Energy Task Force

etno

ANNUAL REPORT 2012

European Telecommunications Network Operators' Association

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CLIC ON

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Foreword

The ETNO Energy Task Force was established back in 2004 by visionary members of the European Telecom Operators realizing that energy consumption and handling of CO_2 would have become an essential skill in the telecom industry. Since then the Group has organized 15 physical meetings and tens of emeetings focusing of the energy efficiency and carbon footprint with increasing interest and commitment. The Telecom industry is facing the following energy related challenges:

- The continuously expansion of network coverage and data capacity growth is rapidly increasing the total network energy needs. At the same time global energy costs will most likely continue to increase, e.g. both per unit and thus in absolute terms.
- The trends of declining revenues seems to continue, also irrespective of times of recession, and hence the energy costs, nowadays representing typically the second OPEX within the TLC Operator's balance Sheets, is increasing in relative importance
- Energy saving features of both fixed and radio access networks are becoming more frequent, however with various degrees of practical implementation. Looking forward, also the increasingly complex multi-layer networks (2G/3G/LTE and use of Small Cells) address the challenge of optimizing power consumption, especially related to (partial) shutdown strategies during less than peak-traffic hours.
- Europe has set an ambitious set of targets known as the "20-20-20-target" (20% less CO_2, 20% more energy efficiency, 20% share of renewable energy) until 2020
- Energy supply and energy efficiency are even more on the agenda of the public and of cost-conscious companies as energy prices rise and more natural and technical breakdowns have happened.
- The ICT Sector is increasingly recognised as the key sector for modern climate protection offering a whole range of possibilities to reduce energy consumption and CO_2 emissions in segments like power-, industry-, building-, automotive- and other sectors. In particular, Smart Grids and Smart Cities will represent the top priorities.

The ETNO Energy Task Force is typically focusing on three topics:

- further decrease the energy consumption of the ICT Sector by pushing engineering excellence not only for more efficient networks and data centres but also in order to reduce the customers' energy bills through less energy hungry end user equipment.
- motivate society to make use of the existing potential of Green ICT like reducing business travel and commuting, increasing the energy efficiency of logistics and buildings and offering efficient IT Services from the cloud.
- develop new solutions to increase the energy saving impact of ICT. The most recent developments in collaboration and videoconference tools are one example. Nowadays many of the operators prepare to contribute with their communication and IT skills towards smarter electricity grids allowing "presumes" to store and produce energy.

This Annual Report 2012 will show the readers the main outcomes of the activities of the ETNO ETF concerning the above topics. All the authors of this Report can be contacted and will be more than happy to provide any further information (and, why not, to welcome new members!). Because this is what the ETNO ETF is about and will continue to work on: to push energy efficiency with an open exchange on Best Practices.

Yours sincerely

Res Witschi

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Introduction

The Energy Task Force is part of the ETNO COrporate REsponsibility (CORE, http://www.etno.eu/home/topics/corporate-responsability) branch, the members of which have each signed the ETNO Sustainability Charter. By signing up to the Sustainability Charter each Signatory has freely accepted a number of commitments, recognising the importance and the value of doing business in a sustainable way.

The Energy Task Force (ETF) initiative is one such demonstration of this commitment. It was established in June 2004: since then, the ETF Group has jointly worked with the following goals and methodology.

Goals:

1. to ensure efficient energy utilisation and the reduction of environmental impacts through improved energy management.
2. to contribute to national and global efforts to reduce GHG emissions.
3. to provide opportunities to market environmental practice and demonstrate the viability of voluntary actions.
4. to share knowledge and best practice among all the Association's members.
5. to benchmark among the members and look for best practice
6. to provide all members with a recommended Energy policy
7. to put pressure on suppliers with a Code of Conduct
8. to carry out innovative pilots

Methodology:

1. To maintain a network of energy experts committed to the use of benchmarking as a means of driving energy efficiency
2. To meet 2 times per year to exchange views, share knowledge, discuss solutions, work collaboratively, etc.
3. To hold recurrent telephone conferences calls and webex meetings between F2F to track on progress and ensure completion of action points
4. To deliver continuous improvement

A list of the ETF-Meetings is listed in the Annex. The physical meetings are just a small part of the ETNO ETF activities: rather, the Group widely uses and encourages audio and video conference services.

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Example of topics covered since the creation of the Group:

Powering

- Installation of combined solar panel and wind generator
- DC and High Voltage DC Power Systems
- Technology for Fuel cells
- Use of Bio-Fuel
- Power Saver Plugs
- Purchase of renewable/green energy

Cooling

- Kyoto cooling for Data Centres
- Underground Cooling with heat exchanger (air or liquid)
- Use of Fresh Air Cooling in Central Offices, RBS and Data Centres
- Air Conditioning System Electrically Commutated Fans

Innovative solutions for energy efficiency

- Definition of ratio/efficiency metrics and energy conversion factors
- Energy Monitoring/Management System
- Use of frequency converters
- Increasing the temperature in equipment rooms
- Liquid Pressure Amplification
- Energy optimisation using switchable connector strips
- Inclusion of power management requirements in RFQ/RFP

All the network segments (Fixed, Mobile, Data Centre, Office, Customer equipment) have been covered so far; moreover, the analysis and the solution discussed are often not limited to the technical point of view, but rather include economic (ROI, PBT) evaluations.

This Annual Report 2012 is divided into two main parts:

- Part 1, showing the most relevant outcome of activities and initiatives jointly performed by the Group as a whole
- Part 2, highlighting the most interesting energy saving projects from single ETNO ETF members

Looking Forward:

The ETNO ETF has rapidly grown in size and reputation since its creation in 2004. Its main goals and activities were also communicated to:

- several standardization Bodies (e.g. ITU SG5, dealing with environment and sustainability, or ETSI EE, dealing with Environmental Engineering
- many congresses and conferences (e.g. Intelec, a worldwide telecommunications energy conference and exhibition that embraced the idea of a more sustainable way of working, using less and greener energy).

The authors wish that their effort towards the finalization of such Annual Report 2012 will bring to a greater awareness of energy efficient actions to reduce the carbon footprint of the ICT sector, as well as possible involvement of further Companies in this successful Group.

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PART 1 :

ETNO ETF MAIN ACTIVITIES AND INITIATIVES

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1. Benchmark of current power consumption of STB and HG / Routers

Following a first survey on energy consumption in 2010, a new benchmark of Set Top Boxes (STBs) and Home Gateway (HG) / routers currently in use has been carried out among members of ETNO ETF in 2012. The aim of the benchmark was to provide an overview of current state on power usage of end devices and hence to stimulate the market to provide devices with low power needs.

Power data of STB were provided for the on, standby passive, standby active and auto power down modes while for CPE data in on and low-power states have been recorded. The definition of these modes and states are according to corresponding EU CoC's. Additional features as internal hard disk drive, wireless interface as well as the different technologies have been used as criteria to partition devices in homogeneous classes, thus enabling simple and meaningful comparison of corresponding power performance. In this benchmark internal disk drive has been considered as major additional energy factor for STB while for HG/routers Wi-Fi is used as key additional factor.

The data of 38 STB and 21 HG/routers are included in current benchmark. 31 STB have been measured based on CoC for Digital TV Services. The remaining 7 STB have been tested based on CSTB VA (voluntary agreement). All HG/routers have been measured according to CoC for energy efficient broadband equipment but possibly according to different versions.

The results of the power consumption are shown separately for each power mode. In all figures the results have been sorted with increasing power consumption. For each device its date of apparition on the market is indicated. Results for STB are reported in Figure 1 to 4 for the different power modes. It appears on Figure 1 with power data in on mode that, even if exceptions occur, devices newly placed on the market show by trend lower energy consumption.

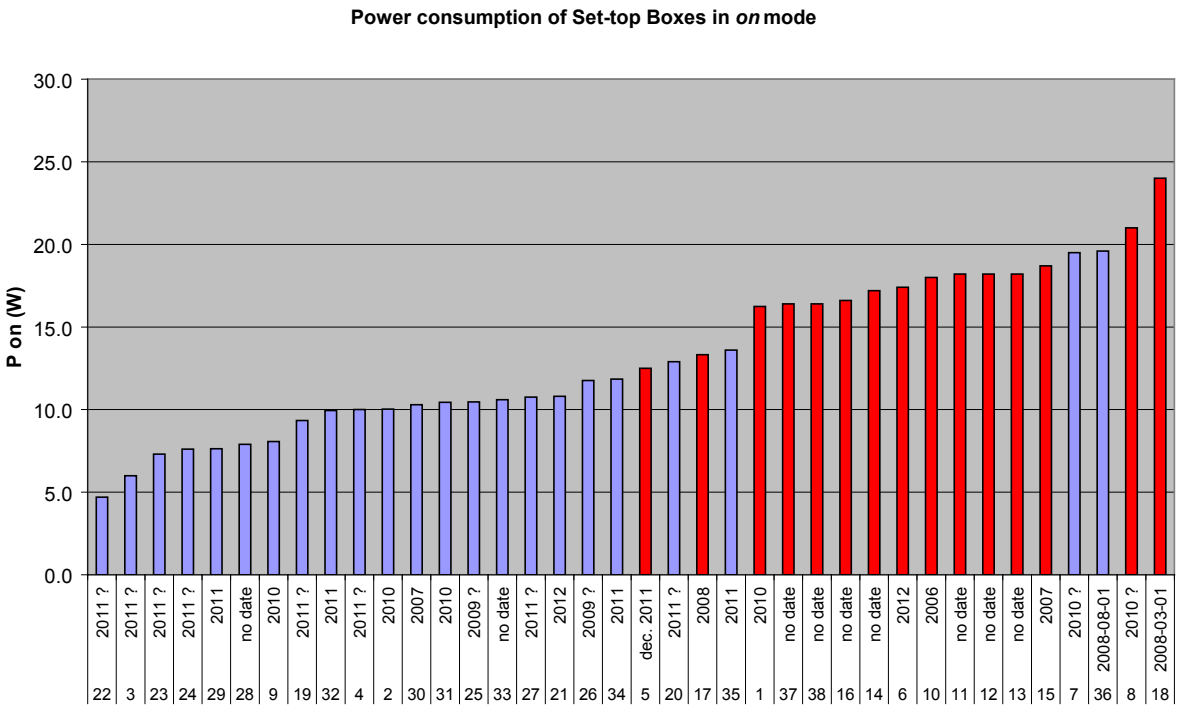

Figure 1: Power consumption of STB in on mode (red/blue columns: with/without internal disk drive).
First date of apparition of the devices on the market is also indicated

As expected, devices with additional internal disk drive consume more power. Power consumption varies by a factor 5 between the best in class and the worst case. Except two devices with quite high power needs, the power consumption in standby active mode (see Figure 2) varies moderately by a factor 2 between the extreme devices. In standby passive mode, we may observe a discrepancy between devices with very low power consumption and the rest with moderate or even very high consumption (see Figure 3)The four devices with auto power mode show power consumption below 1.5 W (see Figure 4).

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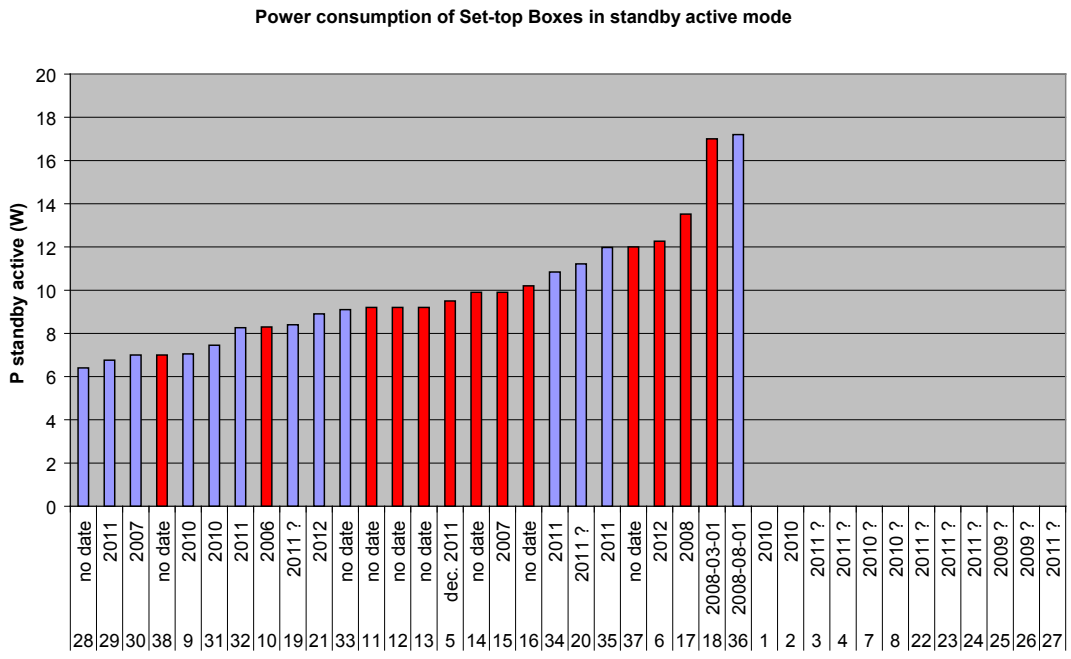

Figure 2: Power consumption of STB in standby active mode (red/blue columns: with/without internal disk drive). First date of apparition of the devices on the market is also indicated.

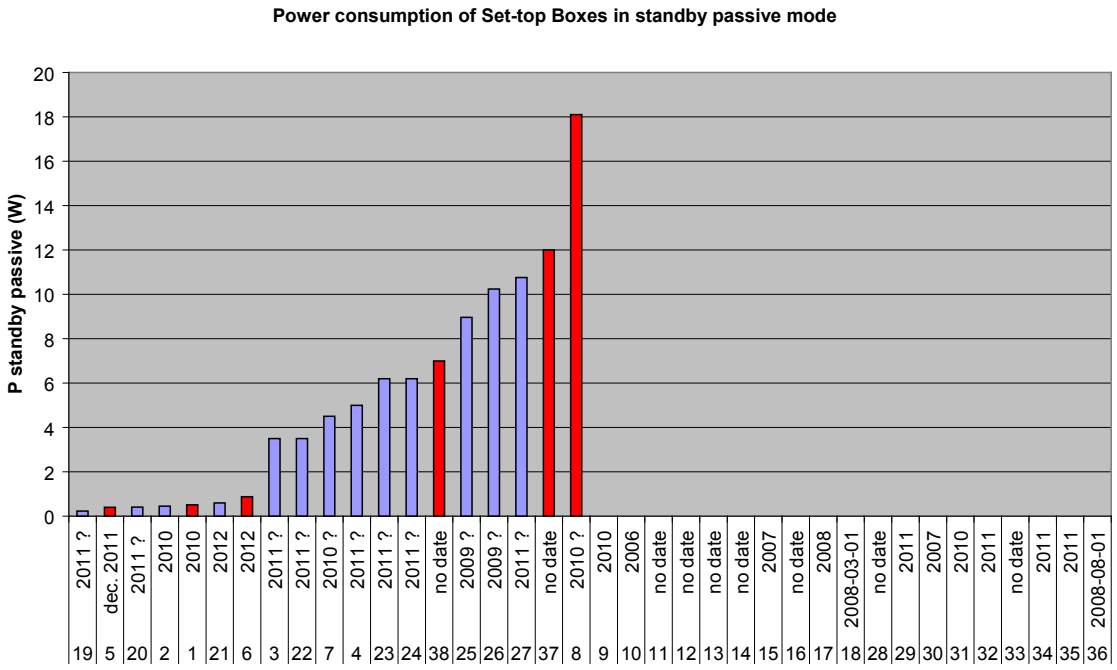

Figure 3: Power consumption of STB in standby passive mode (red/blue columns: with/without internal disk drive). First date of apparition of the devices on the market is also indicated.

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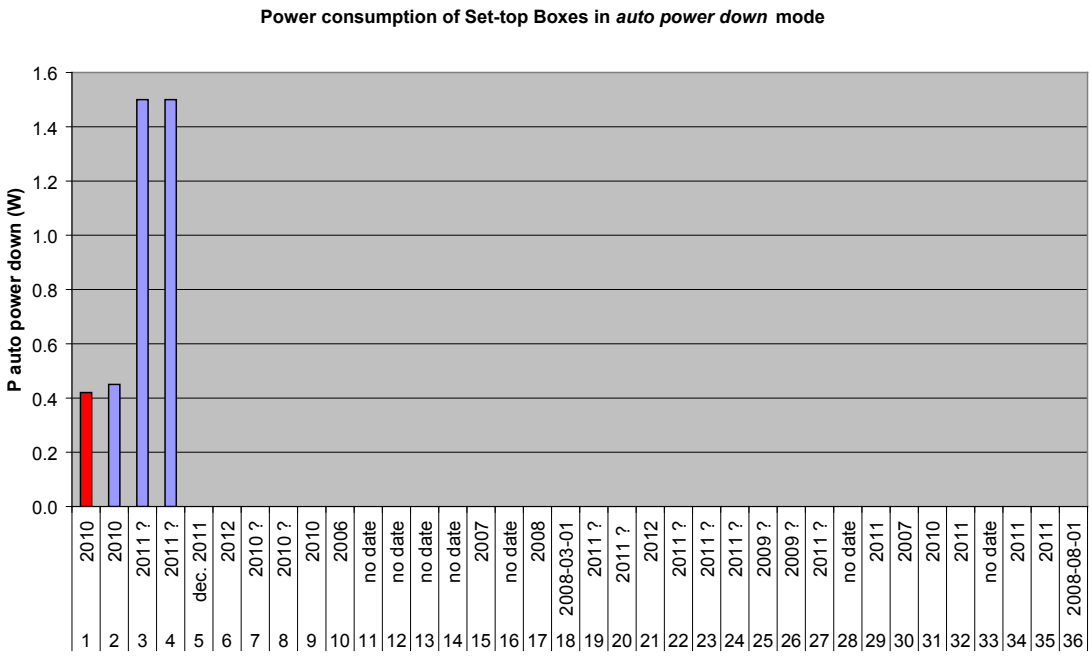

Figure 4: Power consumption of STB in auto power down mode (red/blue columns: with/without internal disk drive).
First date of apparition of the devices on the market is also indicated.

Power consumption of the HG/routers is reported in Figure 5 and Figure 6 respectively. In Figure 5, we observe a discrepancy by a factor 9 between the best in class and the worst case. Even if no date of apparition on the market is given for most of devices on the left of the graphic, a trend towards lower power needs appears. We notice no significant difference between power consumption in on (Figure 5) and low power state (Figure 6).

