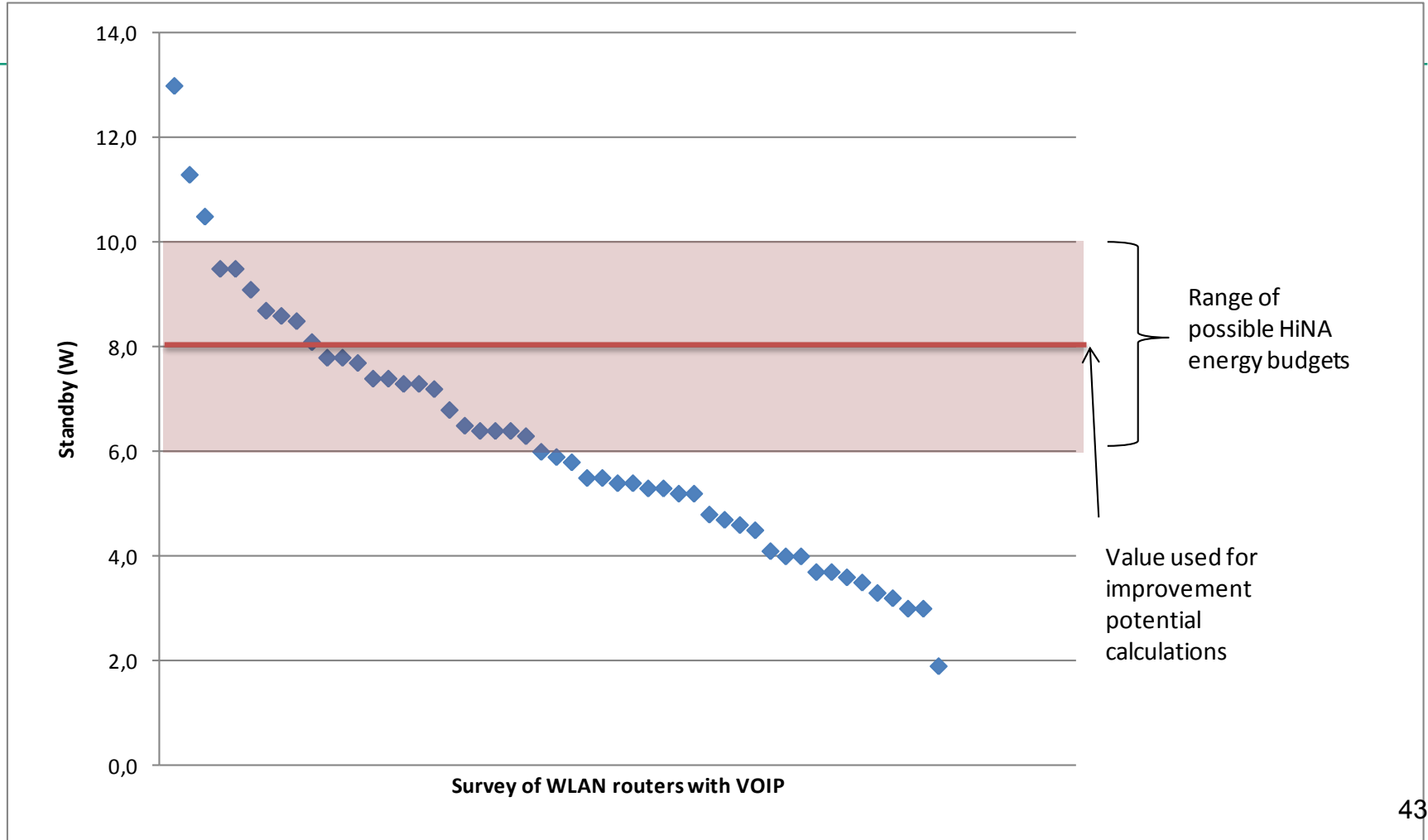


Option 5/6:

Power-down for networking equipment

- Scope: Stand-alone networking equipment (non-rack, CPE / SOHO)
- Specification:
 - Delay time for idle mode duration: **15 minutes max.**, specifications for Idle and LowP1 (product-specific)
 - **Energy consumption 8 Wh/h**
- Considerations:
 - IEEE 802.3az (Energy Efficient Ethernet) implementation
Note: change of infrastructure will take time (about 5 to 7 years [use cycle])
 - Interface power management needs to be supported by protocols
Note: most network technologies (e.g. WAN) have no power management
 - Technical options incl. deactivation of unused ports / adaptive clock speed,
Note: wireless interface may change connection status frequently

WLAN Router with VoIP (idle/standby)

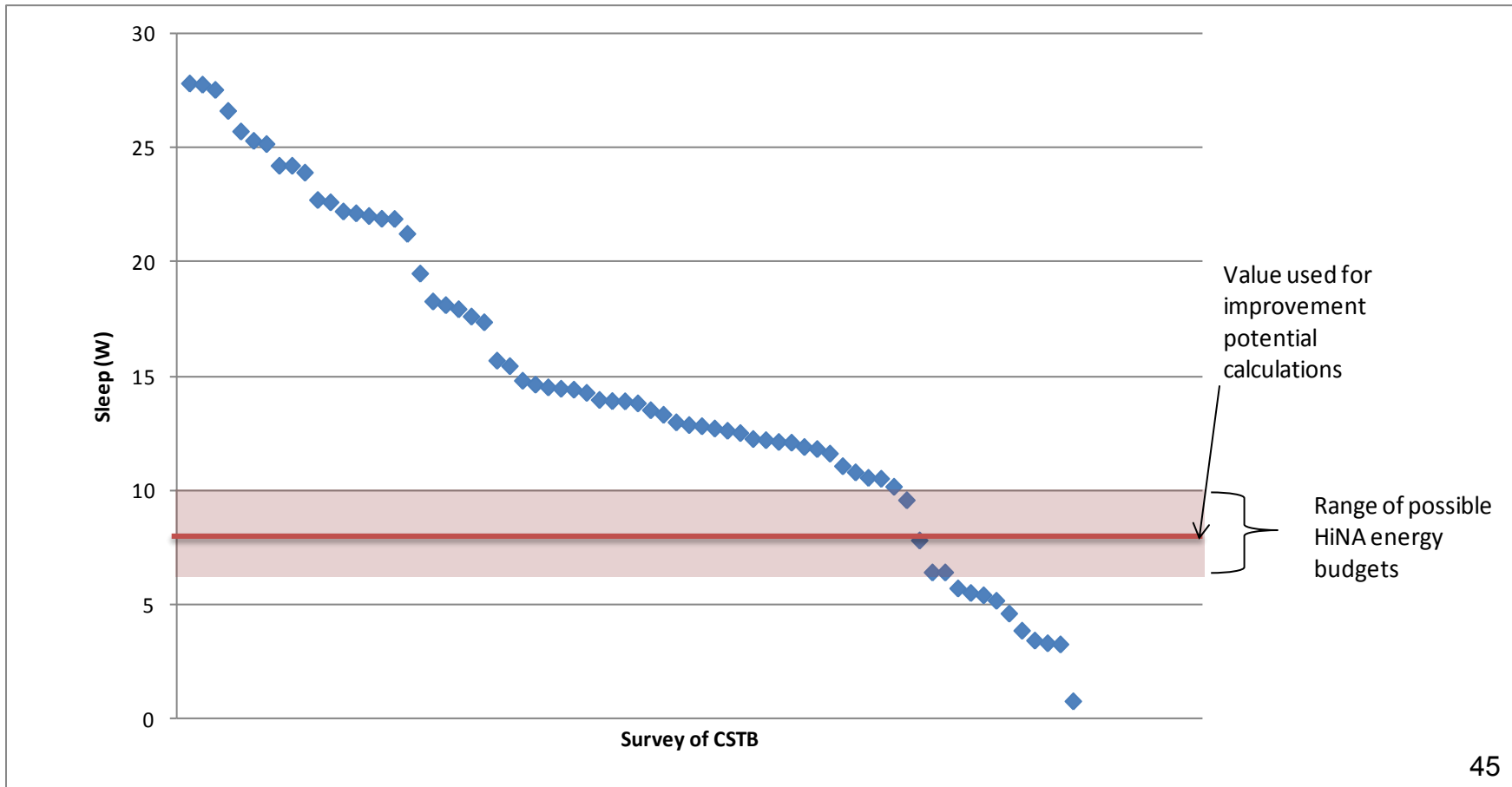


Examples for BAT in Home Gateways

Product name	Conceptronic C300GBRS4	Sitecom WL-351	AVM FritzBox 7270	AVM FritzBox Phone WLAN 7390
Configuration	1xWAN, Router (4xLAN), W-LAN (n), WOL	1xWAN, Router (4xLAN), W-LAN (n), Multi-SSID	DSL Modem, Router (4xLAN FE), W-LAN (n), 3 Antenna, 1xUSB host, 2 TAE	VDSL- and ADSL2+ Modem, Router (4xLAN), W-LAN, VoIP, ISDN, analogue Tel (2), 2x USB
Power consumption	4 W Idle with 1xWAN, 1xLAN and 1WLAN client registered	3.3 W Idle with 1WAN, 1xLAN and 1WLAN client registered	6.3 Watt Active Idle-timeout, auto reconnect, UPnP deactivation, Night timer	9.3 W Active 8.1 W Idle WLAN-off-switch

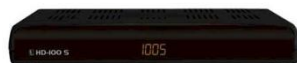


Complex STB (idle/standby)