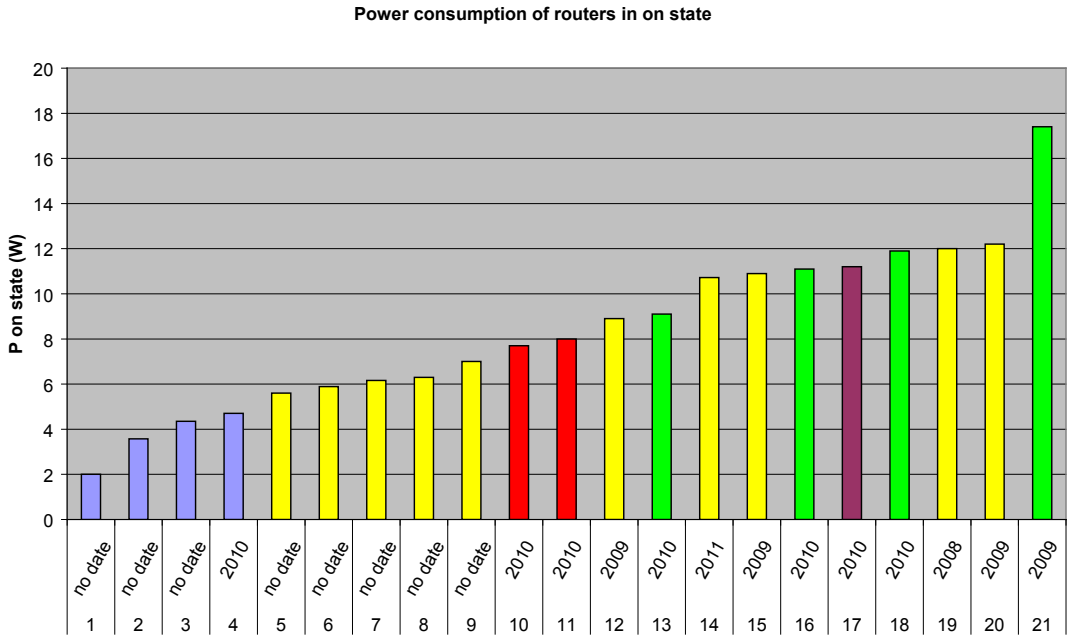

Figure 5: Power consumption of HG/routers in on state:

blue columns: ADSL, no Wi-Fi yellow columns: ADSL with Wi-Fi red columns: VDSL no Wi-Fi
green columns: VDSL with Wi-Fi purple column: Fibre with Wi-Fi

First date of apparition of the devices on the market is also indicated.

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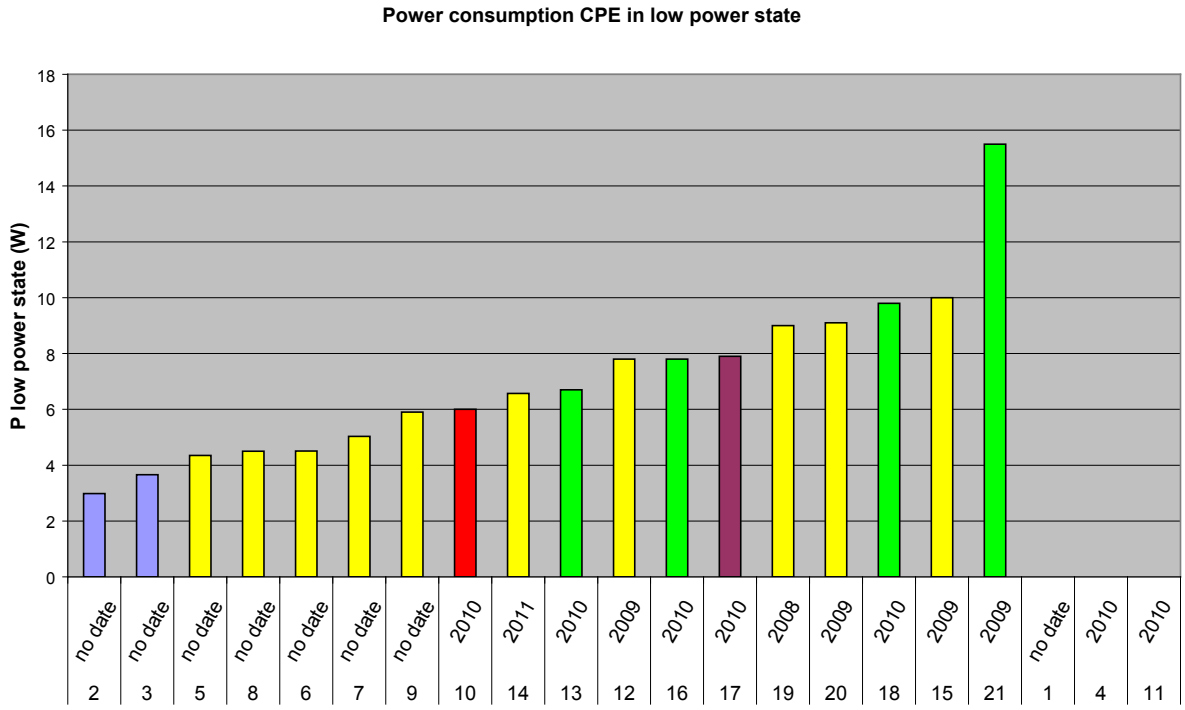

Figure 6: Power consumption of HG/routers in low power state:

blue columns: ADSL, no Wi-Fi yellow columns: ADSL with Wi-Fi red columns: VDSL no Wi-Fi
green columns: VDSL with Wi-Fi purple column: Fibre with Wi-Fi

First date of apparition of the devices on the market is also indicated.

Basically results show an improvement trend for both equipment types in all the specific power modes supported. However a quite big discrepancy appears between "best in class" and the worst case. As expected the power consumption rises with additional features and increasing bandwidth. The power consumption in standby mode for STB and low power state for HG/routers is still rather high, which should motivate manufacturers to promote solutions enabling a drastic lowering of this consumption because such modes are expected to be active over longer period of time.

It is foreseen in a next step based on these results to evaluate the yearly energy consumption (TEC) according to CoC and to refresh on yearly basis this benchmark, thus tracking progress in this field.

2. Benchmark on "Smart" services

The word "Smart" is nowadays pretty much used (and even more will be in the future!), being associated to a plethora of different services offered towards different stakeholders (just think about Smart Grid, Smart Cities, Smart Monitoring, etc.). This sometimes can generate confusion and possible misunderstandings on the real features, goals and beneficiaries of the services. Therefore, starting from this consideration, the ETF members decided to perform a benchmark aimed at classifying the various "smart" services that each Operators is currently offering or planning to offer. First of all, it was decided to create two macro clusters, one called "Smart Internal", (that is services created with the aim to improve the efficiency of the Operator itself), and the other defined instead as "Smart offering" (including all the services provided to external customers). As far as the "Smart Internal" cluster is concerned, it was divided into three main subtopics:

- Electrical Energy Metering/Control, investigating the remote monitoring and control (both passive and active) of Central Offices (CO), Data Centres (DC), Radio Base Stations (RBS) and offices
- Other Energy Metering/Control (e.g. natural gas, water, air conditioning/heating, etc)
- Minute reserve market/Virtual Power Plant

The charts reported in Figure 7 show the results of the benchmark on "Smart Internal" services as far as the Electrical Energy Metering/Control subtopic is concerned. More precisely, for each of the 8 item identified (remote monitoring of CO, DC, RBS, offices, each of them considered either as "simple" passive monitoring or rather as active, including therefore some type of remote load control – e.g. change parameters of cooling systems) a specific weight has been assigned. Such weight has been set equal to:

- 0 in case the specific item is not considered
- 1 in case the specific item is currently planned
- 2 in case the specific item is currently implemented in some limited trial
- 3 in case the specific item is already widely implemented

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As it can be seen, the level of implementation of the above mentioned 8 item is quite different depending on the various Operators. The two items more widely implemented are respectively the passive remote monitoring of Central Offices and Data Centre. This is quite normal, considering that fixed networks are responsible for the greater part of the total energy OPEX of an Operator. On the other hand, Data Centres are progressively increasing their energy consumption due to increasing fixed/mobile BB services and Cloud Computing services. No need to say that such monitoring is applied starting from bigger sites (e.g. energy consumption greater than 100MWh or power consumption greater than 100kVA). Of course the active monitoring is currently less mature: anyway, some trials have been started especially concerning offices and Central Offices

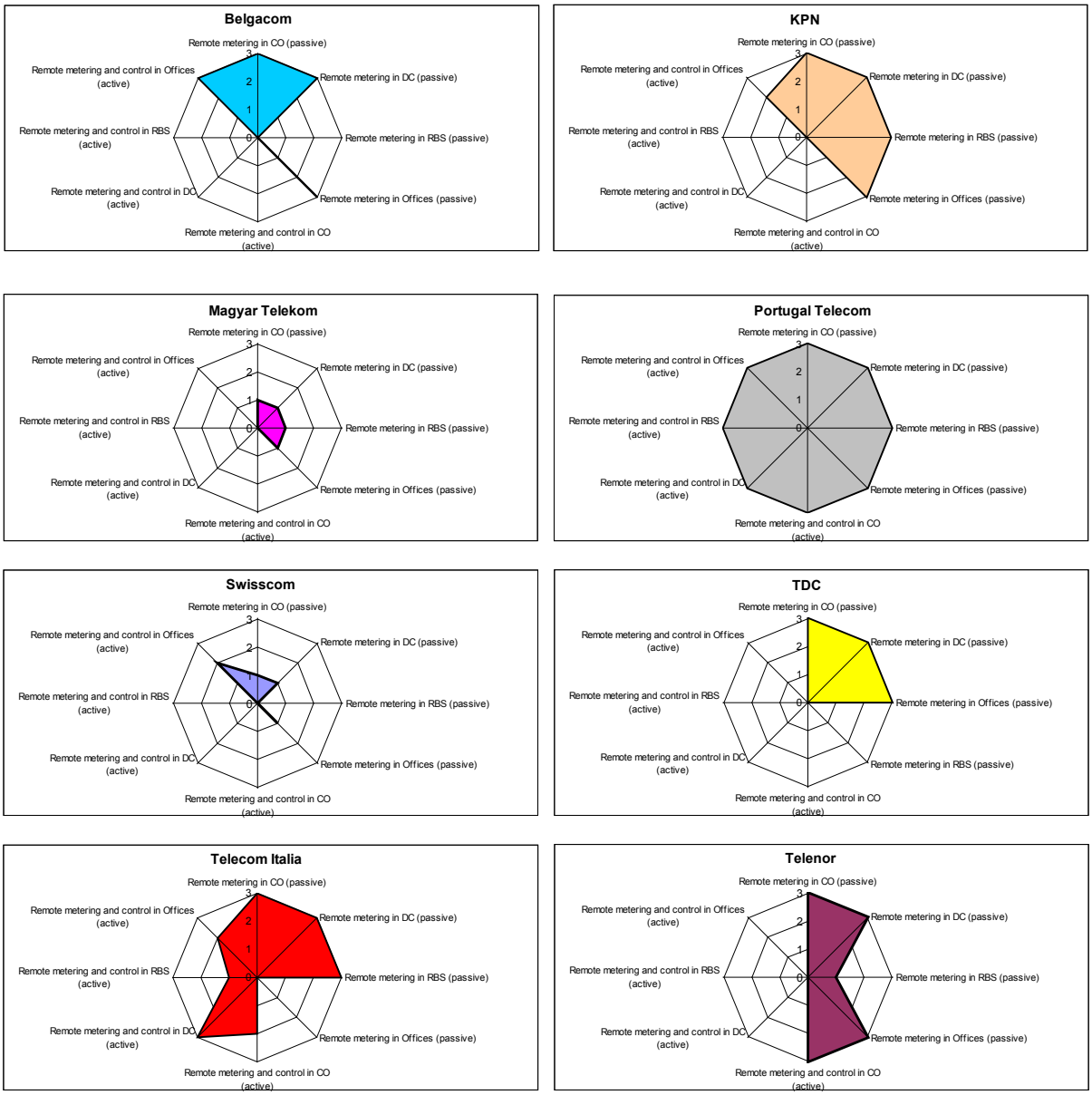

Figure 7: results of the benchmark on "Smart Internal" services

Moving to the "Smart offering" cluster, it has been divided into four main subtopics:

- Smart Grid services for Utilities (Electricity, gas, water, …), which in turn have been classified into services at the level of the Utility's distribution system (Low Voltage) and services at the level of the Utility's transmission system (Medium Voltage - High Voltage). The services dealing with distribution system have been analysed investigating the following main features: increase of customer awareness, distribution system automation, selective customer's load control, managing distributed generation, type of communication from meter to concentrator (e.g. Zigbee, Mbus, Powerline) and type of communication from concentrator to Energy Data Management (e.g. GPRS/3G, DSL, Fibre,..). on the other hand, services dealing with transmission system have been studied analysing the following features: measurement of phase and other advanced measurements, flow control devices, loss optimization and distributed and autonomous control
- Smart Grid services for residential Customers, with particular focus on type of information/warning communicated from the meters through the customer GUI, time-of-day and time-of-use meters, and load management (control of customers' loads). The technology for communication has also been investigated, analysing the communication from meter interface to concentrator/energy service portal (e.g. Zigbee, DSL, Fibre, GPRS/3G, Powerline) as well as the communication from meter to Energy Data Management (e.g. DSL, Fibre, GPRS/3G, Powerline)

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- Smart Grid services for Municipalities, among which the following categories have been accounted: services on street lighting systems/street light automation, water supply and waste water systems, GPL/gas metering, traffic management systems, public/transport authorities, energy efficiency/ saving and garbage management
- Smart services for other Sectors, including for example fleet management, M-Health, M-Banking, logistics and dematerialization

Also for the "Smart offering" cluster four different weights have been assigned, from 0 to 3, depending on the level of maturity of the service offered (0 = service not offered, 1 = service planned in the near future, 2 = service on trial, 3 = service online/provided). The charts reported in Figure 8 show the synthetic results of the benchmark. According to the chosen classification, the "other" services got the highest average score (= level of maturity), followed by smart grid services towards residential customers. In particular, among the "other" services, the M-Health/E-Health (including SOS/telealarm towards relatives/neighbours in case of emergency, exchange of medical data and imaging via secured WAN, wearable sensors and communication devices to monitor cardiac patients 24/7 and alert medics on extreme values, etc) seems to be very promising, together with e-book web store and music box/streaming music services. Finally, concerning the communication technology for smart grid services towards residential customers, currently there's no particular "winner"; rather, according to specific Operator and specific scenario, all the existing technologies have been accounted (DSL, zigbee, fibre, GPRS/3G/CDMA, WiFi, etc.)

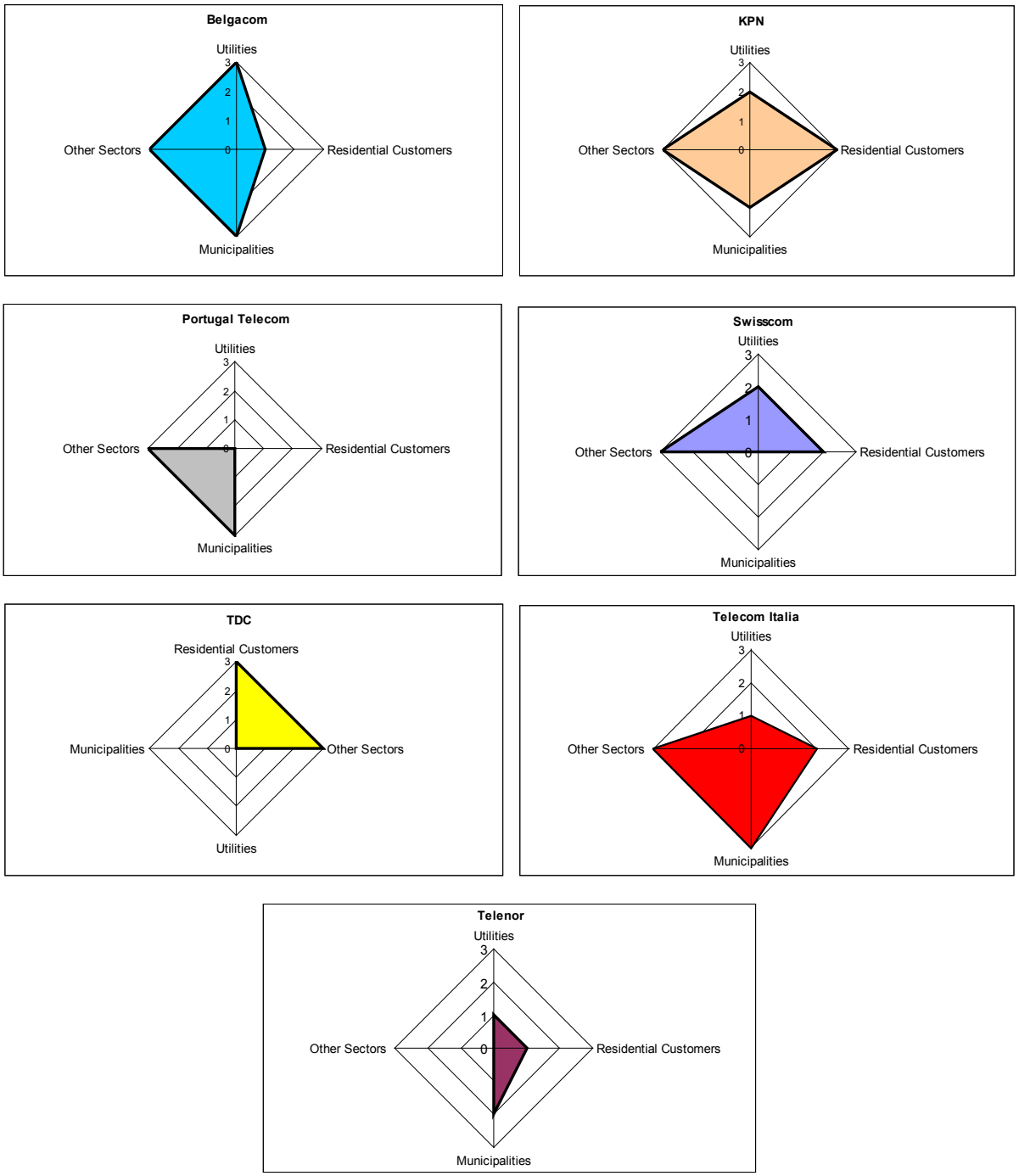

Figure 8: results of the benchmark on "Smart Offering" service

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3. Benchmark on Energy Management Systems

Resource efficiency in all areas and particularly with regard to energy is the hot topic of our time. There are good reasons for this such as reducing costs, protecting the climate and environment, having sustainable business operations, improving one's image as well as utilizing statutory relief.

ICT-related energy consumption on all levels (e.g., for data centers, fixed/mobile networks as well as Home and Entertain) is growing continuously worldwide. ICT generally provides the opportunity to significantly reduce or at least slow down energy consumption in many industry branches and consumer sectors (see also the "smart 2020" study). However, at the same time all network operators and ICT service providers are requested to reduce their own carbon footprint and to lead the way as innovative role models.

The sustainable improvement of energy efficiency at ICT network operators requires the introduction of a systemic energy management system. The relevant guidelines and standards, such as ISO 50001, stipulate the basic structures with POLICY, PLAN, DO, CHECK, ACT and provide an excellent framework for the installation of an energy management system at ICT network operators as well (see Figure 9).