Examples for BAT in complex STB and Player/Recorder

Product name	SL HD-100 S	WISI Or 187 HDTV-CI+	Samsung Blu-Ray BD-C5500	AVM FRITZ! Media 8260
Configuration	HD-DVB-S, HDMI, SCART, USB	HD-DVB-S, CI+, HDMI, SCART, USB, Recording via USB	Blu-Ray-, DVD-, CD-Playback, HDMI, USB, LAN, Internet@TV, AllShare (DLNA)	HD-DVB-S2CI, DLNA/UPnP-AV-Streaming, Video-On-Demand, Web-Services, LAN, USB, HDMI
Power consumption	8.5 W Active 3.2 W Standby (networked) <0.2 W Standby	11.5 W Active, 0.2 W Standby (incl. timer)	9.2 W Active (Blu-Ray), 7.8 W Active (DVD), 0.1 W Standby	14 W Active, 11 W Standby incl. streaming access, 1.7 W "Deep Standby"



46

ADSL Home Gateway (accord. to CoC V3)

Function	low-power-state		on-state	
	2009/2010	2011	2009/2010	2011
Central functions + ADSL WAN interface	4,2	2,6	5,0	3,8
4 port Ethernet switch	0,8	0,6	2,2	1,8
single radio IEEE 802.11b/g Wi-Fi interface	1,0	0,7	2,0	2,0
USB ports	0,3x2	0,25x2	0,3x2	0,25x2
Total equipment	6,6 W	4,4 W	9,8 W	8,1 W

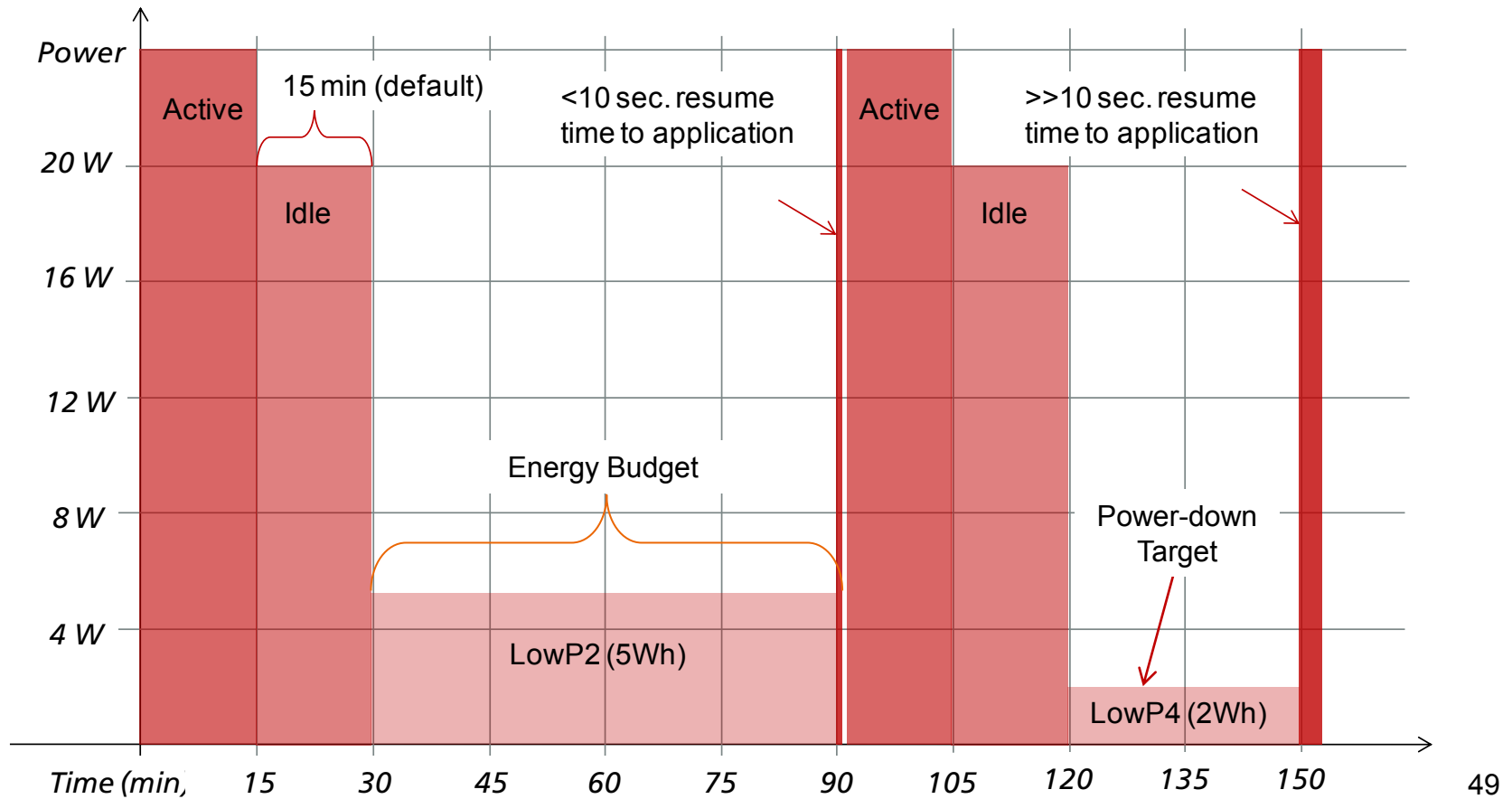
47

Medium and Low Network Availability

Medium and Low Network Availability

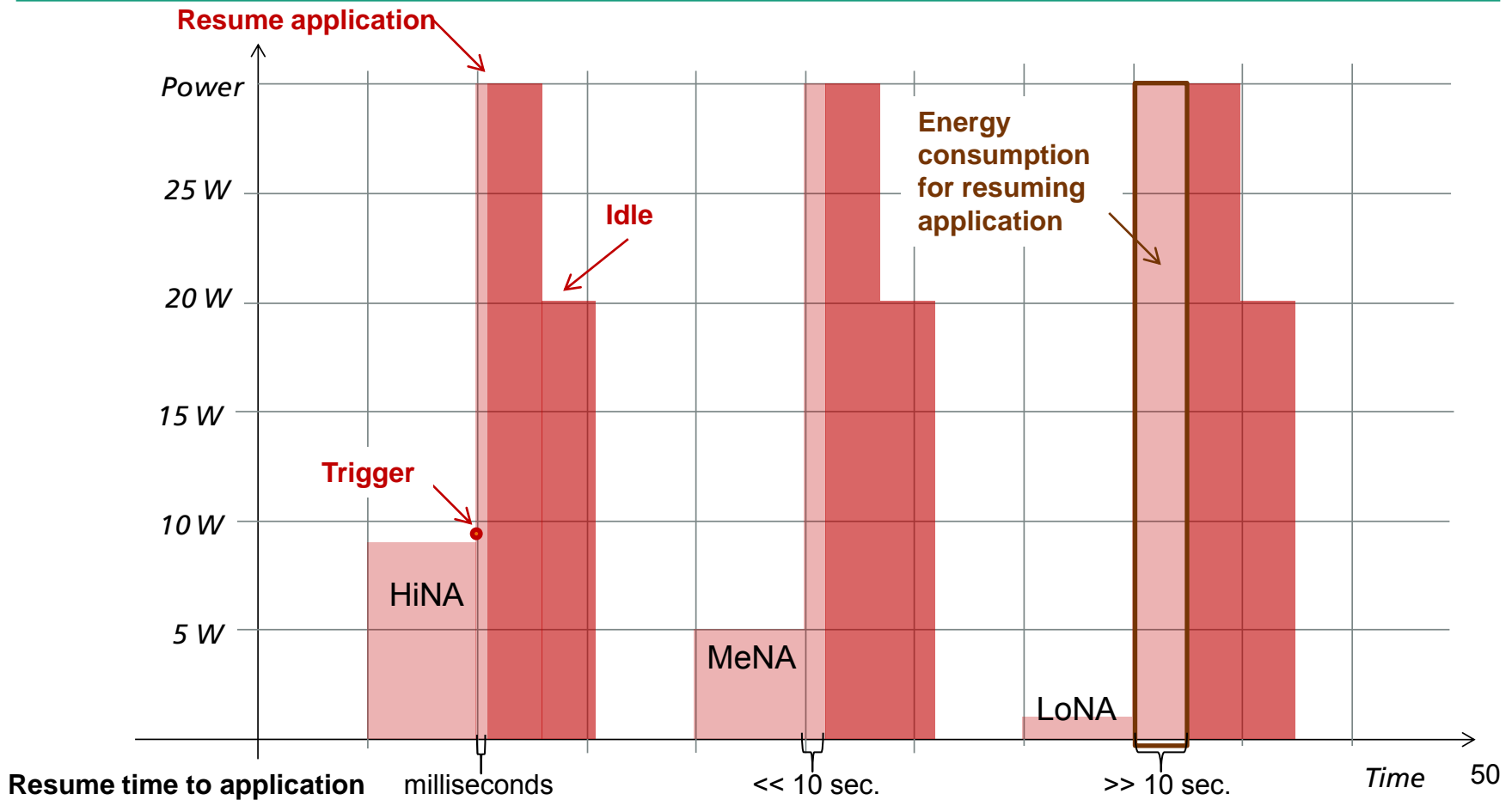
- Option 7: Power down routine for all other products
- Option 8: LowP2 energy budget
- Option 9: LowP4 average power consumption limit
- Technical Analysis and BAT
- Improvement potential

Medium and Low Network Availability



Network Availability

High (HiNA), Medium (MeNA), Low (LoNA)