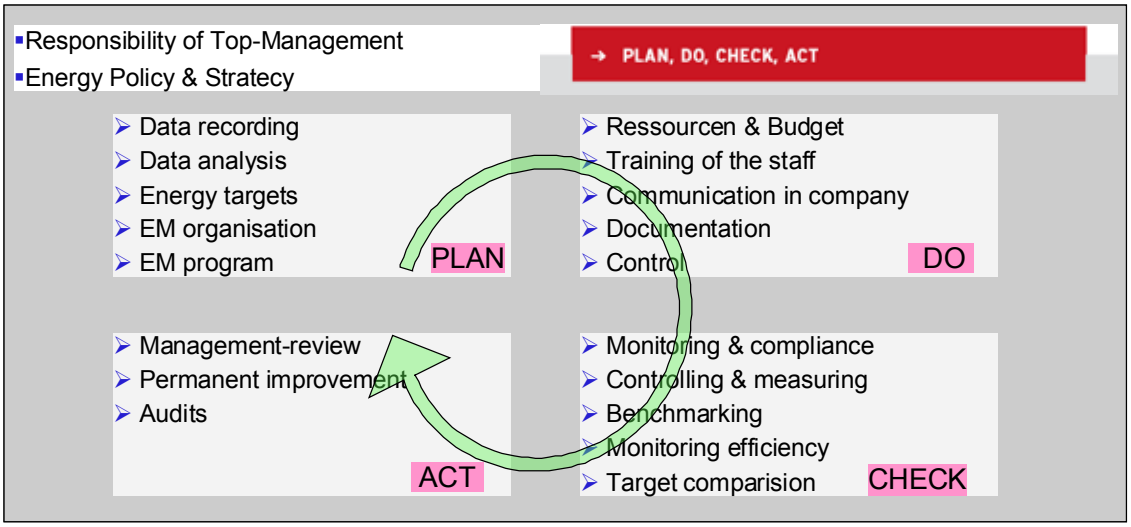

Figure 9: Plan-Do-Check–Act scheme for Energy Management

It is shown here which processes must always be installed and which parameters recorded to be able to operate permanent energy and environmental management. The task of the ETNO working group was to design a best practice specifically for ICT network operators and DC operators for the introduction and permanent operation of such a system and to obtain the current status from the members. In contrast to industrial companies and complex administrations, the energy consumption of the ETNO members is spread over a variety of network nodes and objects, whereby energy is mainly used in the form of electricity. This requires special designs for all sectors of the management system, which have been defined in the best practice below.

Best Practice on POLICY: Responsibility of TOP-Management & Energy Policy

The energy policy is defined und written down by the TOP-Management
Scope and limits of Energy Management System (EnMS or EMS) were determined
Energy policy(or environmental policy if energy included) has been communicated to all are involved
Commitment of the top management to continuous improvement of energy efficiency
An Energy Manager or Environmental Manager) was appointed, he reportes to TOP-M
ISO 50001 or equivalent norm (as e.g. ISO14001) has been established Required resources (staff, specialized skills, budget) are provided by TOP-M
Reviewing the EnMS-(or EMS) Organization at regular intervals by the Top-M

Best Practice on PLAN: Organization of Energy Management

A leading team of energy efficiency or an environmental team in all the relevant areas is established
Leading the team by a fulltime energy manager or environmental manager
A main energy data system with all energy-related data is available and is updated continuously
Energy consumption- and cost-data are analyzed regularly for vulnerabilities
Energy-efficiency keys are defined (PUE, kWh/m2, CoP, ...)
strategic long-term targets are defined (PUE improvement, reducing energy consumption, ...
realistic operational targets are defined and included in a Balance scorecard
Optimization programs are set up (business case with actions, costs, reduction, amortization, schedule)
An Energy management program or environmental program summarizes and combines all activities together

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Best Practice on DO: Realization of Energy Management

Resources for implementation of the programs are available (budget, staff, ...)
Responsibilities for implementation are identified
Implementation of the measures carried out in project form
Sensibilisation and awareness of employees is formed
Training is provided as part of staff development
Communication of EnMS or EMS took place in the company
Responsibility for documentation is combined with QMS, EMS, EnMS
Integrating of energy efficiency in all processes (planning, design, procurement, operation, maintenance, sales, quality ...)
Responsible for planning and implementation will be conducted on energy target

Best Practice on CHECK: Monitoring & Check of Energy Management

continuous monitoring and recording of energy consumption and energy factors
Summary of significant energy consumption in the form of key values
Target-comparison of actual and expected energy consumption
For larger deviation --> analysis, documentation and measures for solution
Creating benchmarks of same energyclusters for detection of potential-savings
Annual monitoring of EE for Powering and Cooling with PUE values for CO
Monthly monitoring of EE for P & C PUE for DC
Monthly monitoring of peak-load performance in measured consumption points
Monitoring and evaluation of compliance of specification, guidelines, legal effects

Best Practice on ACT: Permanent improvement of Energy Management System

Make annual internal audits to monitor the EnMS or EMS
Ensure, that the Top-M is checking the EnMS or EMS regular
Make an annual energy report
Integrate the EnMS or EMS in your normal controlling process

Status of the introduction and operation of a systemic energy management system:

So far, a systemic energy and environment management system (EnMS) has only been rolled out and operated at a small number of network operators. Five larger network operators confirmed the aforementioned check points as best practice. The reasons for the hesitant roll-out of such an EnMS are bound to include the high workload/cost but also the need to adjust many data recording processes. Presumably, lack of management awareness of the benefits for a company of rolling out such a system is another reason. Real experiences have shown that the costs of such a system are recouped by the companies due to the permanent savings achieved. Furthermore, transparency of the company's energy situation is significantly increased so that it is possible to draw up risk strategies with regard to costs and availability, identify and meet statutory provisions and make use of the opportunities offered by the national legislator and the EU. All in all, the roll-out of an EnMS creates a win-win situation for the company, the employees and the environment.

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4. Benchmark on Fuel Cells

Continuity of service on fix, mobile, internet networks need a high availability of power for supplying the equipment dedicated to those services. So, energy back-up is usually needed to prevent short or long grid outage. This back-up is commonly covered with batteries and fossil-fuel powered generators. The choice or the addition of those techniques depends of the power consumption of the equipment, back-up time, time for accessing to the site, CAPEX and OPEX.

Owing to continuous oil cost increase and needs to use techniques with still lower environmental impacts, Telecom operators are still looking for new back-up solutions for grid connected but also for off-grid sites in association with photovoltaic or wind systems. Fuel-cells (FC) can answer to those considerations for limited power ranges.

Fuel cells are electrochemical devices that convert hydrogen into electrical energy with low environmental impacts (waste is only heat and water).

Numerous FC technologies are available but mainly PEMFC (proton exchange membrane FC) are suitable for back-up as it works at medium temperature (70°C -80°C) and can provide its energy in a short-time (a few seconds to a few-minutes). The main components of the fuel cell systems are the followings:

- FC stack which is composed of cells assembly, heart of the system
- FC auxiliary equipment (air blower, water pump, power electronics, …)
- Start-up batteries or supercapacitors
- Hydrogen production: directly from high pressure cylinders or from methanol with reforming process or from water with electrolyze process

QUESTIONS	ANSWERS					
	ORANGE-FT	TELECOM ITALIA	MAGYAR TELEKOM	SWISSCOM	TELIASONERA	TELEFONICA
Is your company interested by using Fuel Cells (FC)?	Yes	Yes	Yes	No, We have a rather well meshed and reliable electricity network in Switzerland and therefore only reduced back-up time is required even at remote sites	Yes	Yes
If YES:						
for which use (back-up, permanent production, etc)	For back-up mainly, for temporary power supply (waiting grid connection) and possibly for combination with solar system on remote sites	Same as Orange-FT. Under study the possibility to feed an off grid RBS station with photovoltai+eolic+fuel cell with on site autoproduction of H2 by means of an electrolyzer	back up		Mainly for back-up.	Back up mainly with combination of hybrid systems for off grid systems too
for back-up, is it for battery and/or genset replacing?	Batteries or genset if P>5 kW	Mainly battery replacing	battery and mobil diesel generator		Both battery and genset replacement depending on power and back-up time requirements.	Battery/Gensets
for which power range?	From 2,5kW to 30 kW	From 2,5kW to 30 kW	5 kW		From approx 0,5 to approx 10 kW	2 to 15 kW
Have you experimented PEM FC in labs and/or on network sites?	Yes, both in labs and on network site	Yes, currently on network site	only on network site		Yes. Only network sites	Yes, both in labs and on network site
If YES:						
how many FC have you used?	3 in labs, 1 on site (waiting grid connection)	250 on site in operation since 2009	13 on site in operation		7 on site in operation since 2005-2008	We have tested 8 PEM fuel cells. Actually dismanteled. High OPEX needed for operation on network with H2 storage
which power ranges?	250W - 2,5 kW - 5kW	3 - 6 - 12 kW	5 kW		1 to 5 kW	2,5 kW - 5 kW
which fuel (H2 cylinder, methanol, etc)?	H2 cylinder, methanol with reformer, water with electrolyser	Mainly H2 cylinder; some water with electrolyser	H2 cylinder (changeable and on the spot fillable), methanol (HydroPlus)		H2 cylinder, methanol/water with reformer.	H2 cylinder/Methanol/Water with electrolyser
what is your main technical conclusions? Which are the main technical issues that need to be solved?	Some problems on sensors and leakage, reliability shall be improved. Another issue is the choice of the best suitable fuel	The overall performance of the 200 FC has been quite good. In some cases we encountered issues with short and frequent mains' black-out, due to difficulties in the FC start-up. Such issues have been solved by the Vendor	proper housing of PEM engine (technical) and logistics of H2 (not technical)		Start up reliability needs to be improved. Reliable bridging solution needs to be found. When the FC has started and taken load, the reliability is high. H2 bottles are heavy and large.	Some problems with workers and explosion risk. Good performance for back up. On testing process for off grid aplications with solar and wind.
Is there the need to install a traditional VRLA battery in order to support the FC bridging time (start-up)?	Yes	Yes	Yes		Yes (or similar solution - other types of batteries or super capacitors.)	Yes. Telefonica install ion-lithium for starting the battery
do you plan to start/continue PEM FC roll-out within the next 2 years, how many/year?	Not decided due to high cost and fuel logistics	Yes, further installations are planned in the next years	No decision		No. Not decided due to high cost. Fuel logistics in critical situations (large scale electricity grid failures) not solved.	Not decided yet

CONTENT

QUESTIONS	ANSWERS					
	ORANGE-FT	TELECOM ITALIA	MAGYAR TELEKOM	SWISSCOM	TELIASONERA	TELEFONICA
If NO:						
do you plan to start an experiment within the next 2 years? If no, is there a special reason?					Plans on small scale installations for testing fuel logistics, maintenance training and further reliability test.	
What is the average operating temperature for Fuel Cells?	-20 ÷ +55°C	-20 ÷ +45°C	-40…+50 celsius		-20 ÷ +45°C	-20 ÷ +55°C
What is the average lifetime for Fuel Cells?	10000h	Operative stack lifetime of 10,000 hours.	MTBF 40000hours for fan of engine		Approx 10,000 hours. Different lifetime figures from different suppliers/manufactures.	10000h
Have you experimented other FC technologies (SOFC, MCFC, etc)? If YES, what are your main conclusions?	No	No, only PEM	only PEM		No, only PEM.	Only PEM. Actually studying MCFC
Additionnal comments		«TI has a strong interest on fuel cells.The main reasons are related to the need of keeping ISO 14001 and a good ranking in the Dow Jones Sustainability Index, considering that Fuel Cells replace the pollutant lead acid batteries.				

Table 1: current situation of Fuel Cell implementation among the ETNO ETF

As FCs are seen as a promising technology and could become commercially viable solutions for some applications such as telecommunications, a benchmark has been set-up between European telecom operators.

CONTENT

The Table 1 shows a current statement of FC use, which is mainly on experiment steps with no roll-out decision except for Telecom Italia which has a voluntary FC deployment policy in order to stick to its environmental commitments.

To be mentioned also, a foreseen assessment by Telefonica on permanent power production with MCFC high temperature technology (Molted Carbonate FC).

As a conclusion, the position of European Telecom Operators is to watch the further FC evolutions mainly in terms of CAPEX. As this technology is in a permanent improvement on technical and cost aspects it will be worth to still share experience between ETNO ETF members.

5. Benchmark on Fresh Air Cooling (FAC) Solutions

The energy consumption for cooling of Central Office and smaller sites like BTS with cooling load < 20 kW depends on the required room temperature and first of all on the used air cooling system. Generally speaking, European network Operators adopt a cooling strategy according to ETSI climate class with server room from 30°C to 40 °C.

Some Operators are using till this day cooling equipments without free cooling as well as operate by room temperature below 25°C. By comparison of these inefficient systems to optimised "free and fresh air cooling systems" (FAC) the energy consumption is <10% with FAC. The ETNO Energy Task Force has analysed in 2012 different solutions of fresh air cooling systems. The results and some examples of the different solutions are reported in the Table 2 and in the following figures.

Fresh Air Design	Peak Cooling System	short describtion of System	CAPEX (Capital) per 1 kW-cooling load	COP	Energy consumption per 1 kW cooling load	Elec. Rate	PEAK-Load Cost per 1 kW-cooling load	Opex per 1 kW-cooling load	Total Cost Capex & Opex per 1 kW-cooling load	Enviremetal Aspects	best solution for
			(€/kW)		kWh/kW*a	€/kWh	€/kW*a	€/kW*a	€/kW*a		(kW-ICT-Load)
Referenz	DX	Air condition with 100% compressor cooling without free cooler	1000	3	1200	0,15	25	205	355	ref. Fluid; CO2	
SwissCom-Mistral	no	1or two fan for exhaust air, no fan supply air underpressure in operation room	1500	45	195	0,15	0	29	254	no refrigeration Fluid; no water	<100
PASM-(Mistral)	concrete loading at night	1or two fan for exhaust air, no fan supply air underpressure in operation room	1500	58	151	0,15	0	23	248	no ref. Fluid, no water	<20
PASM-Water	fresh water	1 fan for supply air overpressure in operation room	1250	43	204	0,15	6	37	224	water	>10
PASM-Dx 4engy	DX	1 fan for supply air overpressure in operation room	1000	33	265	0,15	25	65	215	ref. Fluid	<8
PASM Dx-WKT	DX	1 fan for supply air overpressure in operation room	1500	37	237	0,15	25	61	286	ref. Fluid	<50
TI-Adiabatic	adiabatic recooler	fans extract exhaust air, fresh air enter for underpression, adiabatic process decreases the incoming air temperature underpressure in operation room	1000	50	175	0,15		26	176	water	<30
Belgacom-(Mistral)	concrete loading at night	1or two fan for exhaust air, no fan supply air underpressure in operation room	1246,5	40	219	0,15	0	33	220	no water, no ref. Fluid	< 40
KPN-Dx	DX	Downflow airco unit with direct free cooling module (in three versions: 10, 20 or 40 kW indoor units) Figures are given based om 20 kW version	2000	66	133	0,15	0	20	320	ref. Fluid	< 40

Table 2: ETNO ETF Benchmark table on FAC

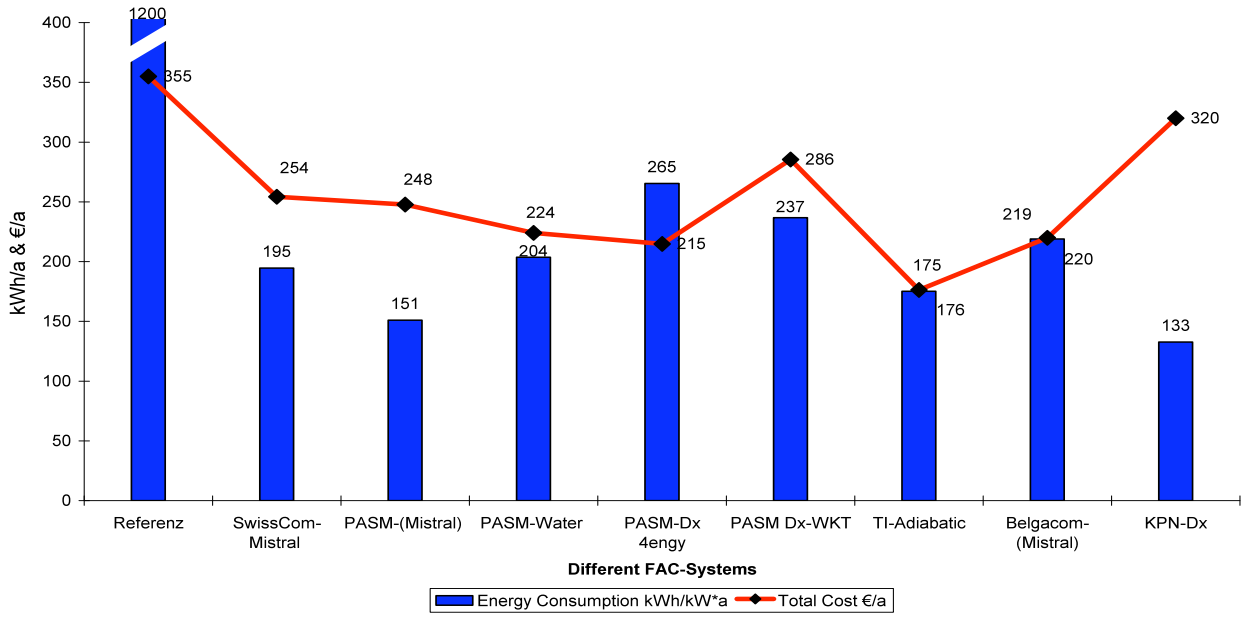
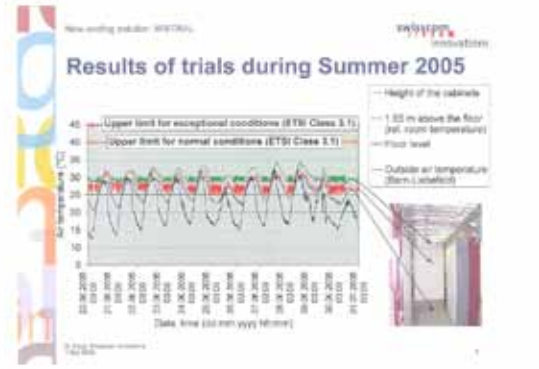


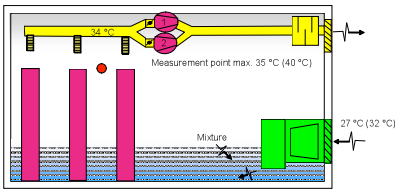
Figure 10: Total Cost and energy consumption per year and per kW cooling load

CONTENT

a) Swisscom System-Mistral



b) PASM System "Mistral"

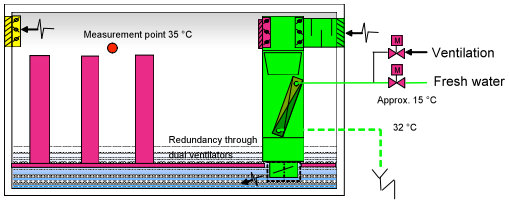


- No compressor cooling
- Control: Ventilator 1: IN 28°C / OUT 25°C
  Ventilator 2: IN 33°C / OUT 30°C

Only suitable for climate regions where outside temperatures of max. 33 °C occur. The permitted room temperature of 35 °C can be kept to in these climate regions. If outside temperatures of > 33 °C occur over a lengthy period, the max. permitted room temperature of 40°C required in accordance with climate model ETS 300 cannot be complied with. Incoming air temperature = outside temperature (no incoming air temperature rise), cooling load up to approx. 10 kW.

Power & Air Solutions

c) PASM System freshair/freshwater

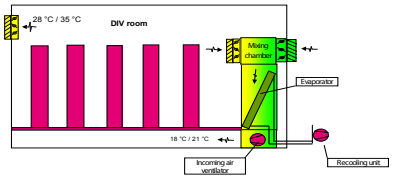


- Without mechanic cooling maschine
- Regulation: Pure outside air system with outside temperatures of up to approx. 27°C
  Combination system with fresh water as of outside temperatures from approx. 27-34 °C

Also suitable for climate regions in which outside temperatures of up to max. 36 °C occur. The room temperature at the measurement point may be kept below 35 °C by free cooling for 90 percent of the time. In the remaining time, the room temperature can be kept permanently under 35 °C by additional cooling (cooling with fresh water). Incoming air temperature rise possible due to mixing with recirculated air. Cooling load of up to approx. 20 kW.

Power & Air Solutions

d) PASM System Dx (1)



- Central (cold water) or local (direct heat exchanger) cooling; outgoing air via pressure relief damper; little space required in engineering room; CAPEX savings and substantial energy consumption reductions are possible depending on the local situation; different climate models can be covered, power spectrum of 14 – 54 kW per device, very high cooling performance possible due to modular structure

Power & Air Solutions

e) PASM System Dx (2)

Device view with cooling unit

Air passage principle

Outside air

- With mechanic cooling sytem
- Regulation: Pure outside air system with outside temperatures of up to approx. 27 °C
  Mechanical cooling as of outside temperatures of > 25 °C

Innovative, maintenance-free filter system (but only G4 guaranteed), very low investment, price of device approx. EUR 3,800; low annual energy consumption (approx. 2000 kWh) with approx. 8 kW cooling performance;

Power & Air Solutions

f) Telecom Italia EFFC

Extraction Full Free Cooling (EFFC)

Free Cooling techniques: uses the external air to cool the room temperature

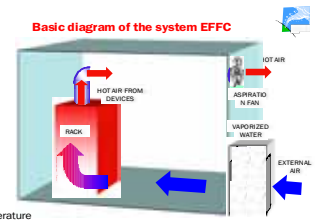
Adiabatic Free Cooling: if necessary the external air is cooled passing through vaporized water (possibility to force a decrease of the temperature of 4 - 6 C depending on the humidity)

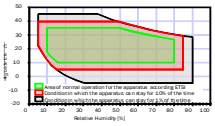
Full Extraction of the apparatus hot air directly over the racks

The quantity of air necessary to cooling a room by free cooling is about 400 m³/h for each kW of power installed

The purpose of the system is to keep the room temperature within the limits set by standard ETSI EN 300 019-019-1-3 v2.2.2

Basic diagram of the system EFFC





Low capital, maintenance and energy costs (capital costs reduced by a factor 3 to 4). Typically cost for a plant in a middle Central Office (30 kW): 25 K€.

Energy saving of 80-90% in respect to the traditional systems (estimated average over a year, test plant installation)

Reduction in CO2 emissions of 80-90%

Maintenance costs are extremely low (replacement filter inlet, typically once a year, maximum two)

TELECOM

g) KPN fresh-air-System

kpn

KPN DX2FC

Average ambient temperature in The Netherlands is: 10,9 °C

>26°C	100 hours (1.2%)
>18°C and <26°C	930 hours (10,6%)
<18°C	7730 hours (88,2%)
	=========
Totaal 24 hours x 365 days =	8760 hours (100%)

Setpoint supply air DX Precision-airco: 18C
Setpoint 100% compressor operation (DX): >26C outdoor temp.

Result:

- **At least 7730 hours / yr 100% free cooling**
- **Only 100 hours / yr 100% compressor cooling**

Figure 11: examples of Free Cooling implementations among the ETNO ETF members

CONTENT

6. Benchmark on GHG Reporting with focus on calculations of savings from the use of Green ICT

The Smarter 2020-study from Boston Consulting Group and Geri shows, that the ICT industry can help saving 16.5% of the world's green house gas emissions by 2020. In their greenhouse gas reporting telecommunication companies have been focussing on their scope 1 and 2 emissions only in the past. While the emissions from cars, buildings and the use of electricity are certainly important, the savings from the use of ICT services, but also other aspects such as commuting or the manufacturing and the electricity consumption of telecommunication devices were not considered.

In this benchmark we asked in a first step what sort of emissions were reported by our members. According to the GHG standards Scope 1, 2 and 3 emissions were asked. In Scope 3 we chose from the 15 possible categories only those who seem to be the most relevant:

The emissions in all categories are usually measured in CO2-equivalents standing for all the greenhouse gas emissions from a certain activity.

Topic	GHG Standards	Description
Buildings	GHG Standard Scope 1	CO2eq emissions from the use of buildings (heating).
Cars	GHG Standard Scope 1	CO2eq emissions from the use of cars (fuel).
Electricity	GHG Standards Scope 2	CO2eq emissions from the use of electricity in the company for network, data centers, etc.
Business travel	GHG Standard Scope 3 Category 6	CO2eq emitted from trips for business reasons using airplanes, cars or the train
Commuting	GHG Standard Scope 3 Category 7	CO2eq emitted by travelling to work by car, train, bus,
Third party deliveries / Purchased Goods and Services	GHG Standard Scope 3 Category 1	CO2eq from manufacturing of the goods and services purchased by the company such as mobile phones and other end customer devices, network equipment, etc.
Use of electricity by end-user equipment	GHG Standard Scope 3 Category 11	The CO2-emissions of electricity used for e.g. routers, setup boxes, mobile phones etc.
Savings from Green ICT	GHG Standard Scope 3 Category 11	Savings of CO2 reached by using Green ICT services such as videoconferencing or home office services.

Table 3: Overview of the GHG reporting categories covered in this benchmark

Six telecommunication companies were participating in this benchmark. There are Cable&Wireless, KPN, Telecom Italia, Telia Sonera, Telenor and Swisscom who provided data. Table 4 reports the overview of the reporting activities of these companies in the GHG reporting categories mentioned in Table 3:

Operator	Build-ings (CO2)	Cars	Electricity	Bus-iness travel	Com-muting	Third party deliveries	Use of end-user equipment	Savings from Green ICT
Scope	1	1	2	3	3	3	3	3
Cable&Wireless								
KPN								
Swisscom								
Telecom Italia								
Telia Sonera								
Telenor							*	*

* Telenor has calculations available for the interested customers.

= systematic external reporting = reporting available = reporting planned = no reporting

Table 4: Benchmark on GHG categories reported by telecommunication companies (End of 2011)

Discussion

The benchmark shows that all telecommunication companies report systematically on Scope 1 emissions from buildings and cars. All companies but Swisscom also report on Scope 2 emissions from electricity.

CONTENT

In Scope 3 only 50% of the companies (3 out of 6) were reporting systematically. The most often reported category is business travel. The emissions from commuting are reported from two companies.

Most of the other companies have data available on business travel and commuting but do not report them systematically.

All the companies have planned to report on Scope 3 emissions from Third party delivering, the use of end-user equipment and the savings from the use of Green ICT services. This shows that the product related emissions become more important.
The main reason for not having any systematic reporting yet in these categories is the uncertainty about how to calculate these emissions. A GHG standard for the calculation of emissions from the ICT industry will only occur in its final version in 2013. The GHG standard for Scope 3 emissions itself was still quite new in 2011.

Outlook

A finnish telecom company named Elisa gives an outlook on how savings from Green ICT services can be reported. Their environmental report is mainly focussed on this topic. It can be found on the internet:

http://corporate.elisa.com/corporate-responsibility/environmental-responsibility/ "

Elisa went a pragmatic way to calculate the savings from the use of Geen ICT service. Their calculations were also verified by PWC as an external company to increase their credibility.

Figure 12 and Figure 13 report some examples of the savings that were reached with the services in the first half of 2012. The services taken into account are virtual conferencing, mobile work (in blue in the first graph), computer rooms as an efficient data centers service, cloud services, reuse of products such as PCs and mobile phones and finally electronic invoicing instead of paper bills.

This is a first step to give visibility to the savings possible and promised in the Smarter2020-report.

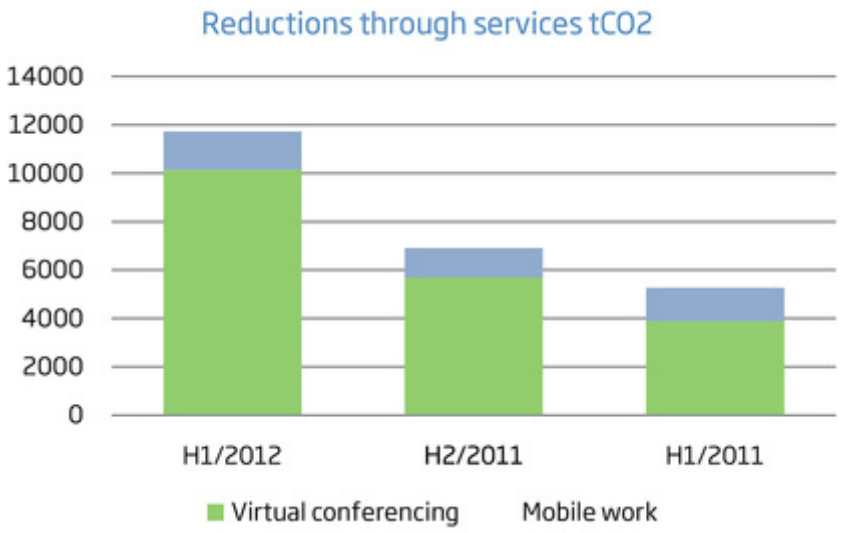


Figure 12: Reductions through ICT services Virtual conferencing and Mobile work in 1H/2012 at Elisa

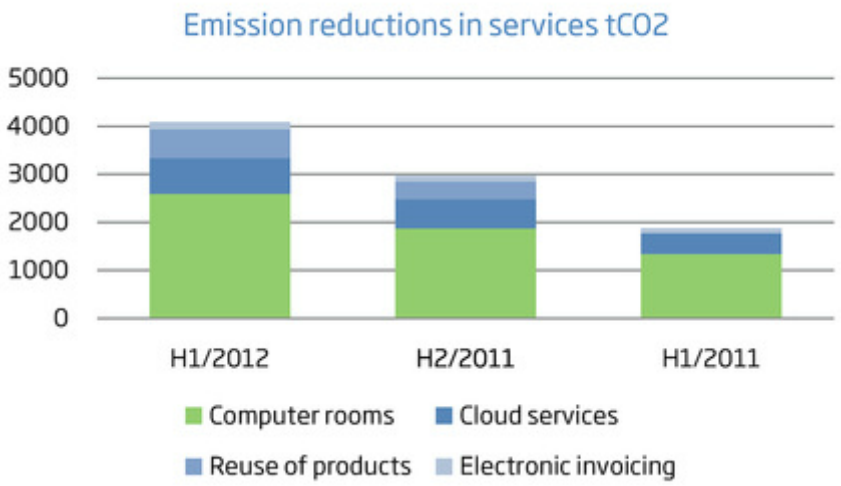


Figure 13: Reductions through ICT services Computer rooms,
Cloud services, Reuse of products and Electronic invoicing in 1H/2012 at Elisa

CONTENT

7. Benchmark on LED Lighting

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices and are increasingly used for other lighting. Appearing as practical electronic components in 1962 early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness. As far as TLC Operators are concerned, the use of such LED can be applied to potentially all their buildings (offices and shops especially, but also Central Offices and Data Centers) with interesting energy savings. To this end, the ETNO ETF Group decided to perform a benchmark aimed at highlighting the current state of the art in terms of :

- Type, number and location of installed LED (tube LED, spotlight LED, system LED, please refer to Figure 14 for some examples...)
- main features (efficiency, color temperature, Color Rendering Index – CRI)
- rough economics (pay back time, yearly energy savings)

Figure 14: examples of LED types

Table 5 reports the outcome of such brief benchmark. As it can be seen, lots of Operators are taking into account this technology (at least with some trials), and the trend is continuously increasing. Currently the leader in this field is Telecom Italia, with more than 300.000 installed LED, and an associated energy saving of more than 40GWh.

COMPANY	TYPE (TUBE LED, SPOTLIGHT LED, SYSTEM LED, ...) (1)	COMMERCIAL/ CUSTOMIZED TYPE OF LED	EFFICIENCY	COLOR TEMP [K]	CRI	TOTAL NUMBER OF INSTALLED LED LAMPS	LOCATION	TEMPORIZATION ASSOCIATED	PROJECT TIMELINE	EXPECTED YEARLY ENERGY SAVING [MWH OR %]	NOTE
[K]"	CRI	Total number of installed LED lamps	Location	[K]"	Project timeline	Expected yearly energy saving [MWh or %]	Note				
A1 Telekom Austria AG	LED Downlight L (Like SYSTEM LED 3)	Commercial	50 lm/W	4.000	80	917	Common areas, office building	No	Q4/2012	up to -70%	Trial changing programm
Belgacom	Panel LED	Customized	>63 lm/W	2.990	83	5.550	Office Corridors	Yes	2012	300MWh	Replacement 2 old PLC 14W by 1 Led 10W
	Ad hoc lamps for retrofit of light bulbs (filament & halogen)	Commercial	>70Lm/W	3.000	N.a.	1.500	Office Corridors	Yes	2012	160MWh	
Magyar Telekom	LED stripes instead of fluorescent lamps in background lighting	Commercial	n.a.	n.a.	n.a.	50	T-Point shops	n.a.	2012	0	First trial
	TUBE LED instead of Fluorescent Lamps in the parking levels	Commercial	88,6 lm/W	n.a.	n.a.	150	Office Building	n.a.	2012-2013	47,3MWh	First trial
Swisscom	LED for Halogen Spots	Commercial	>80 lm/W	3.000	n.a.	164	Service Points (14) in an office buiding	Yes	Q2 2012 - Q1 2013	6,14MWh	12 W, 3000 K
	LED for Halogen Spots	Commercial	>80 lm/W	3.600	n.a.	62	Elevators (10) in an office building	No	Q3 2012	5,15MWh	2.5 W, 3600 K, 40°
	LED for Halogen Spots	Commercial	>80 lm/W	2.800	n.a.	18	Meeting area in an office building	Yes	Q3 2012	2,34MWh	10 W, 2800 K, 45°
	LED for Halogen Spots	Commercial	>80 lm/W	3.600	n.a.	26	Elevators (4) in an office building	No	Q2 2012	3,58MWh	4 W, 3600 K, 40°
Telecom Italia	Tube LED and spotlight LED for retrofit of fluorescent or alogen lamps	Commercial	>80 lm/W	3.000-3.500	> 70	300.000	Common parts in office buildings	No	2012-2013	28.000MWh	
	Ad hoc lamps for retrofit of fluorescent lamp	Customized	>80 lm/W	~ 6.000	n.a	22.000	Telephone boots	Yes	2012-2013	15.000MWh	Some single LED act as courtesy lights, being always on during the night, while some other LEDs are instead switched on only when a customer enters in the telephone boots
Telekom Slovenije	LED tubes instead of fluorescent lamps	Commercial	90 lm/W	2.800	n.a	60	Office corridor	Yes	2012	-50%	LED TUBE T8 18W
	LED spot	Commercial	62,2 lm/W	5.500	n.a	8	Exhibition panel	Yes	2011	-77%	High power LED lamp AR 111, Gu10 230V
Telenor	LED wall wash	Commercial	31,3 lm/W	2.700	83	368	Art columns, outdoor FBU	No	2012	-38%	BCS419 12xLED-HB/WW 30 L305
	LED spot, rail	Commercial	47 lm/W	3.000	80	150	Common areas, indoor	No	2012	-68%	StyliD 3C BRG520 1xSLED800/830 PSU MB I ALU
	LED spot	Commercial	54 lm/W	3.000	80	2.190	WC areas	No	2012	-84%	MASTER LEDspotLV 5.5-35W 3000K MR16 36D
	LED spot	Commercial	54 lm/W	3.000	80	1.100	Meetingroom areas FBU	No	2012	-80%	MASTER LEDspotLV D 10-50W 3000K MR16 24D
TeliaSonera	Obstruction light LED for aerial constructions (antennas and masts)	Customized (probably)	Going from traditional 115W/lamp to LED 20W/ lamp	n.a.	n.a.	«~ 4.000					
	Almost no LED at all in (inside) technical sites or offices.	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	We often have traditional flourescent lights with motion detectors in the technical sites. No LED's in the offices except some in emergency/evacuation signs. This apply for Sweden, Finland, Norway and Denmark.

Table 5: outcome of ETNO ETF benchmark on LED lighting

CONTENT

8. Analysis on correlation between traffic and energy consumption

Telekom Slovenia has performed and shared with the ETNO ETF Group the outcome of power consumption measurements of several network equipment types present in their IP/MPLS core network. The aim was to find the relation between data traffic and power consumption. This can lead to more power conscious operation and ultimately to traffic-energy proportional network operation. It must be highlighted that data traffic within communication network of telecom providers adheres to certain patterns that change periodically on daily, weekly and monthly basis. Furthermore different traffic pattern behaviour during non-working days can be observed.

Due to multilayer hierarchical network organisation network equipment were tested at several levels: core, aggregation, access. IP/MPLS protocol is used throughout. All equipment (device under test) is 48 VDC powered, with dual redundant connections. Both sides of power inlets were measured and their sum used in power consumption calculations. Devices under test were from several vendors (Cisco, Juniper, Iskratel) and equipment types (router core, router aggregation, BRAS, VoIP softswitch). Device under test were from 2007 time frame, which means that their design is from 2002 time frame. U, I measurement equipment was from two vendors (Dewesoft, Metrel) and types (handheld, station) with sampling 8 kHz and 20 kHz and resolutions 12 bit and 18 bit, and Hall effect current clamps. Bit traffic measurements were extracted from MRTG open source software package gathering SNMP V2 MIB files.