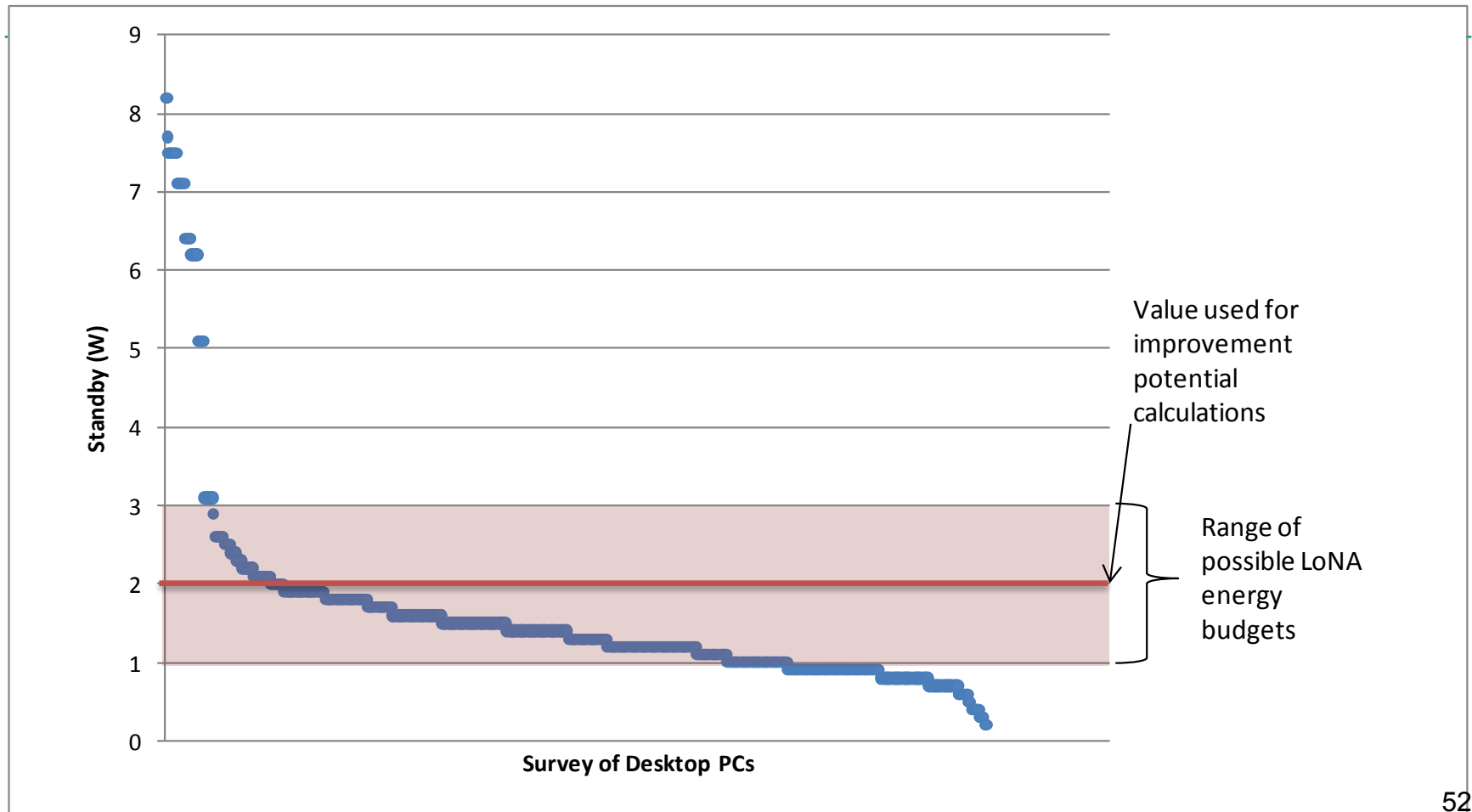
Option 7/8/9:

Power down routine for all other products

- Scope: All products excl. networking equipment covered above
- Specification LowP2:
 - Power-down from idle/pause mode after **15 minutes maximum**
 - Medium network availability ~10 sec reactivation (suspend to RAM)
 - **Energy budget 5Wh**
- Specification LowP4:
 - Power-down from LowP2 or if applicable from idle
 - Low network availability >10 sec. reactivation (suspend to disk)
 - **Energy consumption 2Wh/h**
- Problems:
 - HDD or flash memory needed: limited lifetime of non-volatile memory, reliability, form factor and sound (moving parts). In our view this would only apply for very extreme scenarios, see Task 6 report.

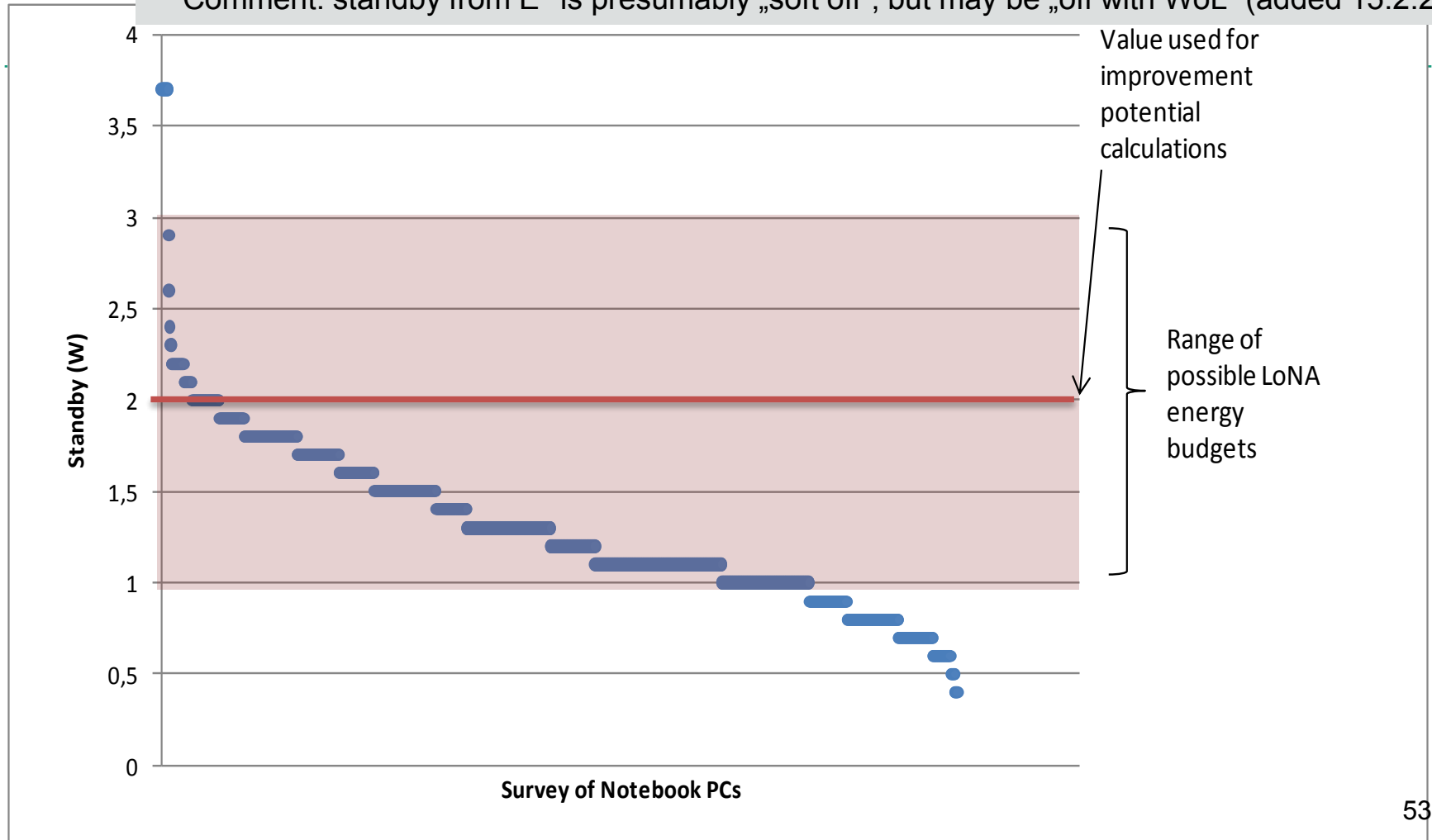
Desktop PC – Standby (Energy Star DB)

Comment: standby from E* is presumably „soft off“, but may be „off with WoL“ (added 15.2.2011)



Notebook PC – Standby (Energy Star DB)

Comment: standby from E* is presumably „soft off“, but may be „off with WoL“ (added 15.2.2011)



BAT examples for PC (provided by Intel)

System	Type	S3 PWR ¹ [W]	S3 WOL Pwr ¹ [W]	S3 WOL AMT Pwr ¹ [W]	S4 Pwr ¹ [W]	S4 WOL Pwr ¹ [W]	S5 Pwr ¹ [W]	S5 WOL Pwr ¹ [W]	Idle (disp on) ¹ [W]	Idle (dis off) ¹ [W]	ARP S3 WOL Res time [Sec]	ARP S3 AMT Res time [Sec]	ARP S3 WOL Res Energy [W*Sec]	ARP S3 AMT Res Energy [W*Sec]
SugarBay CRB	DT	1.28	1.4	1.65	0.87	1.08	0.87	1.08	28.77	28.31	8		342	
Dell Optiplex 960	DT	1.62	1.62	2.23	1.2	1.2	1.2	1.2	32.42	31.94	11	0.1	412	8.23
Huron River CRB	NB	0.84	1.06	1.3	0.57	0.78	0.57	0.78	8.32	11.42	9		230	
HP Elite 2540p	NB	0.66	0.978	1.25	0.5	0.84	0.5	0.84	8.47	12.67	10		170	



Examples for BAT in Network Attached Storage (NAS)

Product name	Buffalo LS-WSX500L/R1EU	LG N2R1
Configuration	2x250 GB HDD, Raid 0/1/JBOD, DLNA-Server, i-Tunes-Server, Torrent-Client, LAN, USB	2x1TB HDD, RAID, DLNA-Server, Gigabit LAN, eSATA, 3xUSB
Power consumption	8 W Active 5.5 W Idle 2.3 W Standby _{WOL} = LowP3	22 W Active 19 W Idle 9.3 W Standby (10 sec. reactiv.) 2.3 W Hibern. (40 sec. reactiv.)