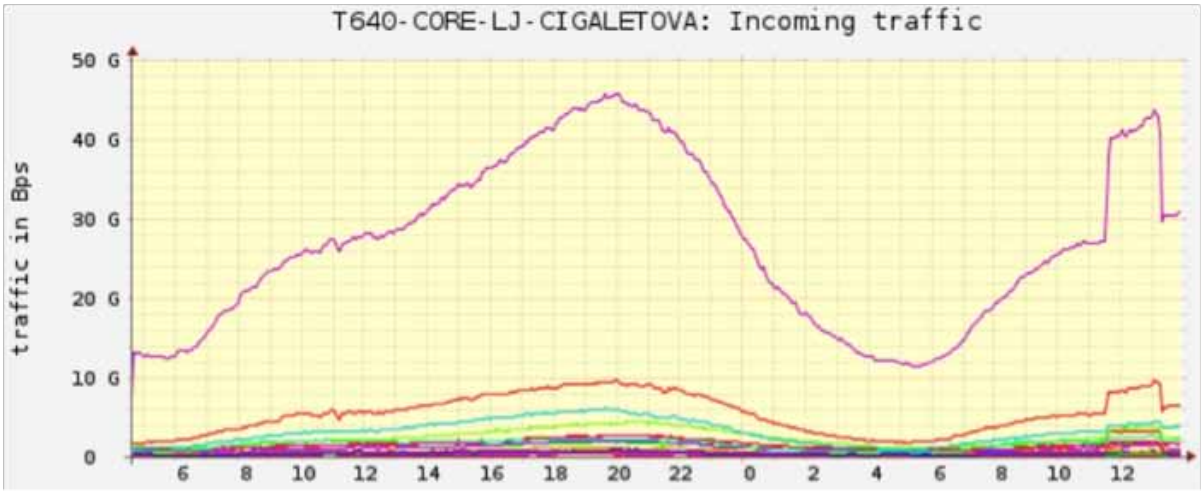


Figure 15: typical bit traffic pattern during busy week day

Figure 15 shows a typical bit traffic pattern during busy week day. We can observe min-max variation approximately 3.8 times.

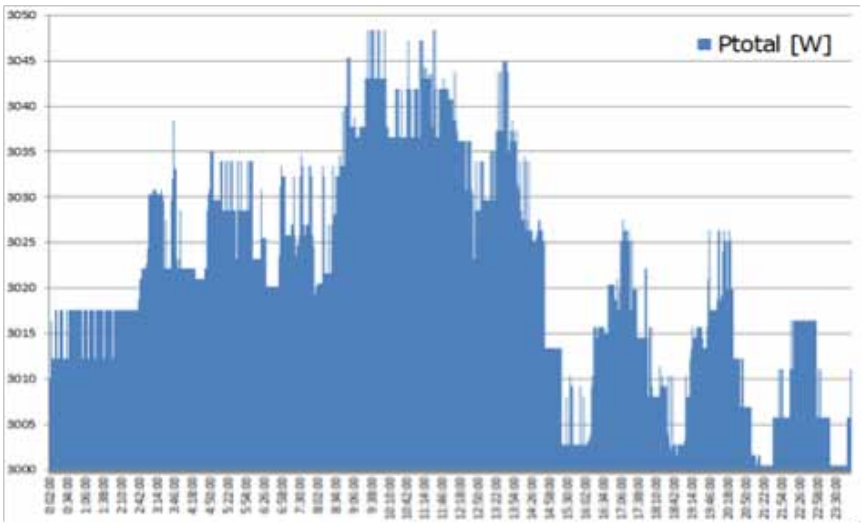


Figure 16: power consumption variation during busy week day

Figure 16 reports instead the power consumption variation during the same time period on device under test. It must be observed that the min-max variation is only 48 W on a scale of 3 kW. Similar results were demonstrated on all other devices under test.

CONTENT

As a conclusion, it can be said that there is no correlation between network bit traffic and power consumption on core routers. We can not trace any energy conscious behaviour and clearly inefficient operation. At least not on the designs with origins traced back to first half of 2000. From the results we can calculate also energy per bit transported, or better Gb transported.

As a consequence, the ETNO CORE ETF members have agreed on pushing towards the design of new network equipment with traffic-energy proportional designs to achieve energy proportional networking.

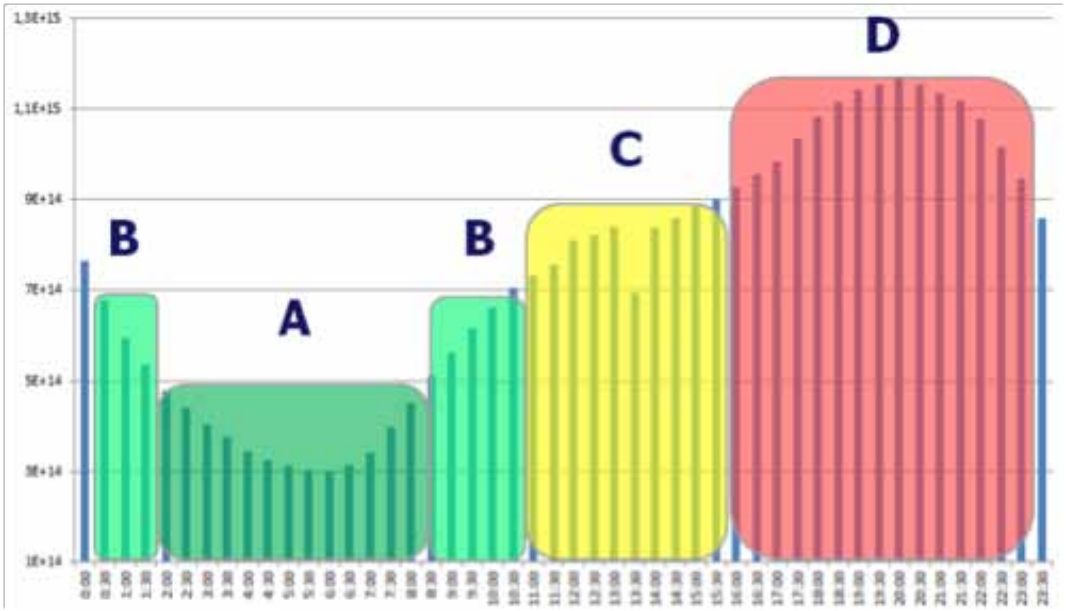


Figure 17: proposal of traffic clustering for power consumption optimization purposes

The end solution to full linear proportional energy networking can be achieved in several stages. One can be step wise energy proportional networking. As reported for example in Figure 17, we can observe several distinct regions of bit traffic A-B-C-D corresponding to regions of < 45%, < 60%, < 80%, > 80% bit throughput. A viable solution could be for example the design network router such that these bit traffic scales are proportional to power consumption, i.e. < 45%, < 60%, < 80%, > 80% of rated power. With this simple solution, on a device under test we can expect approximately 2000€/year operational, electricity cost reduction, which represents in device under test cases 25% in cost savings. And this is without taking into account lower requirements for cooling.

Proposed simple solution is obtainable, since IT servers have done a lot on energy proportional operation in last several years, where we have seen dramatic performance increases for modest power changes, leading to cumulative performance per Watt increase at least 4x. This can be done for networking equipment, too.

CONTENT

9. Contribution towards EC JRC CoC DC

The Codes of Conduct (CoC) have been launched as a voluntary initiative by JRC (EU Joint Research Center) for signing and implementation. Its aim was to bring interested stakeholders together, including the coordination of other similar activities by manufacturers, vendors, consultants and utilities. Parties signing up will expect to follow the intent of this CoC and abide by set agreed commitments. Currently there are five CoC: Broadband equipment, Data Centre (DC), External Power Supply, Uninterruptible Power Supply, Digital TV. In particular, the CoC on DC proposes general principals and practical actions to be followed by all parties involved in DC, operating in the EU, to result in more efficient and economic use of energy, without jeopardizing the reliability and operational continuity of the services provided. Many DC Operators are simply not aware of the financial, environmental and infrastructure benefits to be gained from improving the energy efficiency of their facilities. Therefore, this CoC aim at:

- developing and promoting a set of easily understood metrics and Best practices to measure and improve the current efficiencies of DCs, producing a common set of principles to refer to and work in coordination with other international initiatives.
- raising awareness and commitment amongst managers, owners, investors, as well as providing reference for other participants (the value of the Code of Conduct goes beyond the number companies that sign and commit themselves…)
- creating and provide an enabling tool for industry to implement cost-effective energy saving opportunities.

Concerning the set of Best Practices, the ETNO ETF recognized that the increase of the operating T range of servers would bring to huge energy savings and therefore should receive the highest weight in the evaluation. To this end, several Operators of the Group have performed some tests aiming at confirming the feasibility of current equipment to work up to 45°C without particular degradation in their performances. Hence, the Group prepared a presentation on this topic that has been shown during a F2F meeting in Ispra. In Figure 18 the most relevant slides have been reported.

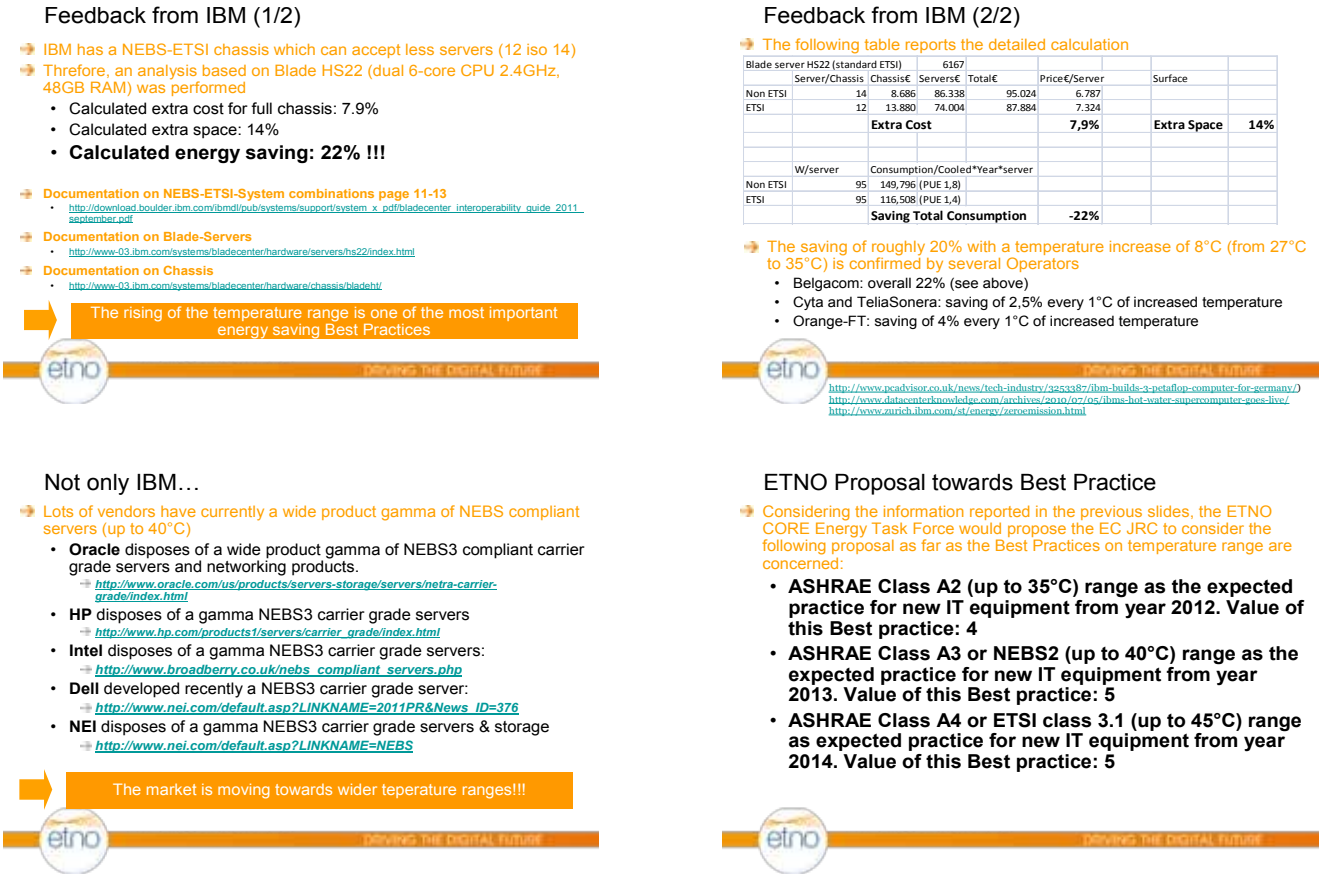


Figure 18: abstract from the ETNO ETF presentation towards CoC DC on increase of the operating T range

CONTENT

10. ETNO ENERGY TASK FORCE LETTERS

10.1 Letter on HVDC roadmap

The letter reported in the following was sent to main IT manufacturer on behalf of the ETNO Energy Task Force on 25th October 2011. The main goal of such letter was to ask some questions concerning the HVDC roadmap and at the same time to invite them to future ETF F2F meetings.

Several answers have been received (e.g. Delta, Huawei, IBM, UECORP-STARLINE) and a F2F meeting with Huawei and Emerson was finally arranged in November 2011. Such solution still remains among the hot topic faced by the ETNO ETF Group.

From: Res.Witschi, Gianluca Griffa, chairman and co-chairman of the ETNO (European Telecom Network Operators) Energy Task Force

Date: 25th October 2011
Your contact res.witschi@swisscom.com, gianluca.griffa@telecomitalia.it
Topic: Promotion of HVDC server and network equipment

Dear manufacturer of servers and/or network equipment

Telecom and IT operators united in the ETNO (European Telecom Network Operators Association) and representing the following 15 Telecom Operators: Belgacom, Cable&Wireless, CYTA, Eircom, KPN, Magyar Telekom, France Telecom Orange, Swisscom, TDC, Telefonica, Telecom Italia, Telenor, TeliaSonera, Telekom Austria, Telekom Slovenije are requesting you to provide us with specifications and roadmaps on server (1U, 2U, blade, other) and network equipment (switches L2/L3/TOR, routers core/P/PE, access) that answers at least the following questions:

1. *HVDC – higher voltage DC (up to 400 VDC) powering of server / networking equipment, models and roadmap of market availability. Please state all models of equipment that you envision.*
2. *HVDC compliance to relevant international and regional standards.*
3. *HVDC power inlet connector types and recommended power cord specifications or standards (cross-section of cables).*
4. *Any quantified analysis results of better efficiency, higher modularity or reduced space requirement, etc. of the whole HVDC chain from power generation and distribution up to energy conversion at equipment compared to 48 VDC or 230 VAC models of the same type. What kind of efficiency of HVDC power supply unit do you claim?*
5. *What are your recommendations for HVDC power generation and distribution within the networking and/or data center facility from AC power transformer to HVDC equipment?*
6. *Can you provide any MTBF or availability figures for the whole HVDC chain from power generation and distribution up to energy conversion at equipment or state that it is significantly different compared to 230 VAC models?*

Your kind answers are expected by 14th November 2011. Your answers will be analysed in a confident manner.

Please indicate your willingness to participate in our ETNO meeting on 24-25th November 2011 in Budapest and present HVDC equipment details to our ETNO members on a closed workshop.

We are convinced that suppliers addressing these issues will have a competitive advantage in telco-ICT market.

Kind regards

Res Witschi, Gianluca Griffa, Chairman and co-Chairman of ETNO Energy Task Force

CONTENT

10.2 Letter on changes to the Best Practices of the EU CoC DC

The letter reported in the following was sent to the EC DG JRC on behalf of the ETNO Energy Task Force on 20th October 2011. The main goal of such letter was to ask the JRC to keep in the CoC DC Best Practices the specific operating temperature range according to ETSI EN 300 019 class 3.1 (up to 40°C / 45°C), avoiding its replacement by the more moderate ASHRAE Class A2 (up to 35°C).

As a result, the ETSI range is still present in the current Best Practice document (v3.0.8)

From: Res.Witschi, Gianluca Griffa, chairman and co-chairman of the ETNO (European Telecom Network Operators) CORE Energy Task Force

European Commission / Mr. Paolo Bertoldi DG JRC
Date : October 20th, 2011
Your contact res.witschi@swisscom.com , gianluca.griffa@telecomitalia.it
Topic : Statement on changes to the best practices of the EU CoC for data centres

Concern: Statement from ETNO (European Telecommunications Network Operators) CORE Energy Task Force towards EC (European Commission) on changes to the best practices of the EU Code of Conduct (CoC) for data centres

Dear Mr. Bertoldi

We as Telecom and IT operators united in the ETNO (European Telecom Network Operators' Association) have been informed that the industry is willing to change the point 4.1.3 of the best practices of the European Code of Conduct for data centres, namely to replace specified operating temperature range according to ETSI EN 300 019 class 3.1 (up to 40°C / 45°C) by moderate ASHRAE Class A2 (up to 35°C). In addition a note was added in point 5.3.3 minimizing the energy saving by using this ETSI class 3.1.

We inform you herewith that we don't support these changes because of the following reasons:

1. *Shared experience between ETNO members shows that applying the ETSI class 3.1 enables to reduce the energy consumption for cooling by one order of magnitude. Renouncing to apply this standard at data centres would lead to unnecessary high energy loss. Furthermore the possible removal of mechanical compressors would enable to eliminate harmful refrigerants to the environment.*
2. *It seems that there is a misunderstanding on the temperature occurrence definition of ETSI class 3.1. According to this class:*

a. *Normal temperature conditions are in the range between 5 and 40°C. Actually it defines the range 10-35°C as the most probable one (90% of the time). The values outside this range are assumed to be reached only in the residual percentage of the time (10%).*

b. *Temperature values above 40°C due to some possible failures of cooling systems or extreme outdoor environmental conditions may occur during at the most 1% of the time, but in no case above 45 °C.*

3. *In 2009 it has been agreed on this best practice, giving time to industry until 2012 to adapt their products, if needed. Should we understand that in the mean time no efforts from industry have been done in this sense?*
4. *Basically similar technologies are used in broadband telecommunication equipments or IP routers. For this reason we don't see, why it should be more difficult to extend the temperature range for IT equipment.*
5. *Some tests on servers show that the ETSI class 3.1 specifications are already fulfilled, even for not declared ETSI class 3.1 compliant servers. Apart from particular storage equipment (e.g. tape backups), most - if not all - servers are probably already fulfilling the ETSI class 3.1 specifications. For particular storage equipment a separate location with less severe environmental conditions may be dedicated, if needed.*
6. *Should IT equipment, supporting this temperature range, have higher capital cost per unit performance than IT equipment, which supports only more moderate range, as objected by industry, it is the duty of the operator/user to select the best product on the basis of the TCO approach including operational and capital cost for cooling.*
7. *The ETNO (European Telecom Network Operators' Association) Energy Task Force has already addressed a LOI to IT vendors with specifications on servers for energy efficient operation in data centres. These specifications include the compliance to ETSI class 3.1. The foreseen change in the CoC would disagree with our LOI.*
   We therefore ask you to consider our request not to change the point 4.1.3 and not to include the note inserted in point 5.3.3 of the best practices of the CoC for data centres and thus help us in our efforts to enhance energy efficiency by operation of our data centres. We are also convinced that suppliers addressing our request early will have a sustainable competitive advantage on the IT market.

Moreover, we would propose to arrange asap a dedicated meeting with the aim to properly discuss this point and define the way forward.