Examples for BAT in Imaging Equipment

Product name	Canon Pixma MG 6150	Ricoh Aficio SP 3400SF
Configuration	Inkjet-Multifunctional-Device, 9-12 ppm, USB, LAN, WLAN, Duplex, CD/DVD-Print	EP (laser) All-in-One: A4; black and white
Power consumption	25 W Active 6.4 W Idle 2 W Sleep 0.3 W Off	850 W Max 475 W Active 68.8 W Idle 9.7 W Standby (15 sec. reactiv.)



Examples for BAT in Televisions

Product name	Panasonic TX-L37GW20	Sony KDL-52LX905
Configuration	37-inch-Display, Full-HD, DVB-C, DVB-T, DVB-S2, analog, recording functionality (on USB), DLNA-Client, VIERA-CAST Web-Services, LAN, USB, HDMI, CI+	52-inch-Display, Full-HD, DVB-C, DVB-T, DVB-S2, analog, DLNA-Client, LAN, W-LAN, USB, HDMI, 3D, presence-detector
Power consumption	98 W Active 20 W (Recording) 0.25 W (Standby)	130 W Active ca. 60-80W Eco-Mode 20 W Fast-Reactivation-Mode 0.2 W Standby



Additional technologies: BAT in mobile phones

iPhone 4

Configuration: 3.5"-touchscreen, 32 GB, GSM/UMTS/HSDPA/W-LAN, 2x camera, photolight, different office-, internet- and entertainment-software

Data: 1600 mAh @ 3.7 V battery; runtime: 6 h (web via W-LAN), 300 h (standby)

Calculated power consumption:

- **Approx. 1W internet via W-LAN**
- **Approx. 20 mW standby GSM/UMTS**

Samsung I9000 Galaxy S

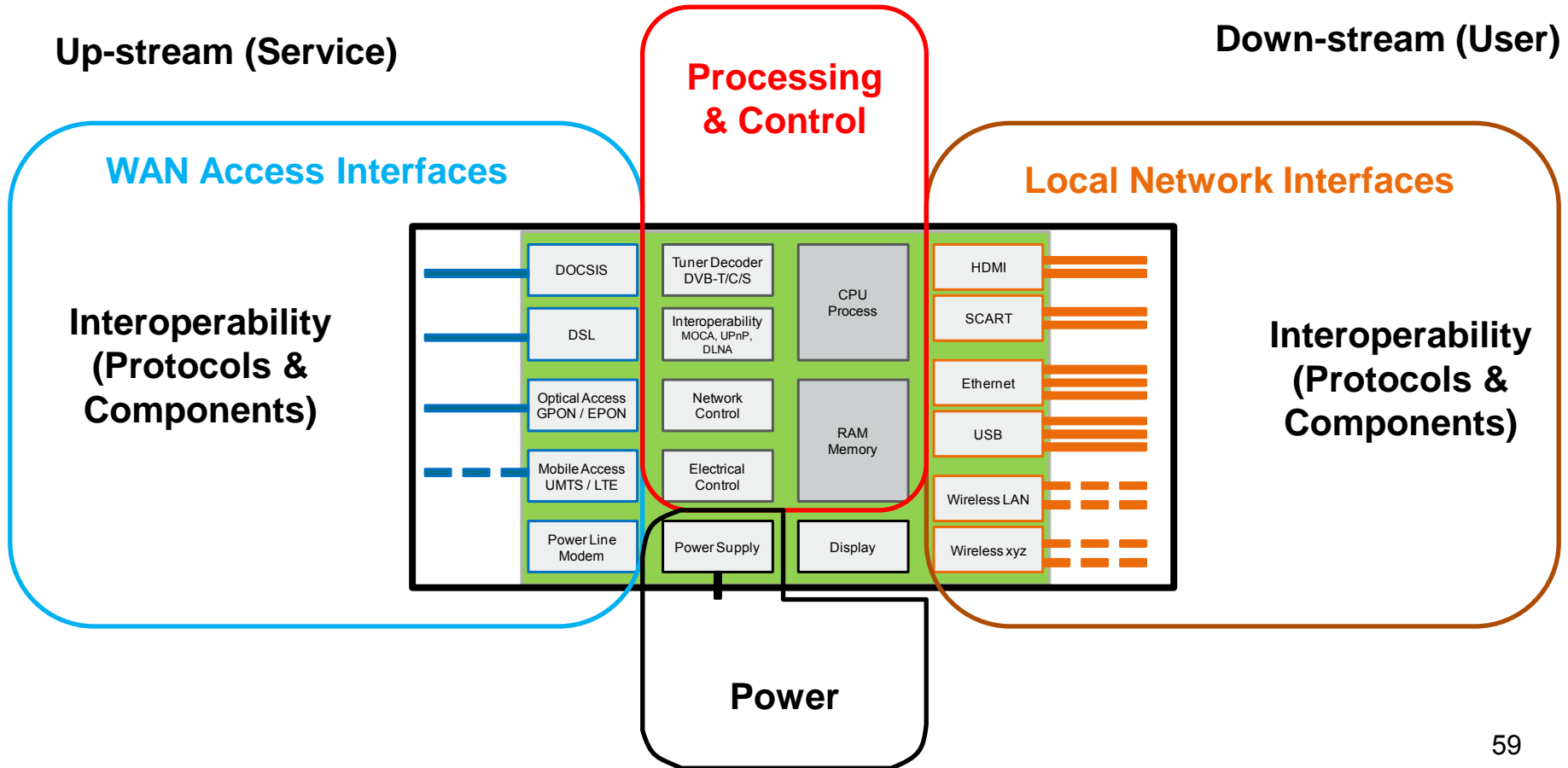
Configuration: 4"-AMOLED-touchscreen, 16 GB, GSM/UMTS/HSDPA/W-LAN, 2x camera, different office-, internet- and entertainment-software

Data: 1500 mAh @ 3.7 V battery; runtime: 4.5 h (web via W-LAN), 750 h (standby)

Calculated power consumption:

- **Approx. 1.2 W internet via W-LAN**
- **Approx. 7.5 mW standby GSM**

Summary of Main Influences



Summary of Current Product Data

Product	Network Types	Current (2010) Power Range (Watts)		
		Idle (current), HiNA equiv.	LowP2/MeNA equiv.	LowP4/LoNA equiv.
Desktop PC	LAN, WLAN, local	10.0 - 85.0	1.4 - 4.7	1.1 - 3.2
Notebook PC		10.0 - 45.0	1.0 - 3.7	0.8 - 2.2
IJ Imaging Eqp.		6.0 - 20.0	1.5 - 4.0	0.4 (off)
EP Imaging Eqp.		40.0 - 140.0	6.0 - 9.7	0.4 (off)
Networked Storage		5.5 - 27.0	2.3 - 17.5	-
Game Console		20.0 - 125.0	-	-
Complex Recorder	HDMI, LAN + tbd	15.0 - 30.0	3.2 - 16.6	1.7 - 16.6
Complex TV		15.0 - 45.0	-	-
Complex STB	WAN, HDMI, local	8.0 - 14.5	2.5 - 14.5	-
Home Gateway	WAN, LAN, WLAN	6.0 - 15.0	1.9 - 13.0	-
Mobile Phone	GSM, UMTS, WLAN	7.5 - 20 mW (GSM standby); 1 - 1.2 W (web via WLAN)		

Content Part 4:

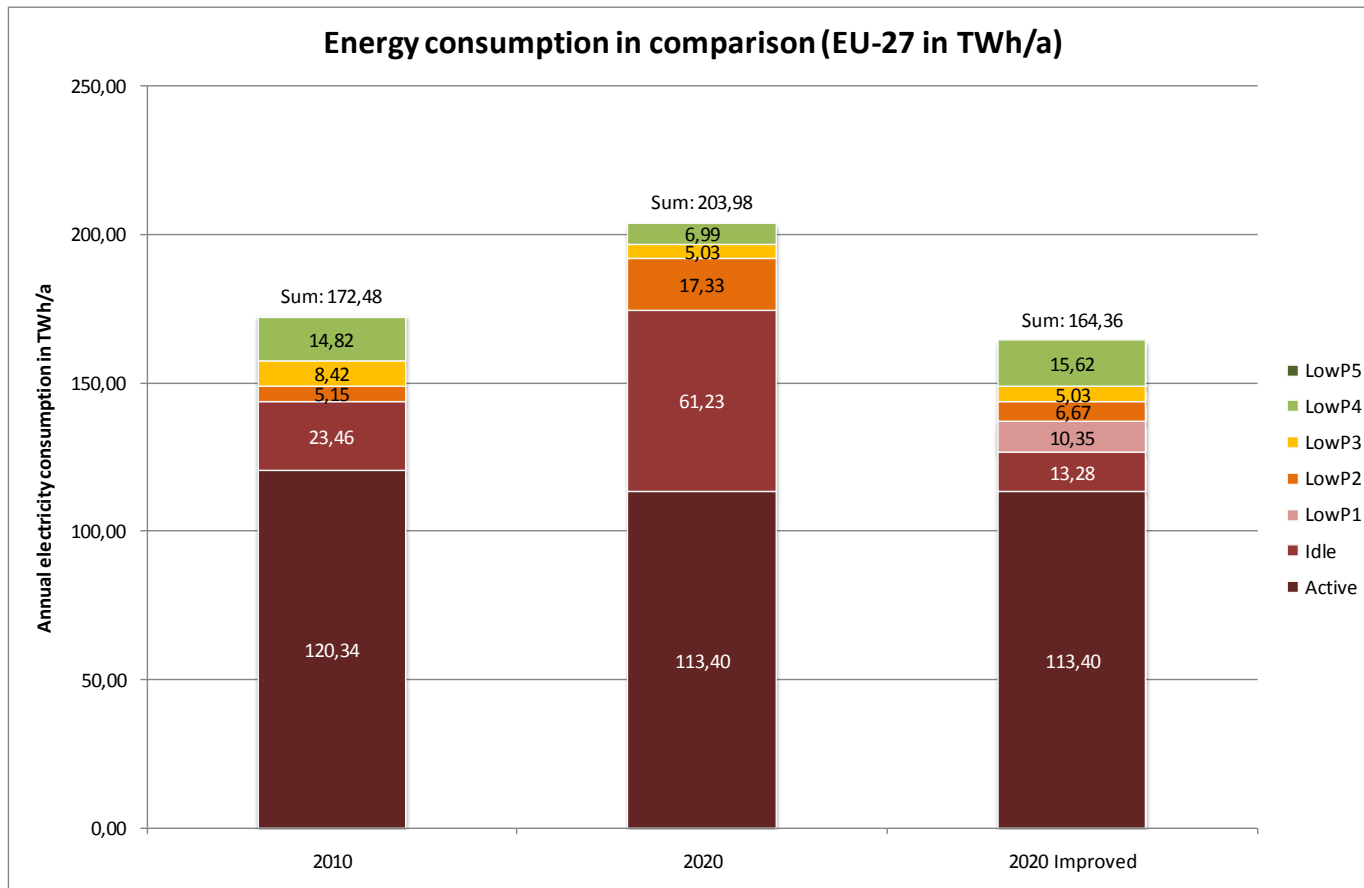
Towards policy recommendations:

- Critical discussion of improvement options
- Addressing the product scope in future regulation
- Test standards

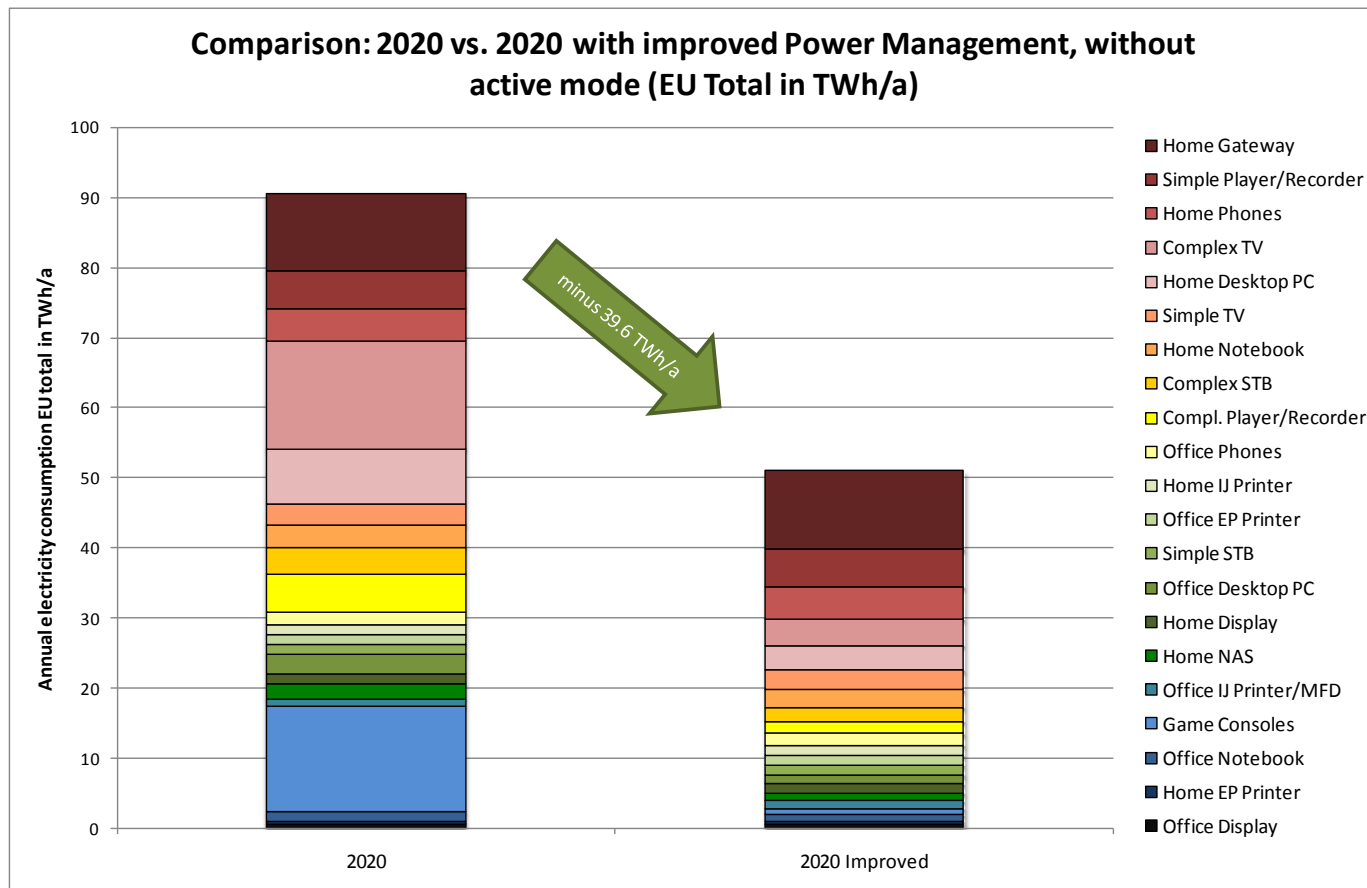
Horizontal improvement scenario 2020

- Active Same duration & consumption (no changes)
- Idle 10 minutes idle per 1 hour active (rounded to full quarter), same energy consumption
- LowP1 High network availability: 8 Wh/h
- LowP2 Medium network availability:
Energy budget 2 x 5 Wh per day
- LowP4 Low network availability mode:
2 Wh/h for remaining time of the day

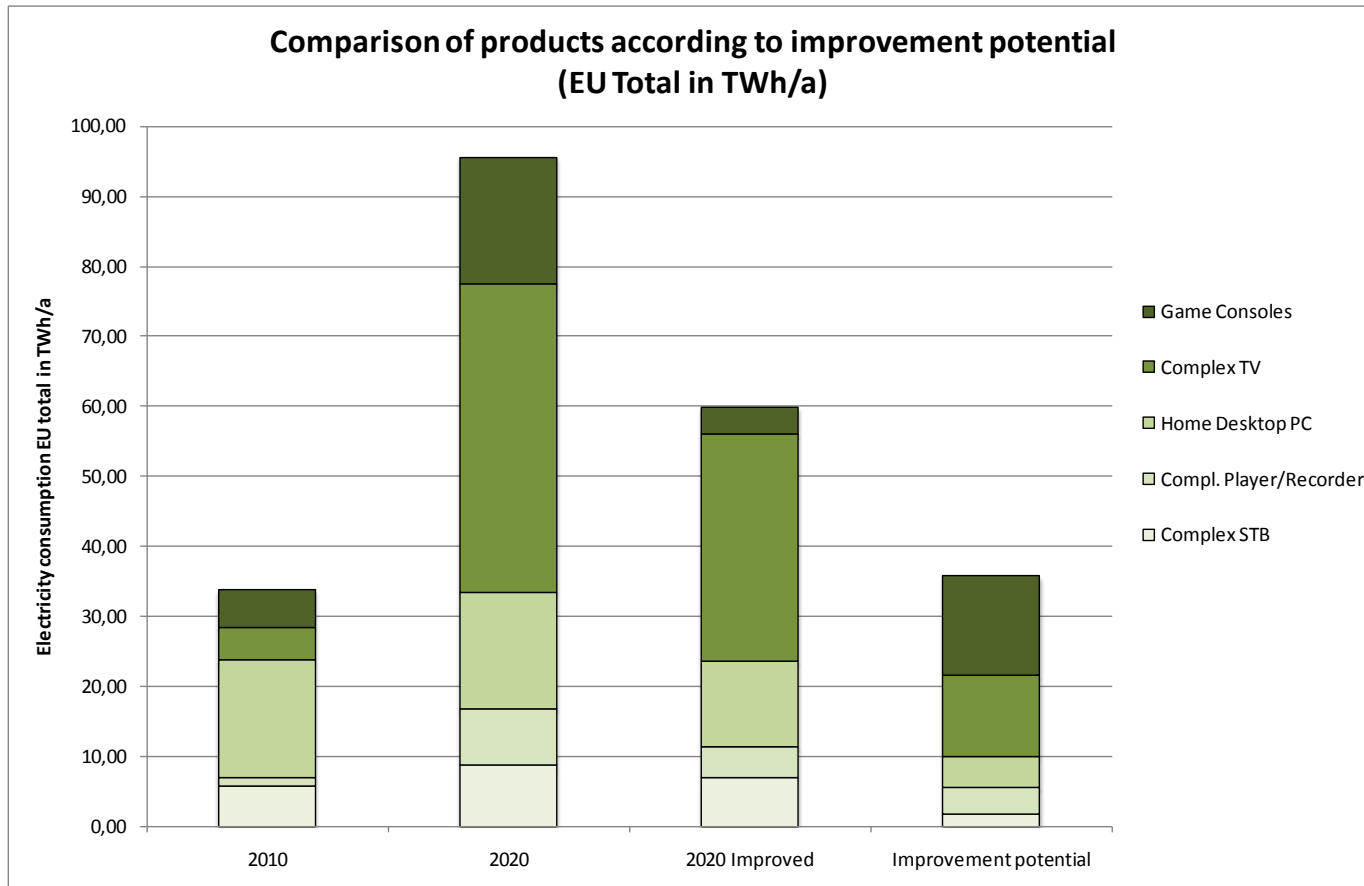
BAU and ECO scenario comparison (Horizontal – all product groups)



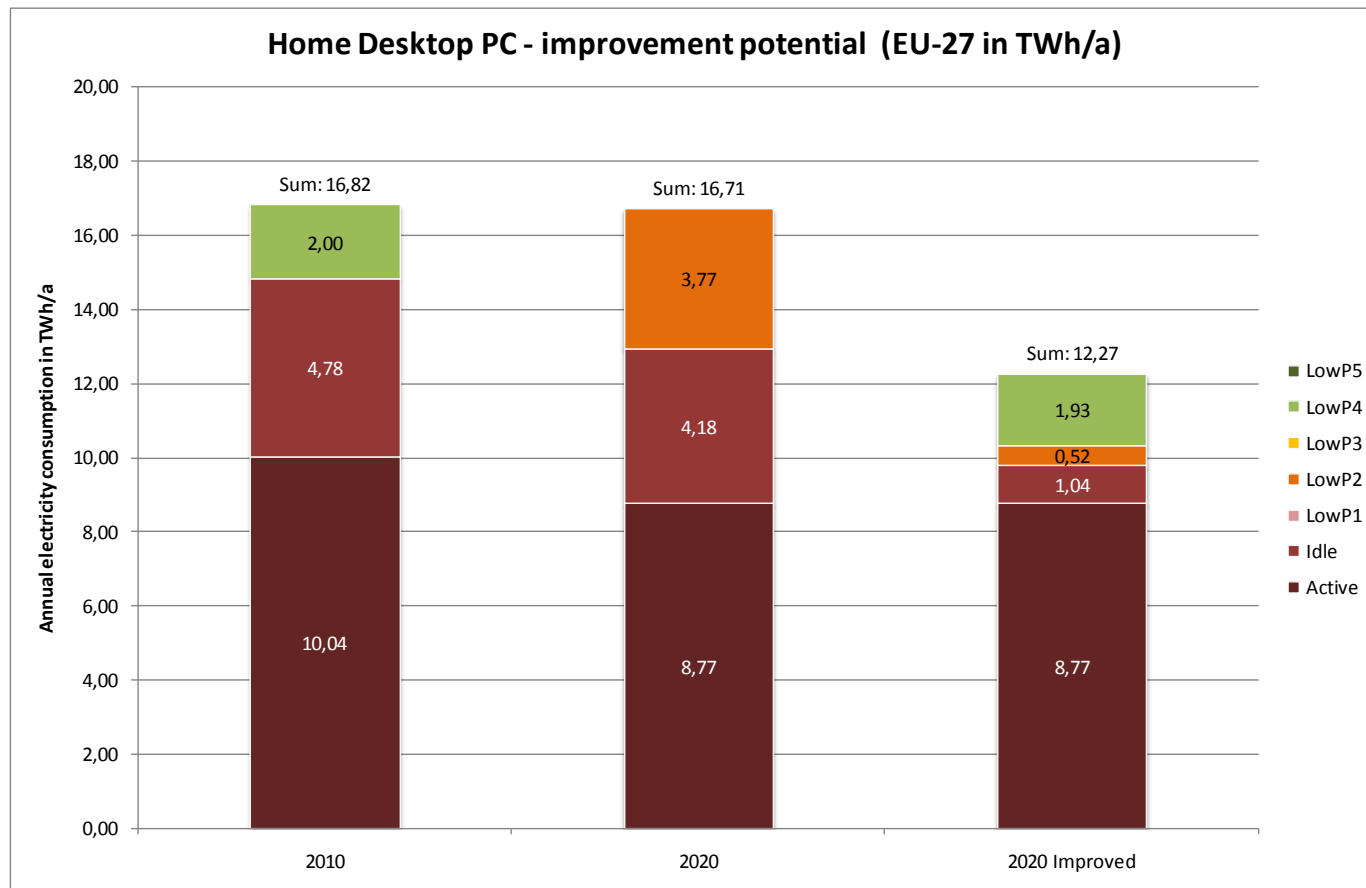
BAU and ECO 2020 without active mode (Vertical – individual product groups)