Kind regards

Res Witschi, Gianluca Griffa, Chairman and co-Chairman of ETNO CORE Energy Task Force

representing the following 15 Telecom Operators: A1 Telekom Austria (CoC DC signatory), Belgacom (CoC DC signatory), Cable&Wireless, CYTA, Eircom, KPN, Magyar Telekom, Orange France Telecom (CoC DC signatory), Swisscom, TDC, Telecom Italia (CoC DC signatory), Telefonica (CoC DC signatory), Telenor, TeliaSonera, Telekom Slovenije

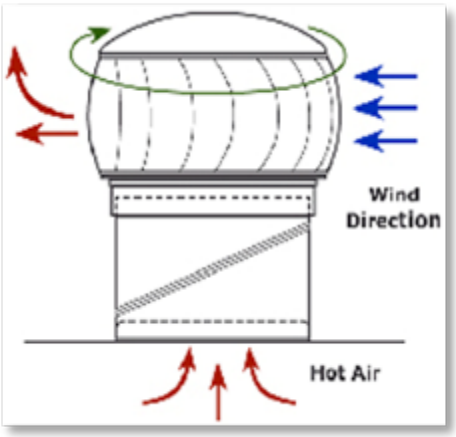
CONTENT

PART 2:

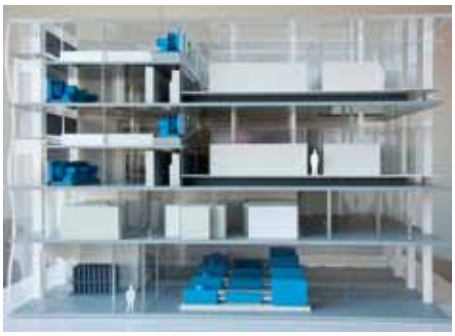
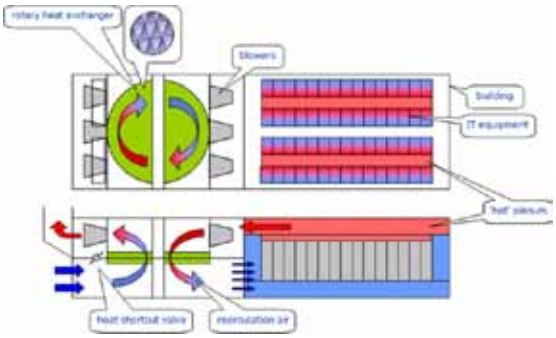
MAIN ENERGY SAVING PROJECTS FROM SINGLE ETNO ETF MEMBERS

ANNUAL REPORT 2012

CONTENT

Operator	
Projekt /Initiative Name	A1 Telekom Austria AG Hybrid Cooling with Natural Wind Power
Project Brief Description	Technology: Use of natural energy source "wind"… Ratio air conditioning to hybrid cooling av. 50:50 No additional electric power necessary Reduction of operating hours of air conditioning to 23% p.a. Sites: currently four test sites Savings electric power: ¾ of power consumption/year CO_2 Savings: no data Winner of A1_Team_Tech_Award_2011 Distinguished by klima: active Program/Environmental Ministry  
Project Status	Actually testing solution
Expected Energy Saving	¾ of power consumption / site p.a.
Expected PBT	N.A.

CONTENT

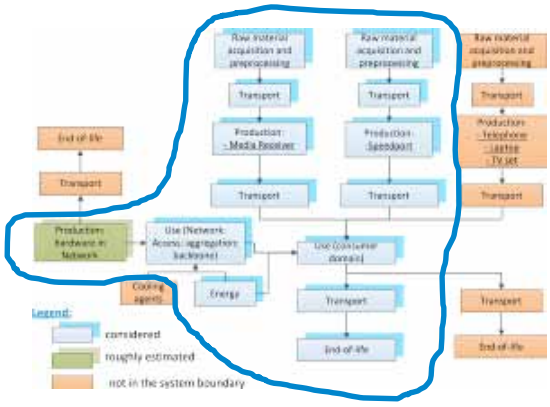
Operator	belgacom
Project / Initiative Name	Belgacom Kyoto Data Center
Project Brief Description	Belgacom is opening a new, green data center for its business customers in Brussels. With the new data center, Belgacom will be able to meet the fast-growing demand for cloud and data-center services. The new data center is extremely energy-efficient and uses sustainable infrastructure for its power supply and cooling. On 1 February 2013, Belgacom opened a new data center in Brussels. The expansion of the Belgacom data centers was necessary to meet the growing demand from companies for cloud and data-center services. The new data center has a surface area of 2,250 m². This increases the total surface area of Belgacom's data centers (15,000 m²) by 19%. More and more Belgacom customers are using cloud solutions. This trend is causing a strong rise in the demand for extra data-center capacity as well as an increase in energy consumption. The data center will be managed in an environmentally-friendly and energy-efficient way. It is built according to the principles of separate cold and hot air flows, powerful cooling installations, and efficient energy use. This enables business customers to store servers/equipment with high energy consumption in the new data centers. The data center is intended for high-density IT systems, blade servers, and other virtualized IT environments. It can support a total useful IT load of 1,450 KW, with an average load of 5.8 KW per rack (250 preinstalled & cabled racks).   Operational reliability Like other Belgacom data centers, the new data center has the ISO 27001 classification Tier-III+. This means that the data centers offer an operational reliability of 99.99% thanks to a fully redundant power supply, supported by dynamic backup generators and a cooling system with buffer capacity. Since Belgacom strives to help its customers reduce their energy consumption and CO2 emissions, the most recent energy consumption standards were used to build the new data center. Belgacom uses the most advanced ecological cooling technique to refrigerate the high-density server room. This free chilling is realized using 4 Kyoto wheels (air-to-air heat exchangers) with a 6m diameter each. The Kyotowheel consists of an aluminum honeycomb wheel that absorbs heat in the internal airflow stream (the side of the IT rooms) and dissipates it in the outside airstream (outside air). Each Kyoto Wheel has a 725kW cooling capacity to guarantee Ashrae conditions (max 27°C) in the cold contained aisles, without need for mechanical cooling as long as the outside temperature does not exceed 23°C. In back-up, a full-fledged mechanical cooling system is available. Heat exchange is ensured by 4 groups of 3 ventilators with a total airflow of 870.000m³/h both on the inside of the computer rooms to evacuate the heat by free chilling and on the external half of the Kyoto wheel. As the Kyotowheels are redundant, air flux is calculated on 217.500m³/h per floor. In- and outside air is filtered with G7 filters. Of course all airflows and rotating speeds are frequency regulated. Thanks to the contained airflow in the computer rooms, these can be held in over pressure to avoid dirt. Humidification is done via ultrasonic evaporation to guarantee RH between 20 and 80%. Based on average weather conditions in Belgium, conventional mechanical cooling will only be required 5% of the total time. By choosing the technique of cooling with outside air, Belgacom can reduce this part of the energy consumption by more than 60%. This results in a yearly saving of 5GWh or 3.800 Ton CO_2. The calculated PUE for this datacenter. Tier-III+ is 1.4 during outside temperature < 19°C and 1.5 on an average year! This new data center is the realization of the concept presented to the ETNO ENGY taskforce in June 2011 and fits perfectly in Belgacom's commitment to reduce its CO_2 footprint
Project Status	Data Center opened on February, 1st 2013
Expected Energy Saving	Power consumption for cooling reduced by 60% with yearly saving of 5GWh or 3.800 Ton CO2
Expected PBT	N.A.

CONTENT

Operator	
Project / Initiative Name	Deutsche Telekom AG: Case Study Entertain

Project Brief Description

The project "Case study Entertain" was undertaken to identify the carbon footprint of an ICT service Entertain, the triple play offer of DT in the German market, including telephone, internet and telephone. By this analysis DT hoped to identify the emission hotspots being beneficial for the planning of emission reduction activities. The carbon balance of Entertain was calculated based on the international life cycle assessment standards ISO 14040/14044:2006 and the GHG protocol standard from October 2011.



Scope of the study

The functional unit was defined as the usage of the "Telekom service Entertain Comfort" by one customer in Germany during one year". It is assumed that one customer is equal to one household (HH). The following graphic shows the scope of the study:

Not within the scope of the study are:

- Cooling agents
- The production, distribution and end-of-life of ICT-products like TV set, phone and laptop
- The distribution and end-of-life of ICT- and support equipment in the network of Telekom
- The production of corresponding software to run the „Entertain"

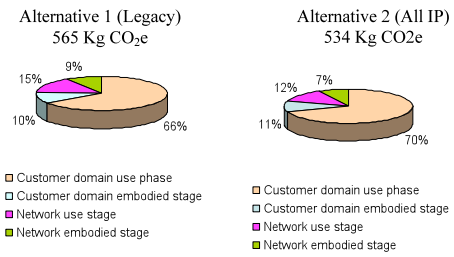
It is assumed that that the exclusions made do not have significant impact on the study results.

Results of the study

The results of the base case analysis showed that the total GHG attributable to the annual use of the "Entertain" service in one German household vary between 551 and 581 kg CO_2e, depending on the different network platforms applied for telephony. Within the individual life stages, the use phase in the customer domain can account for more than 67% of overall GHG impacts. TV set use accounts for the largest proportion of GWP emissions at approx. 35%. Over 12% of the associated GWP is attributable to the use phase in the network domain and around 8% to the production of network-relevant ICT equipment.

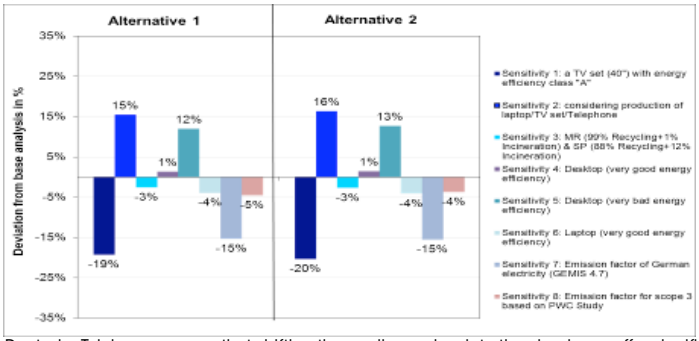
Sensitivity of study results

Furthermore, 8 sensitivity analyses were performed to examine the uncertainty of input data and assumptions. An overview of percentage deviations of the sensitivity analyses from the base analysis is depicted in the diagram below.



Summary and conclusions

With respect to the result, the main outcome is that the carbon footprint of entertain is around 550 kg per year and customer (household), but the main part comes from the customer domain and only one fifth to one quarter is related to DT TLC networks.



With respect to all IP-based networks, the shift to from an average television set to an energy efficient one can save more energy than consumed by the total communication network for the selected functional unit in the use phase.

The study also clearly shows that reductions in the standby energy consumptions for the router and the media receiver offer significant potentials for Deutsche Telekom top improve the carbon balance of Entertain.

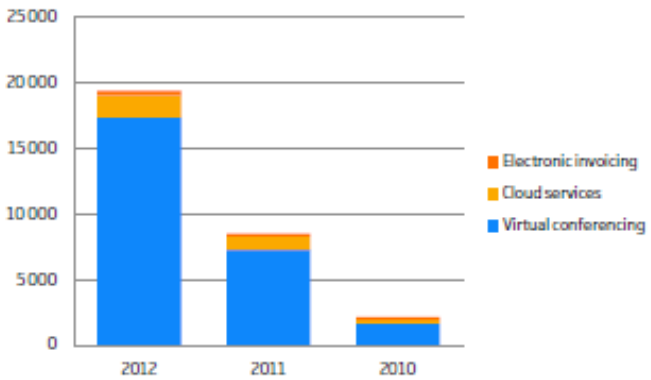
Deutsche Telekom assumes that shifting the media receiver into the cloud may offer significant additional savings in terms of global warming potentials of Entertain. The verification of this potential requires further research.

Project Status	The research project was successfully finished. The results are helping to improve the energy efficiency and carbon balance of Entertain.
Expected Energy Saving	> 50.000.000 KWh (For 20% shift towards all IP and 20% better energy efficiency of router and media receiver in stand-by mode.
Expected PBT	For CPE optimization there is no pay back as the energy savings are on the customer side and not at the operator side.

CONTENT

Operator	elisa
Project / Initiative Name	Elisa Efficient use of floor space
Project Brief Description	Elisa has been developing the design of its facilities and monitoring conditions for several years. The workstations in a multi-space office are used flexibly and facilities are versatile and support different types of work and group work. Excellent results have been achieved through multi-space offices both financially and in terms of the environment. Job satisfaction has also increased as employees can choose when and where they want to do their work. Emission savings amounting to 3,532 carbon dioxide tonnes were achieved in Elisa's operations with the help of mobile work solutions in the year 2012. The savings resulted from replacing travel with remote work and video conferences and by making more efficient use of office floor space per employee. The Table 1 shows Elisa´s energy savings through improved space efficiency. Table 1: Energy savings gained through improved space efficiency in multi-space offices (GJ) **2011** 26 933 **2012** 32 411
Project Status	Ongoing (results will be reported twice a year in Report of environmental responsibility and in the annual report).
Expected Energy Saving	N.A
Expected PBT	N.A.

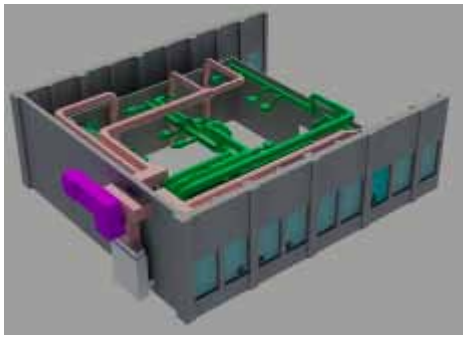
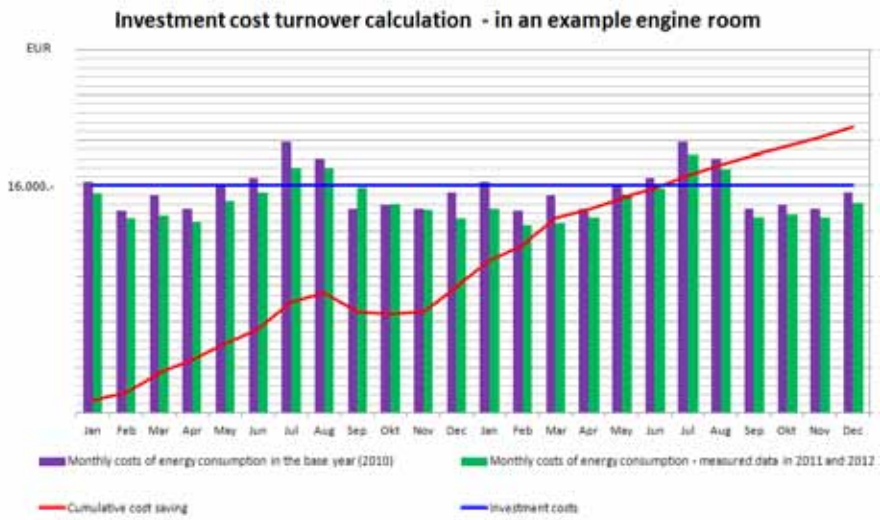
CONTENT

Operator	elisa
Project / Initiative Name	Elisa Videoservices reducing travelling
Project Brief Description	Elisa launched a target-oriented calculation of carbon dioxide emissions late in 2010. Emission savings totaling 19,420 carbon dioxide tonnes were reached in customers' operations by means of Elisa's products and services in 2012. Substituting travel with video conferencing in 2012 has had the greatest impact on the carbon footprint, leading to emission savings of 17,395 tonnes. In addition to traditional video conferences between companies, video-aided customer service is also growing.  *Reduced customer emissions, tCO2*
Project Status	Ongoing (results will be reported twice a year in Report of environmental responsibility and in the annual report).
Expected Energy Saving	N.A
Expected PBT	N.A.

CONTENT

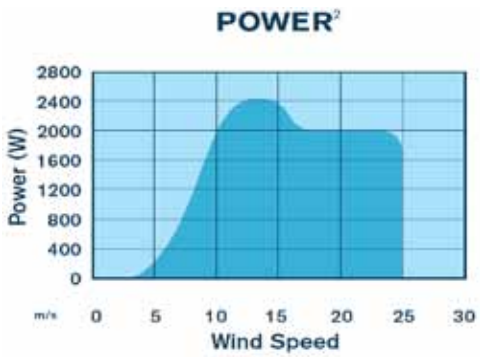
Operator	kpn
Project / Initiative Name	KPN Portal: Energy saving by ICT
Project Brief Description	KPN observed by own experience that energy saving by products has a great opportunity. We can tell our customers how much we saved ourselves using products like: the new way of working, virtualization, managed printing. But we found out that it is hard to explain and work out what our customers could save themselves. That is why KPN realized a portal www.kpnbespaarmeter.nl where customers and other individuals or organizations can find out their own saving opportunities. The base of the portal is the calculation of saving possibilities using 7 ICT services: both IT: (Housing, Hosting, Webhosting and Backup-online) and Telecommunication based: (Teleconferencing, Video conferencing and "The New Way of Working"). Saving calculation is based on public available measurement metrics. And not only savings by the company itself are calculated, but also energy used elsewhere is included. For instance if people are working from home, energy used in the home is subtracted form the total energy to be saved. KPN worked together with Ecofys to implement the measuring tool and WWF verified the results. In the cooperation with WWF as Climate saver, WWF and KPN are now training sales force how to present sustainability together with cost saving to customers. A preview of the tool (in Netherlands): 1 to 7 services can be chosen to calculate the opportunities for your own company. In next screensmore detailed information is asked. The result will be presented in saved euro's, saved working hours and CO2 reduction   The portal is live from 2012 Next phases in 2013 will be: Adding new services; calculate real saving based on implementation; translate in English. By implementing these kind of tools KPN made the first step to realize the ambition to save in 2020 as much energy for our customers as we use ourselves.
Project Status	Ongoing (targets 2013 specified in CSR report)
Expected Energy Saving	The tool specifies the expected energy savings per customer. Next phase of the tool will also calculate the realised savings
Expected PBT	Pay back time of the tool is within one year

CONTENT

Operator	Magyar Telekom
Project / Initiative Name	Magyar Telekom Fresh Air Cooling solution for Data Centers
Project Brief Description	Magyar Telekom already got great energy savings from the Fresh Air Cooling solution working at the base stations in about 1000 applications. The last year we begun to use this principle in the great buildings, reconstruct the existing air condition systems of the engine rooms, and adapt the fresh air cooling system on it. These rooms need to design uniquely, and the solution is different for every case, but the base principle, the used controller unit and the huge amount of saved energy are common. So the removed old air condition systems leave together the new fresh air cooling.  3D design – air condition/free cooling air tube system (room size 50*45m) The electrical consumption of the first 12 location – engine room – have been monitoring continuously, and the measures proves that the reconstructions were successful, the average turnover is about 2,5 years.  Monthly energy saving diagram example The investment costs of the complete implementation are ~12.000EUR/engine room.
Project Status	The reconstruction of 80 engine room already finished, approx. 100 is pending
Expected Energy Saving	~7GWh/year
Expected PBT	~ 2,5 Years