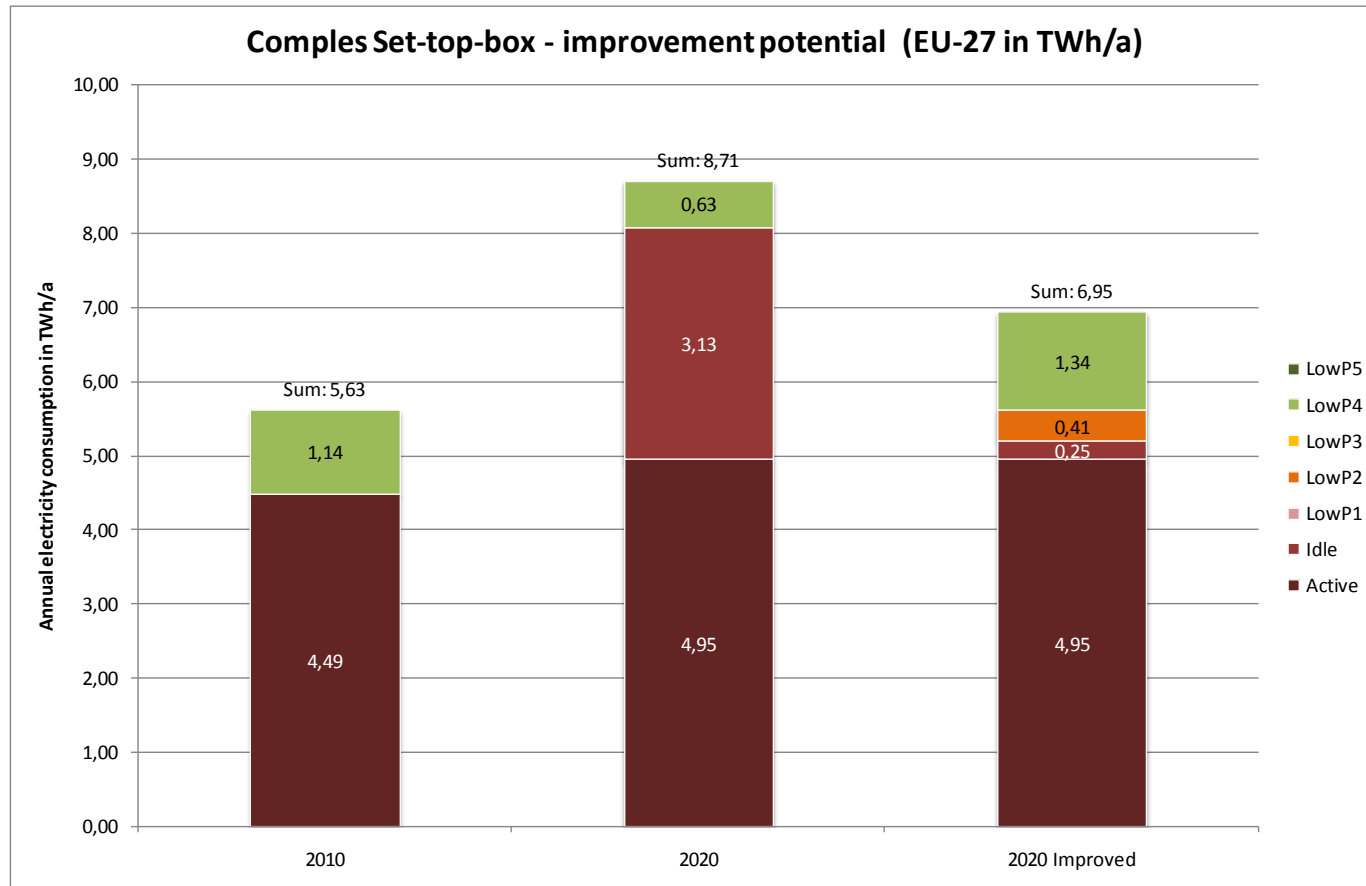
Individual improvement potentials



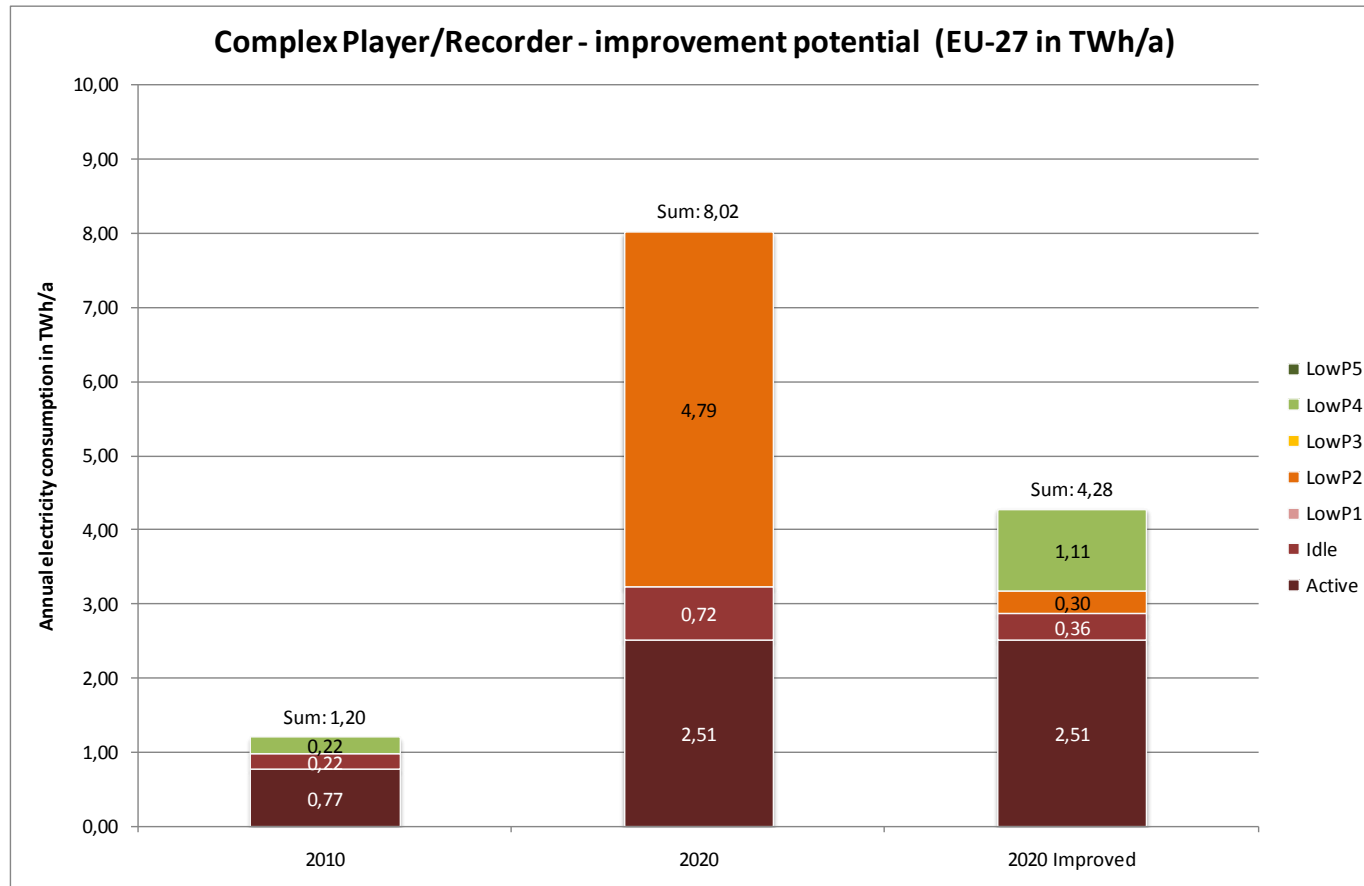
Improvement potential: Home Desktop PC



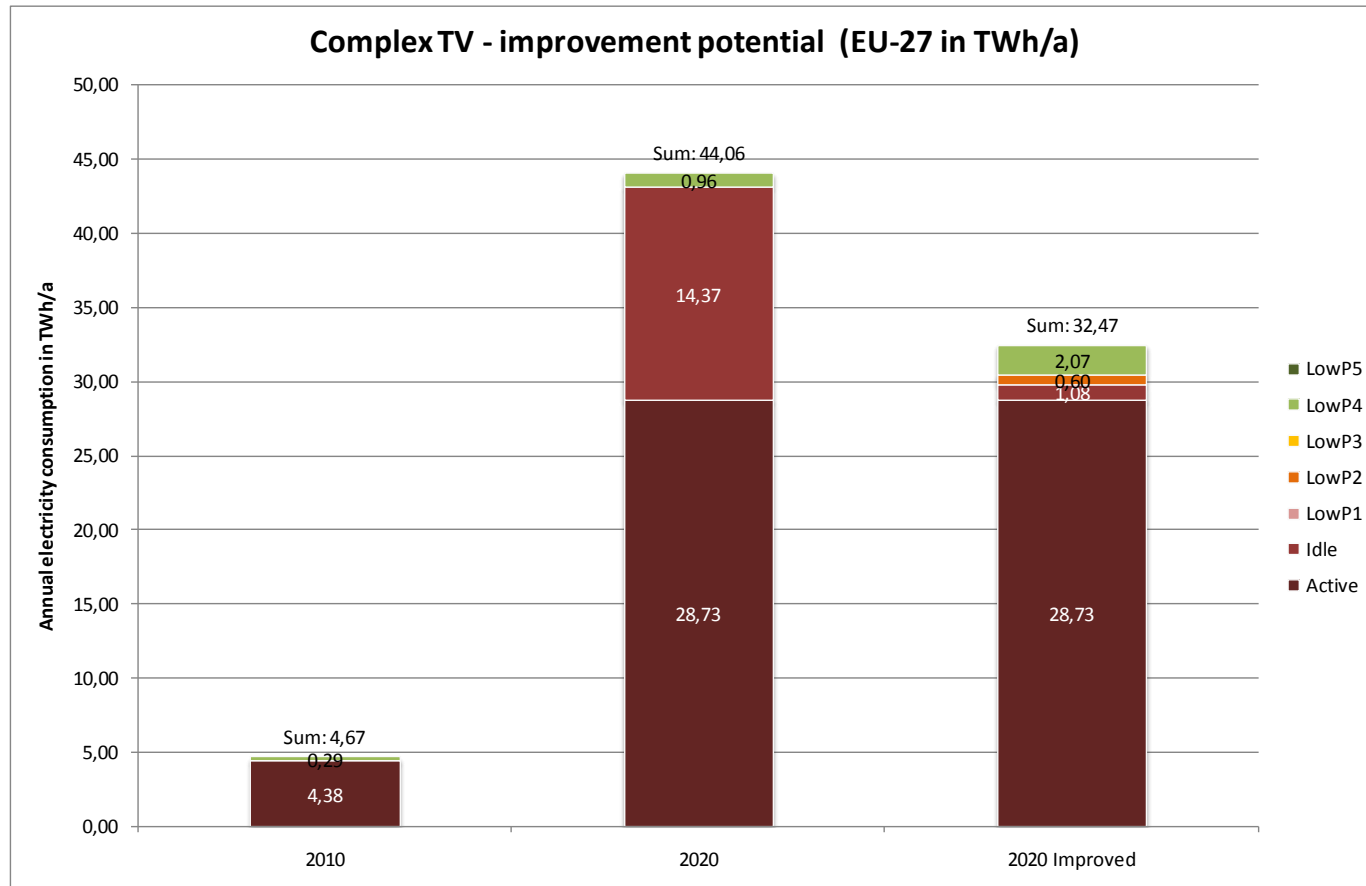
Improvement potential: Complex STB



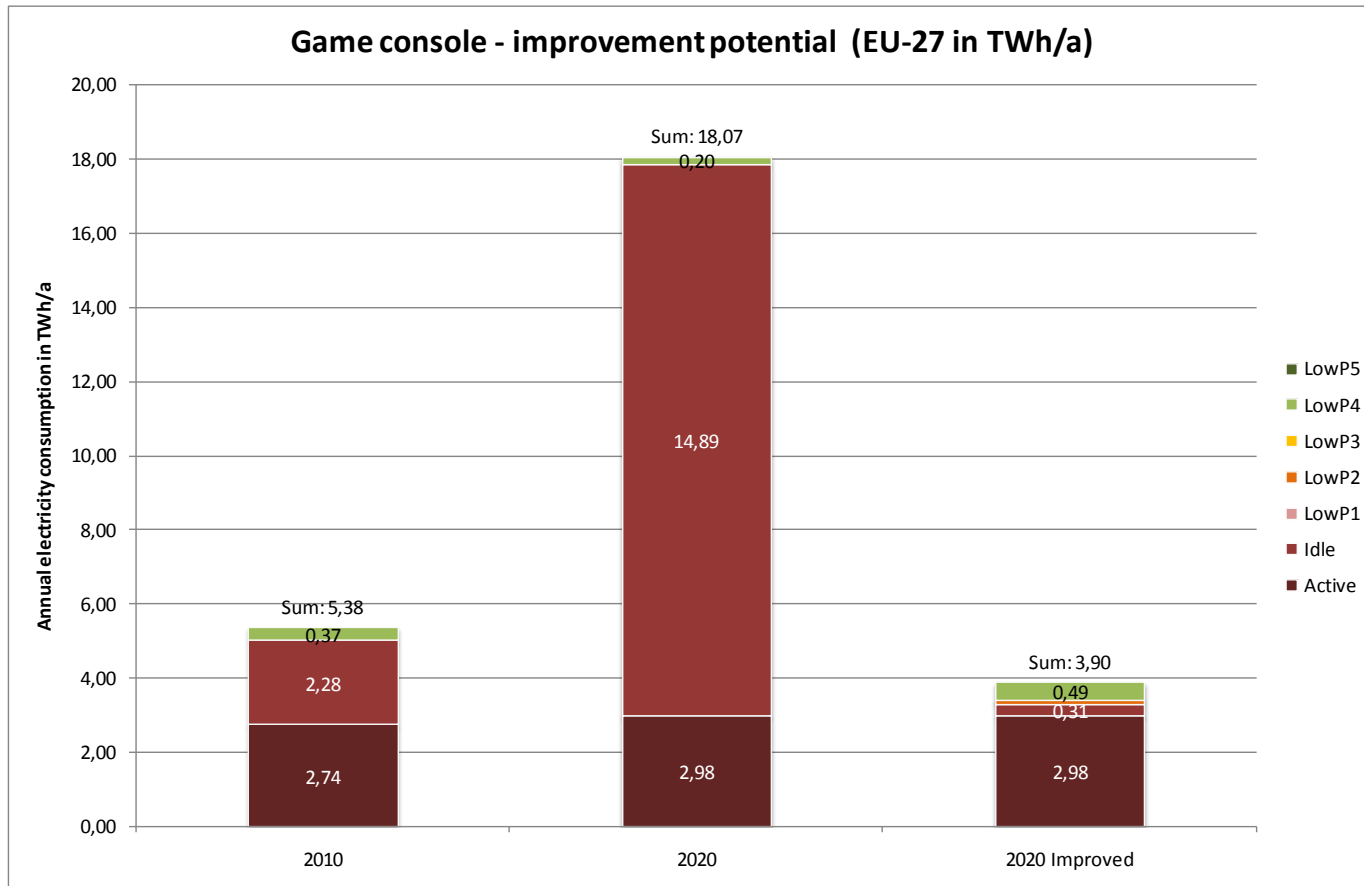
Improvement potential: Complex Player/Recorder