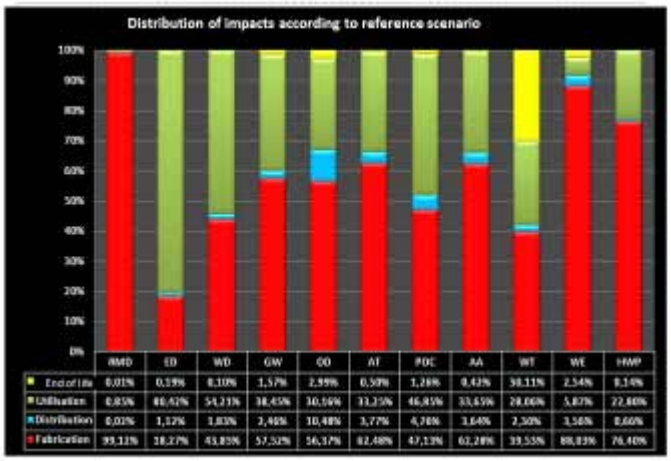
CONTENT

Operator	Magyar Telekom
Project / Initiative Name	Magyar Telekom Tests on BS tower top wind generator
Project Brief Description	In 2011 a project was started at Magyar Telekom, to examine the utilization of wind energy on base station towers in Magyar Telekom. We tested not only the wind generator, but tower too. Horizontal axis wind generator, installed on the top of 3 towers (50-70 m, see the picture). Nominal power 2.4 kW at 13 m/s wind, rotor diameter 3.72 m, stop at 90 km/h (see the picture). Output is one phase, 230 V AC. Life expectancy without maintenance (factory data) is 20 years. All the 3 tower have an online measuring system to measure continously the wind speed and direction, and the strains in the 3 main bars with strain gauges. Among other calculated data is the virtual moment at the floor of tower in kNm, and increments of it caused by wind generator, as a function of wind speed. We made measurements without and with wind generator too. See the table. So about 20 % spare is needed in virtual moment. Two tower have an online telemetric system too, to measure the production and status of wind generator. See a picture. That is output in kW, integrated kWh, rpm of rotor and others. The distribution function of wind speed and CO2 footprint are also calculated. We measured, that 79 % of wind belongs to 5-25 m/s speed. Now we have two years behind us. No any maintenance, only listening and measuring. Tower1 produced 4.25 MWh/year, 10.3 % green energy at the site, CO2 1.92 t/year. Tower2 produced 4.72 MWh/year, 25.4 % green energy at the site, CO2 2.13 t/year. Tower3 is similar, from here we haven t online data. Green energy generated on the spot is significant, because of 10-25 % less CO2, but not a bit significant compared to full electricity consumption of Magyar Telekom.
Project Status	Ongoing (started in 2011)
Expected Energy Saving	10-25 % less CO_2
Expected PBT	15 years (for 3 towers)



Tower1, wind speed in km/h	60-70	70-80	80-90	90-100
average moment without wind generator in kNm, 2011.01.01.-04.30.	560.8	775.6	975.1	1208.6
average moment without wind generator in kNm, 2012.01.01.-04.30.	672.5	910.4	1171.9	1416.5
increment in %	20	17	20	17

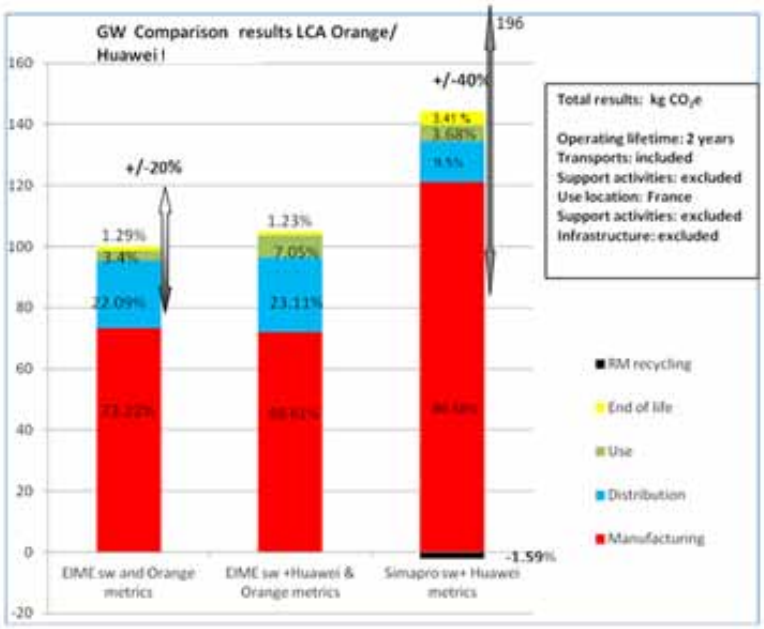
CONTENT

Operator	orange™
Project / Initiative Name	Orange End-user equipment Life cycle assessment
Project Brief Description	The project deals with a complete life cycle assessment of a «standard» DECT. It was performed with the EIME software 4.0 (BDD v.11.4 of 2010 of CODDE Bureau Veritas) on 11 impacts on water, air and non-renewable natural resources. Functional unit: «8 hours call per month for 5 years on the French PSTN network». The entire device, including packaging and manuals, was modelled. The «standard» DECT is the average of 8 representatives DECT on the current market, it has no answering machine, a monochrome display and is manufactured and assembled in China.  R&D, sales, marketing and the production infrastructure were not included in the manufacturing phase as well as installation, the after sales service and the PSTN network for the use phase. The customer's journey to his home is not included into the distribution phase. The scenario used for the end of life treatment of the "standard" DECT is that of dismantling with transition through the WEEE channel.  Manufacturing phase has the greatest impact for most indicators except for ED (energy depletion) and WD (water depletion) indicators. The RMD indicator, consumption of non-renewable resources, is impacted at 99.1% for manufacturing due to printed circuit boards and electronic components using rare materials (gold, silver, tin). High impact (88%) on WE indicator water (eutrophication) is explained mainly by the mining and refining of nickel (NiMH batteries). Use phase has the second highest impacts on all indicators. SLEEP mode, which represents 98.1 % of the life time, is by far the most impacting with 97.6% of the energy depletion of this phase.
Project Status	Other equipment and services LCA on-going
Expected Energy Saving	N.A
Expected PBT	N.A

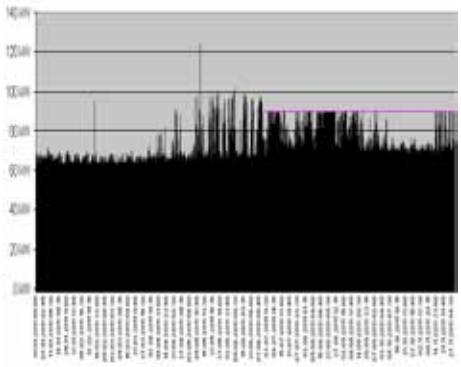
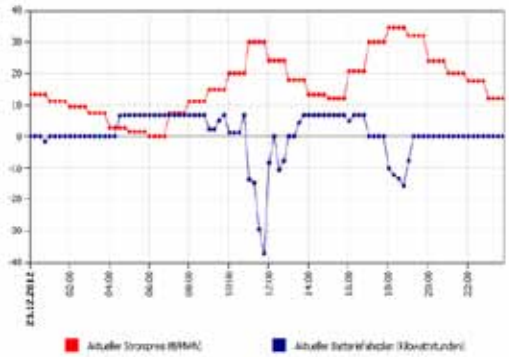
CONTENT

Operator	orange
Project / Initiative Name	Orange Environmental Labelling of mobile and fixed devices
Project Brief Description	The objective is to calculate the environmental performance of products sold by Orange and to provide a clear information to consumers and help them to make the appropriate choice when purchasing The methodology is based on data provided by the suppliers and has been developed by Orange-Labs, WWF and Bio Intelligence Service The detailed label covers 3 indicators • Carbon footprint (CO2 limitation) • Amount of CO2 produced during product life cycle i.e. manufacture, transport, use & end of life • Resources preservation Actions taken by manufacturers to limit sensitive & non-renewable substances in terms of environment, economy or society Eco-friendly design, of which hazardous substances Highlights specific actions from manufacturers to reduce the environmental impact of their devices including limitation of hazardous substances All these indicators form an overall score, called the "environmental score". Communication on Eco-rating in France 
Project Status	Other products labeling on going
Expected Energy Saving	N.A
Expected PBT	N.A

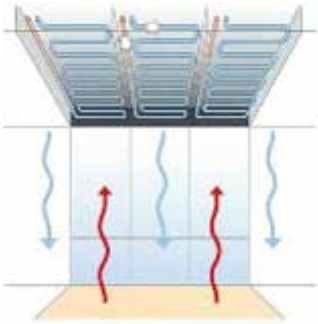
CONTENT

Operator	orange
Project / Initiative Name	Orange Smartphone LCA in the frame of EU Pilots
Project Brief Description	The project was carried out for European Commission DG Communications Networks, Content & Technology with the following objectives: • to assess the compatibility of 2 Life Cycle Assessment methodologies described in the following standards: ETSI TS 103 199 v1.1.1 and ITU-T L.1410 • to check that the metrics, data, perimeter, scope, boundaries are coherent • to compare the results on the same methodology when using Orange's and Huawei's different LCA approaches (procedure/LCA tool/LCI database). LCA have been carried out by Orange and Huawei for the same reference flow: "one Smartphone used for 2 years in France" The figure below highlights results gap especially in Manufacturing aspects when using the same standards and 2 different software tool (Simapro for Orange and EIME for Huawei), similar or different metrics.  General conclusion of the EU pilots for the studied standards The main general conclusion is a good compatibility and non-conflicting documents. Workability needs some challenges such as a high and specific level of skills and knowledge required, large amount of resource required (financial and human), difficulty with data collection for complex products in a global supply chain.
Project Status	ETSI and ITU common tasks for merging in a single standard
Expected Energy Saving	N.A
Expected PBT	N.A

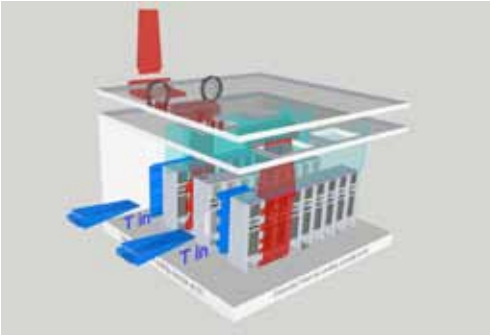
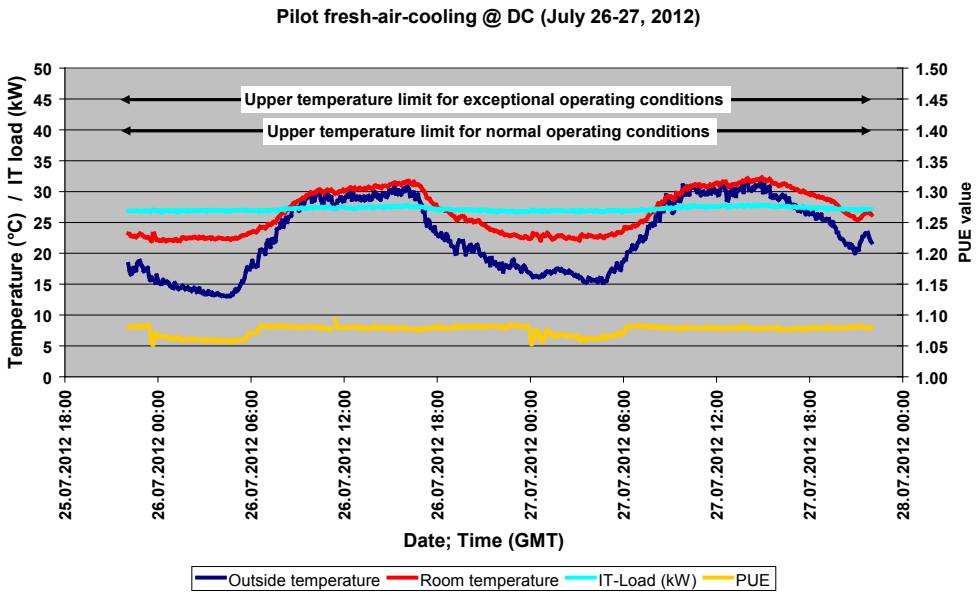
CONTENT

Operator	Power & Air Solutions Deutsche Telekom Gruppe
Project / Initiative	PASM Smart subgrid project
Project Brief Description	PASM ensures availability (voltage, reserve capacity and air conditioning) at the highest level. To this end, PASM produces and markets energy-based complete solutions for technical systems in the fixed network and the Data Center for Deutsche Telekom AG. The energy requirement is largely ensured via long-term futures (base load, peak load). In addition, hourly contracts to close the gap between long-term procurement and short-term demand are traded on the spot market. However, the direct link between current energy requirements and energy supplied also means there is a direct dependency on the prices set by the market: if electricity is needed, it must be purchased, regardless of the price to be paid. The same applies to the sale of surplus capacities. Scope of the study The project's starting point was the consideration that interim stores within balancing group management make it possible (within limits) to separate the time of energy intake from the power grid from the time of consumption. The following objectives should be achieved as a result: • Sourcing of electricity from the spot market in low-price periods • Internal generation of electricity from energy storage devices in high-price periods • Reduction of transmission peaks • Modulation of telecommunications-specific standard load profiles This type of consumption modeling requires that forecasts for traffic flows in the telecommunications networks as well as energy flows of the associated energy network be analyzed in order to determine control criteria for ascertaining the optimum energy distribution in the network including the price analyses of the EEX spot market. The growing supply from regenerative generation plants is already causing major price fluctuations on the spot market today which can be exhausted with the energy stores of PASM's availability-ensuring processes. In the course of a day, the electricity price intermittently fluctuates greatly on the market depending on demand and supply. Sometimes electricity is offered free of charge. In extreme situations where there is low demand and high supply of regenerative energy (sun and wind), even negative prices up to EUR -200/MWh are achieved; consumers are given money if they can acquire electricity from the EEX at the right time.   Fig. 1 Loading curve without/with peak shaving Fig. 2. Charging/discharging curve with market price Results of the study Energy storage devices in the form of lead batteries are integrated in a network node in T-City in a smart subgrid and networked with a central control station via a controller. Depending on the prices on the energy exchange, days of the week and electricity requirements of the network node, a 15-minute-based schedule for charging/discharging the store is imported locally in the controller every day and the backup system is controlled accordingly. The storage devices are charged when prices are at a minimum and discharged in periods of price peaks for internal generation. This may happen several times a day so that energy sourcing costs can be optimized. Peak loads for electric power transmission (1/4 h power) can lead to prices of up to EUR 100/kW*a. An integrated load management process reduces the peaks so that transportation costs are saved as well and electricity networks can be relieved during peak load periods. We plan field tests in Central Offices with peak shaving and also to move into the energy market with controlled energy products. In close collaboration with the laboratory of Deutsche Telekom and the University of Munich we search on the effects to lifetime and availability of different types of batteries and looking for solutions to equalize negative impacts by special battery loading curves.
Project Status	Field tests in CO planned
Expected Energy Saving	Potential of 50-100 T€/MWp*a in the case of peak shaving and 150 T€/MWp*a in the case of primary-controlled energy. Reduce power peaks in the grid, store and use of renewable energy and stabilise the public grid
Expected PBT	N.A.

CONTENT

Operator	P&T LUXEMBOURG
Project / Initiative Name	P&T LUXEMBOURG: GREEN P&T/EDITUS building in Kayl (L)
Project Brief Description	 This 5800 m2 building is used by Editus (subsidiary of P&T Luxembourg) and actually some 120 agents are working in the building in Kayl. During planification and construction of this new building, very strict ecological standards were met, so that for the first time, a new building in Luxembourg has received the pre-certification of DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen). The most important aspects, for the construction of the building, were to obtain an important reduction of combustible and electrical energy by the use of renewable resources. Project Challenges for the architects The challenge was to create a building with a very efficient thermal envelope and a constant and pleasant climate throughout the year, which should be maintained through thermo active concrete ceilings with cold water flow.    The fresh air intake and discharge of exhausted air is controlled by mechanical ventilation with heat recovery. The position and design of ventilation are especially designed to reduce power consumption. A specific study favoring natural lighting spaces ensures a considerable power reduction. Rain water is used for sanitary and solar collectors to produce hot water. Whether at ergonomics, acoustics or at the choice of ecological materials, all points have been analyzed by the criterias of a DGNB gold certification to achieve 300 healthy points.
Project Status	In 2012, the building was certified by the DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen) and got 'Gold' certification, the highest accolade awarded proving that very strict ecological standards were met during construction. It is the first time that a new building in Luxembourg has received this certification. On 24 April 2012, P&T received the «public sector category» prize at the Luxembourg Green Business Awards 2012, at the Conservatoire de Luxembourg.
Expected Energy Saving	62% compared to a traditional new building
Expected PBT	Not specified

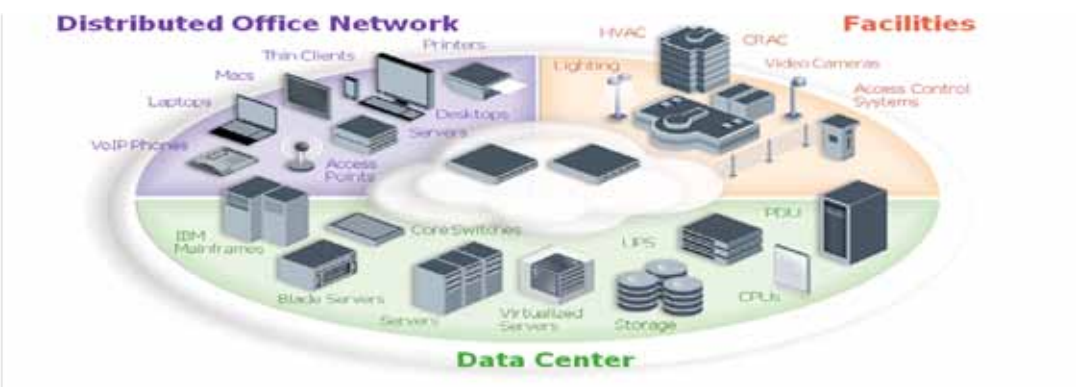
CONTENT

Operator	swisscom
Project / Initiative Name	Swisscom: Fresh Air Cooling year-round @ Datacenter
Project Brief Description	Cooling is one of the major energy and cost driver at data centres. Today most of the data centres are cooled using energy rich and costly refrigeration units with partial free cooling. Starting from our cooling method Mistral, which is currently rolled out in all our telecommunication centres, Swisscom has developed a concept for the implementation of fresh air cooling throughout the year in data centres (see picture 1). Due to higher energy densities at data centres a containment of warm air aisle has been included in this concept to prevent any mixing between warm and cold air. Based on this concept a pilot (see picture 2) has been carried out successfully over a period of one year, from November, 2011 to October, 2012. In the framework of this pilot, an IT platform with 96 servers has been operated continuously at full load. The servers were powered over a high energy efficient UPS. All temperature and relative humidity readings are within the climatogramm of ETSI EN 300 019-1-3, class 3.1. The servers were working properly throughout the pilot, even at hot summer days with outside temperatures above 30°C. The maximum room temperature was comparable to maximum outside temperature (see picture 3). A yearly averaged PUE of 1.06 has been measured. Thanks to this method the energy needs for cooling of data centres can be reduced by up to 90%. Compared with conventional cooling there are in addition to higher energy efficiency some other advantages like lower investment and operating costs, no environment damaging refrigerants, no water needs as well as higher modularity and reliability.   
Project Status	A pilot has been carried successfully over a period of one year. Steps towards a first implementation at Swisscom are on going.
Expected Energy Saving	20 GWh/year
Expected PBT	~ 3 Years

CONTENT

Operator	swisscom
Project / Initiative Name	Swisscom: New Low Power Mode for Set Top Box
Project Brief Description	New services such as Video on demand, recordings, multi tuner etc. ask for more bandwidth and more powerful chipsets in TV boxes. Although an international Code of Conduct for Set Top Boxes co-developed by Swisscom strives to promote energy efficiency within the sector, a Set Top Box still uses approx. 10 W or more in standby mode. A Swisscom project in collaboration with the SFOE and Motorola from 2008 resulted in an efficient low-power mode for the Microsoft IPTV platform at the beginning of 2010. This was subsequently launched in the market in 2012. Pilot projects look set to drive technological development. Low-power mode is default from November 2012 for all new Swisscom TV customers. Either DVR boxes (with recording functionality) as non DVR boxes have low-power mode installed; additionally, all swaps (changing old to new boxes). Low-power mode needs less than 1 W. Assuming a TV customer watches three to five hours a day, most the time, a TV box is not in use and low power mode saves a lot of energy comparing to usual standby mode. While low power mode allows all functionality such as programming recordings, etc. there's a single disadvantage in the usability. The box takes approx. two minutes to start up. Each Set Top Box customer saves about 30-40% of Energy per Year. 
Project Status	Roll-out to all new TV customers
Expected Energy Saving	30-40% per Customer
Expected PBT	N.A.