Improvement potential: Complex TV



Improvement potential: Game consoles



Improvement strategy

- Definition:

- Definition can be applied horizontally
- Common criteria: resume-time-to-application

- Product level implementation of power management :

- EC 1275/2008, Annex II, power management, APD (targets)
- Product specific HiNA, MeNA, LoNA requirements
- Incorporate Network Availability Approach in Typical Energy Consumption (TEC)

- System level requirements :

- Standardization: address power management in network technology (protocols)
- Procurement requirements: Service provider, component supplier (CoC)

Scope: Addressing Product Groups



Standby and off-mode: EC 1275/2008 / ENER Lot 6

HG

Code-of-Conduct
Broadband
Equipment

STB

ENER
Lot 18

PC

ENER
Lot 3

IE

ENER
Lot 4

TV

ENER
Lot 5

AV

ENTR
Lot 3

WG

ENER
Lots

Products not yet covered / New Products & Technologies

72

Conclusion

- 8Wh/h for HiNA:
 - Some WAN interfaces have no power management (e.g. DOCSIS)
 - Higher performing CSTB now seem to need more than 10W (see VA CSTB)
 - Network (link) interaction is critical (support the effort of the end-user-device)
- HiNA product scope needs to be defined based on functionality:
 - Consumer networking equipment, home gateways and set-top-boxes
 - Still difficult: distinguish more capable small business/office solutions with extended network management/server/network control function (QoS)
 - Enterprise grade equipment (Telecom, Data Center) with XX interfaces (>8?) and switch capability, cabinet or rack-mount are mission critical (QoS)
- Collaboration with service provider and component supply chain:
 - Network technology standards (protocols) need to address power management
 - Service provider (CPE/conditional access) need to collaborate

Conclusion

- 5Wh energy budget for MeNA transition phase:
 - Consider a somewhat larger energy budget for more flexibility and acceptance
 - Network interfaces are not a problem
 - Power management with respect to operating system (processing/memory)
 - Resume time to application <10 sec realistic?
- 2Wh/h as final power-down target (LoNA):
 - PC/Notebook/Mobile industry is benchmark (reactivation time still critical)
 - Quick start (convenience requirements) needs to be addressed
 - Critical: products that enhance network functionality though attached devices (USB dongle)
- Product scope needs to be defined (horizontal vs. vertical):
 - Consider overall power consumption e.g. large Printer (rated PSU, PFC)
 - Products with server function

Additional Notes

(added after stakeholder meeting for those not present, 15.2.2011)

Are the values in Task 7 a policy recommendation?

- The power levels and energy budgets discussed (8Wh/h, 5Wh and 2Wh/h) are for determining improvement potential and for describing a „desirable, improved“ 2020 situation.
- Nevertheless, these values were intentionally placed to start the discussion on potential thresholds even before the publication of Task 8.
- Task 8 will be published with the possibility for feedback. However this feedback may not be included in the final version of the Lot 26 reports. Such feedback will be ensured to reach the European Commission (for the following implementation process).

Additional Notes

(added after stakeholder meeting for those not present, 15.2.2011)

Further feedback

- Additional feedback is welcome – as specific and technical as possible.
 - the costs of implementing improvements
 - technologies or product types, which on a technical basis would not meet power down targets in the next few years
 - criteria for distinguishing professional equipment
- Less technical is the request for more specific user data / expectations:
 - how many users will really make use of networked standby capabilities? how many users will want to directly influence network availability (down to phases of no connectivity)? how many users will disable power management, if reactivation times are perceived as too long?

Test Standards

- New reference to CoC Broadband Equipment
- Aspects:
 - Wired (Linked/connected) or lost link (network loop??)
 - Wireless (Interface on / radio up (sending) / with or without client ?)
 - Power supply issues (where to measure)
- Measuring Energy Consumption
 - Integration of networked standby energy consumption into existing TECs
 - Energy budget LowP2 (variable setting)

New Code of Conduct Broadband Equipment (Draft V.4)

- CoC lists 18 basic equipment categories with respective power consumption thresholds in „on-state“ and „low-power-state“
- Values include a basic product configuration with one specified WAN interface
 - Low-power range 2011/12 from 2.5 W (Fast Ethernet WAN) to 7.7 W (WiMax)
- For additional interfaces and a few other options 27 power consumptions are listed (again separate for „on-state“ and „low-power-state“)
 - Low-power range 2011/12 from 0.15 W (Zigbee) to 11 W (Femto cell 10-50mW RF power)

CoC Broadband Equipment (Draft V.4)

Home gateway central functions plus WAN interface	Tier 2011-2012: 1.1.2011- 31.12.2012		Tier 2013-2014: 1.1.2013 - 31.12.2014	
	<i>Low-Power-State (W)</i>	<i>On-State (W)</i>	<i>Low-Power-State (W)</i>	<i>On-State (W)</i>
ADSL2+	2.6	3.8	2.4	3.4
VDSL2 (8, 12a, 17a, but not 30a)	3.5	6.0	3.2	4.6
VDSL2 (30a)	4.2	6.7	3.9	5.3
Fast Ethernet WAN	2.5	3.3	2.0	3.0
Gigabit Ethernet WAN	3.2	6.2	2.5	5.0
Fibre Ptp Fast Ethernet WAN	2.9	5.6	2.9	5.0
Fibre Ptp Gigabit Ethernet WAN	3.5	6.2	3.2	5.6
GPON	4.0	6.5	3.5	5.0
1G-EPON	3.7	5.5	3.5	4.7

CoC Broadband Equipment (2)

Home gateway central functions plus WAN interface	Tier 2011-2012: 1.1.2011- 31.12.2012		Tier 2013-2014: 1.1.2013 - 31.12.2014	
	<i>Low-Power-State (W)</i>	<i>On-State (W)</i>	<i>Low-Power-State (W)</i>	<i>On-State (W)</i>
10/1G-EPON	5.1	7.0	4.8	6.2
10/10G-EPON	5.6	8.8	5.3	7.7
XG-PON	5.1	7.3	4.8	6.5
DOCSIS 2.0	3.7	4.6	3.7	4.6
DOCSIS 3.0 basic configuration	6.2	7.1	4.2	6.2
DOCSIS 3.0 additional power allowance for each additional 4 downstream channels	2.2	2.8	2.0	2.5
WiMAX	7.7	10.6	3.5	6.0
3G	4.0	7.0	3.5	6.0
LTE	4.0	7.0	3.5	6.0

CoC Broadband Equipment (3)

Home gateway LAN interfaces and additional functionality	Tier 2011-2012: 1.1.2011- 31.12.2012		Tier 2013-2014: 1.1.2013 - 31.12.2014	
	Low-Power-State (W)	On-State (W)	Low-Power-State (W)	On-State (W)
1 Fast Ethernet port	0.3	0.4	0.2	0.4
1 Gigabit Ethernet port	0.3	0.9	0.2	0.6
Wi-Fi interface, single band IEEE 802.11g or 11a/h radio ⁵ with up to 23 dBm EIRP	0.7	2.0	0.7	1.5
Wi-Fi interface, single band 11a/h radio ⁵ with up to 30 dBm EIRP	0.7	2.5	0.7	2.5
Wi-Fi interface, single band IEEE 802.11n radio ⁵ with up to 23 dBm EIRP	1.0	2.5	0.8	2.0
Wi-Fi interface, single band IEEE 802.11n radio ⁵ with up to 30 dBm EIRP	1.0	3.0	0.8	3.0
Additional allowance per RF chain above a 2x2 MIMO configuration (e.g. for 3x3 and 4x4)	0.1	0.4	0.1	0.3
Alternative LAN technologies (HPNA, POF...)	2.0	2.5	1.5	2.0
MoCA	2.0	2.5	1.8	2.2
Powerline - High speed for broadband home networking (less than or equal to 50MHz bandwidth)	2.5	3.0	2.0	2.7
Powerline - High speed for broadband home networking (greater than 50MHz bandwidth)	2.5	4.7	2.5	4.5
PowerLine - Low speed for smart metering and appliances control	0.9	2.0	0.8	1.5

FXS	0.5	1.5	0.3	1.2
FXO	0.4	0.9	0.2	0.9
Emergency fall-back to analog telephone	0.8	0.8	0.6	0.6
DECT GAP	0.75	1.65	0.5	1.0
DECT Cat-iq	0.75	2.0	0.5	1.2
DECT charging station for DECT handset in slow/trickle charge	0.4	0	0.4	0
USB – no load connected	0.25	0.25	0.1	0.1
Built-in back-up battery	0,2	0,2	0,1	0,1
Bluetooth	0.2	0.3	0.1	0.3
Zigbee (or other low power wireless technologies)	0.15	0.15	0.15	0.15
Femto cell (Home use, RF power ≤10mW)	7.0	8.0	6.0	7.0
Femto cell (Home use, RF power 10mW-50mW)	11.0	12.0	9.0	10.0
RF modulator (TV overlay for fiber network)	3.5	3.5	3.2	3.2
Embedded handsfree system	0.5	0.5	0.5	0.5
Additional Colour Display (typically found in VoIP devices) TFT QVGA and VG	0.5	1.0	0.5	1.0