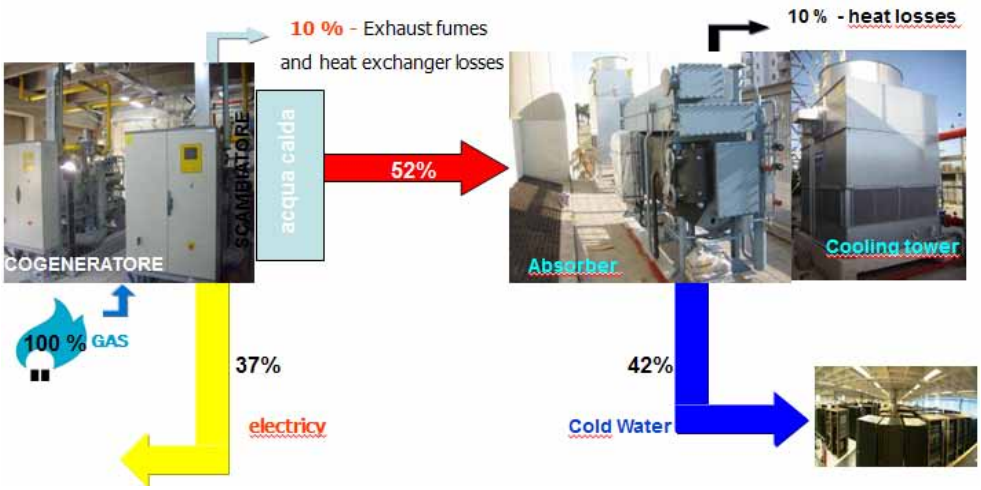
CONTENT

Operator	TDC
Project / Initiative Name	TDC Energy Management
Project Brief Description	TDC bought ultimo 2012 a new innovative Energy Management system from Joulex. Our primary reason is to get a better overview of how energy is used and money spent in office equipment. Our plan is to implement active energy management in this area during 2013. Potential savings is as high as 50%. Next step is to investigate in the possibility of monitoring various sorts of equipment in our infrastructure and thereby being in position to establish independent electricity budgets in the organisation. Another subject in TDC is the manual readings once a year of power consumption on our remote sites. Today it is done with a lot of manual work and a lot of faults. Our goal is to be able to perform this measurement online in Joulex. And also the ability to measure Data Center efficiency (PUE factor) and server utilisation is in scope of the project. As one of the fastest growing areas in our business, the potential is the biggest. In the future we expect Joulex will be able to monitor the power consumption end-to-end in our different products and thereby raise the efficiency. Areas to investigate in the next years (our vision): • Monitor and manage power consumption in Distributed Office (partly implemented) • Get a better overview of equipment use in negotiations with vendors (implemented) • Remote monitoring of power usage in our remote Point of Presence (test in 2013) • Benchmark vendor equipment (ongoing) • Investigating 'Facilities' (2013) • Investigating 'Data Center' – benchmark, PUE ect (ongoing) • Investigating the possibility to have distributed budgets on electricity in TDC (2013-2015) • Load adaptive network (2014-2016) 
Project Status	Under implementation
Expected Energy Saving	Minimum 10 % of managed equipment
Expected PBT	12 to18 month

CONTENT

Operator	TELECOM ITALIA
Project / Initiative Name	Telecom Italia LED for Telephone Booths
Project Brief Description	Currently the lighting system of public telephone booths use a light sensor that manages the light, generated by fluorescent light, for about 13 h /day; Replacing fluorescent lamps with high efficiency LED, **the lamps can be powered from the usual remote power supply of the phones**; it also uses a sensor of presence to put the light in stand-by (courtesy light) when the booth is empty. 
Project Status	Deploy on going in 22.000 Telephone Boots
Expected Energy Saving	7GWh/year
Expected PBT	~ 2 Years

CONTENT

Operator	TELECOM ITALIA
Project / Initiative Name	Telecom Italia Co-Trigeneration
Project Brief Description	The project involves the construction of 9 Trigeneration plants in 2013, including 2-type compact plug & play (size 240 kWh) for a total nominal installed capacity of 10.4 MW. It is expected a total energy saving (due to self-production for CHP and therefore to lower withdrawals from network) of 80 GWh in 2015. The CHP trigeneration structure is set up as an extension of cogeneration and produces electricity, heating and cooling at the same time, allowing to use thermal energy for space cooling, with a reduction of energy consumption from the public electrical grid The main benefits of this solution are: • savings from self production of electricity • saving electricity for energy not consumed by chillers • saving for civil recovery of gas • revenues from TEE (White Certificates) 
Project Status	Deployment ongoing
Expected Energy Saving	80 GWh
Expected PBT	Less 4 Years

Operator	TELECOM ITALIA
Project / Initiative Name	Telecom Italia Green (Ecolabel)
Project Brief Description	 After having defined at the end of 2010 its first line of environmentally friendly products, characterized by the mark "Telecom Italia Green", Telecom Italia extended the number of equipment compliant to the ecodesign requirements defined for the logo use, thanks to a number of actions involving vendors. The label is: and was adopted for the first time for the new "Basic Home Station", an ADSL low end product now deployed in huge volumes (more than 1 million pieces installed). The benefits in term of eco-efficiency are significant as in the use phase the product allows a mean saving of more than 40% of electrical energy, corresponding to the same amount of reduction of greenhouse gases (CO2 equivalent), in comparison to a previous generation product deployed by Telecom Italia and provided with the same functionalities. Besides the energy efficiency performances, a number of ecodesign rules have been adopted to minimize the use of materials, adopt recyclable plastics and optimize the package aspects. Easy disassembling has also been adopted as rule, to optimize the end of life phase. In the following, a list of the new terminals inserted in the green products' line in 2012 is reported, designed and produced having in mind the same main requirements: energy efficiency, material's use optimization, recyclability, easy disposal.

Product name and category	Volumes (estimated installed pieces for the report period)	Mean energy saving vs. previous generation products
Cubovision (Set Top Box) 	10000	75%
Sirio. (corded phone) 	200000	90%
Facile (cordless Phone) 	10000	60%
Modem ADSL Fibra 	New introduction on end 2012, estim. 50000 pieces in 2013	20% (vs. EU Code of Conduct)

Project Status	Over 1.200.000 green devices installed during 2011-2012
Expected Energy Saving	• up to 40% of electrical energy compared to previous generation product for modems • 75% for set top boxes • up to 90% for phones
Expected PBT	Not specified

CONTENT

Operator	Telefónica
Project / Initiative Name	Telefónica GERMANY swap to energy efficient rectifiers
Project Brief Description	Telefónica O2 Germany has more than 25 million customers at December 2012. The power consumption in networks in 2012 was 462 GWh which accounts for 80 million euros of operating expenses approximately. In this sense, Telefónica has an energy efficiency and carbon strategy, which fosters the development of projects aiming to reduce energy consumption in networks in the Group. One of the energy efficiency projects implemented in Telefónica O2 Germany during 2012 was the Swap of inefficient rectifiers. In this project Telefónica swapped around 7000 rectifiers with an efficiency of less than 88% on 3200 sites to High Efficiency rectifiers with an efficiency of more than 95%. The key issue in the project was, that the new rectifier is adapted in the chassis of the old one and the swap runs plug and play without any construction work on site / system; reducing investment requirements. The impact of the project can be summarized in these points: • The project had an investment in 2012 of 2,8 million Euros. • Energy reduction (kwh/year 2012) ~ 1.753.000 kWh. • Cost saving for the company in 2102 ~ 0,4 million Euros from power savings plus 0,85 Euros from repair costs • Expected Energy Saving per year ~ 3.000.000 kWh / year. • CO2 emissions reduction per year ~ 1380 tons CO2 / year This project consists on an important step towards a better energy reduction process in Germany and Telefónica operations.
Project Status	7000 Rectifiers Swapped in Germany
Expected Energy Saving	Annual savings of approx. 3.000.000 kWh / year
Expected PBT (Pay Back Time)	~ 3 Years

CONTENT

Operator	Telefónica
Project / Initiative Name	Telefónica UK Site and Energy Efficiency Project
Project Brief Description	Telefónica O2 UK has more than 27 million customers at December 2012. The power consumption in networks in 2012 was 327 GWh which accounts for 20 million euros of operating expenses approximately. In this sense, Telefónica has an energy efficiency and carbon strategy, which fosters the development of projects aiming to reduce energy consumption in networks in the Group. One of the energy efficiency projects implemented in Telefónica O2 UK during 2012 was to upgrade and extend the surface of an existing switch site. This project involved the built extension on North side of existing switch providing 370 m2 of white space switch site expansion for medium and high density telecom equipment. The impact of the project can be summarized in these points: • The project had an investment in 2012 of 3,8 million euros (£ 3,3 million) • Energy reduction (kwh/year 2012). Approximately 2,4 times more efficient compared with chilled water system used within existing building • Cost saving for the company in 2102 ~ Annual running cost of free cooling CRAC's is 0,63 million euros (£0,56 million) per annum compared with 0,2 million euros (£0,113 million) for chilled water system used on site. Expected Energy Saving per year ~ 300.000 kWh in 2013 (50% of phase) and full savings in 2014 CO2 emissions reduction per year ~ 274 tons CO2 / year  
Project Status	Implemented
Expected Energy Saving	Annual savings of approx. 600.000 kWh / year
Expected PBT (Pay Back Time)	~ 3 Years

CONTENT

Operator	Telefónica
Project / Initiative Name	Telefónica Spain: Smart Buildings Service
Project Brief Description	Telefónica is working formally in the inclusion of Green ICT solutions in their catalogues of products and services. At present Telefónica is providing the Building Automation Service in Spain, (Inmótica in Spanish); which is a service that combines improvement in environmental performance with an economic benefit reducing electricity consumption (and thus the CO2 emissions). This is done through a web-based centralized service that controls all the buildings and their operational rules (switch on/ off the lights, air conditioner etc.) helping the customer to optimize the use of their resources and reduce the electricity consumption. This solution is based in energy intelligence software and is focused on customers, most of the times Enterprises and Public Administration Entities, with buildings all over a country. While other systems helps to reduce the consumption (mostly manually) in only one location, the approach we are presenting helps the customer to manage from a website all the buildings that are have. This service provides an efficient tool that helps to: • Controlling the use of the electricity in all the buildings • Defining new operational rules for a group or all locations • Daily information gathering of electricity consumption in each building (light, air conditioning, others) • Reducing maintenance costs for energy management and control. The solution measures energy and CO2 direct savings. Savings reach around 20% to 30% based on case studies of our customers. We have also included in the offer a "test and buy" model so customers can test the service before. Customer example: http://grandesclientes.telefonica.es/en/ca
Project Status	Service on the Market in Spain
Expected Energy Saving	Annual savings on customer premises of 25 – 30% of electricity consumption
Expected PBT	~ 1-3 Years

CONTENT

Operator	TelekomSlovenije
Project / Initiative Name	Telekom Slovenia: Energy from photovoltaic power plants
Project Brief Description	Using renewable energy sources, photovoltaic solar cells (PV) in particular, brings many benefits to telecommunications operators: lower operations costs and electricity bill, power supply for remote mobile base station towers, reduced CO2 footprint and in general green operations. Telekom Slovenia has a few years of sustainable power engineering experience gained by building combined PV and wind self-powered mobile base stations that show > 3 years operations without any power outage. Driven by our environmental and sustainable corporate policies, as well as reasonable energy subsidies Telekom Slovenia decided to test drive larger pilot PV installation in Ljubljana. PV installation consists of two PV arrays with different technologies: microamorph (49 kWp) and monocrystalline (2 kWp). A substantial sensor network measuring production of both PV arrays (south orientation) at direct current outputs, temperature of panels, solarisation, air temperature, wind speed and humidity at as a living lab for long term efficiency assessment. Design, engineering and implementation of this VESNA platform based sensor network with web browser and Google maps presentation were done in close R&D cooperation with Department of Communication Systems, Jožef Stefan Institute (http://sensorlab.ijs.si/hardware.html). After several months of successful operation it was decided to implement four more PV power plants: 49 kWp (monocrystalline), 47 kWp (microamorph) both in Ljubljana, 49 kWp (monocrystalline) in Koper and 10 kWp (monocrystalline) for mobile base station in Tropovci. 40 PV panels for mobile base station sit on top of container and charges internal battery pack during maximum solarisation. Installations have also long term research value, since we can observe orientation influence (East-West vs. South) for same and different PV technologies at the same or different geographical locations (Ljubljana, Koper), as well as different energy production potential at sea side (Koper). Longer term observation and data analytics, based on 1 min sampling period of vital parameters from these PV installations enables building the right technical solutions for future implementations across Slovenia taking into account design space constraints (orientation, PV technology).    
Project Status	Successful pilot PV installation has been followed by operational deployment of four PV power plants and one PV mobile base station.
Expected Energy Saving	217 MWh/year
Expected PBT	~ 7 Years

CONTENT

Operator	TelekomSlovenije
Project / Initiative Name	Telekom Slovenia: In-row with cold isle cooling design
Project Brief Description	Recent advancement in data center cooling techniques prompted Telekom Slovenia to start a cooling equipment overhaul program in its major network equipment center in Ljubljana. Operational goals included much more efficient cooling of network equipment, servers as well as offering data center space to external customers, since the facility follows Tier 3 recommendation. Project that finished in 2011 offered centralised solution based on free air and adiabatic cooling with possible direct water rack cooling for very power dense (< 30 kW per rack) equipment. These solutions reduce operational costs for cooling and are eco-friendly. Data Centre server cooling techniques can be readily used for network equipment, too. Although there are differences in power densities observed (15 kW/rack vs. 5 kW/rack) the same power losses apply. Network equipment (core, aggregation routers) used to occupy rows of open racks (figure OLD) on raised floor whereby equipment room is being forced air cooled with air exhausts in floor bottom. Temperature of whole space area is thus cooled to required T dictated by equipment (usually T=18 °C). Furthermore thermal camera analysis of present state proved that there was a lot of cold-hot air mixing thus lowering efficiency to around PUE=2. Reduction of cooling loses was required for all new equipment installations. For a new network equipment center it was decided to go for separated cold-hot isle containment design with integrated in-row cooling of equipment racks. This offers possibility to separately control temperature within equipment racks and surrounding space (figure NEW). The end result is a modular, scalable structure of two rows of racks, fully contained in air tight compartment with precisely controlled forced cool air injection from cooling water (T=10/15 °C) fed in-row units through floor bottom and circulating hot air back into cooling system. Solution successfully operates with present capacity of 18 racks and max cooling capacity of 300 kW. Equipment racks are designed to be populated with network equipment with max power dissipation of 12 kW or servers with 18 kW. Three in-row cooling units are placed within each row to cool left and right neighbour equipment racks. This design approach allowed cooling temperatures in equipment racks to be adjusted interval T=[18-25] °C, while hot isle can reach T=40 °C. Furthermore even small variations in cooling temperatures DT=3 °C are possible between different in-row units to optimize to different equipment type cooling requirements.   OLD NEW Surrounding space temperature (T=25 °C) is independently controlled by separate cooling unit (80 kW capacity). Preliminary calculations have shown average year PUE=1.3, considering account free air and adiabatic central cooling system.
Project Status	Operational network and server equipment centers for hosting and cloud computing with in-row, cold isle containment design.
Expected Energy Saving	1.4 GWh/year
Expected PBT	~ 4 Years

CONTENT

Operator	TeliaSonera
Project / Initiative Name	TeliaSonera in Sweden Pilot project on online PUE mapping and follow-up of telecom and Data Centres
Project Brief Description	TeliaSonera in Sweden has today no possibility of online viewing or controlling PUE (Power Usage Effectiveness) at most sites. Most PUE calculations are performed manually after partly manually measuring energy. The manual calculations will soon after they have been performed be outdated. A pilot project is in its startup phase where TeliaSonera will be able to collect data regarding energy consumption, cooling energy and also temperatures in each room in a telecom or data center. When having appropriate data it is possible to continuously follow up the PUE and to set alarm limits. If something is altered (parameters, equipment, etc.) on a site that influences the PUE an alarm can be raised in order to correct the fault without losing unnecessary end expensive energy. By this activity the energy consumption is reduced due to better PUE that will not deteriorate over time. Additional standard measuring transducers will be installed in TeliaSonera's telecom and Data Centres in order to collect the energy consumption, cooling energy and room temperatures. These measuring transducers will complement TeliaSonera Sweden's current energy and cooling remote managing systems. In addition there are plans in the near future of also monitoring the telecom and data equipment effectiveness for using the telecom and data equipment in the most energy efficient way.
Project Status	Startup phase of pilot project on one site Sweden
Expected Energy Saving	When implemented expected better PUE values
Expected PBT	2-5 years, mainly depending on reduced energy cost

CONTENT

Annex: List of ETNO ETF F2F Meetings

Meetings (locations, dates and hosts) held since the formation of the ETNO Energy Task Force are:

01 - Amsterdam, Netherlands	20th - 21st April 2005	KPN
02 - London, United Kingdom	8th - 9th December 2005	BT
03 - Stockholm, Sweden	17th - 18th May 2006	TeliaSonera
04 - Paris, France	13th -14th December 2006	Orange-FT
05 - Sophia Antipolis, France	23rd - 24th May 2007	Orange-FT
06 - München, Germany	12th -13th December 2007	Deutsche Telekom
07 - Reykjavik, Iceland	16th - 17th April 2008	Mila
08 - Wien, Austria	3rd - 4th December 2008	A1-Telekom Austria
09 - Venice, Italy	22nd - 23rd April 2009	Telecom Italia
10 - Dublin, Ireland	26th - 27th November 2009	Eircom
11 - Limassol, Cyprus	17th - 18th June 2010	Cyta
12 – Bern, Switzerland	9th - 10th December 2010	Swisscom
13 – Brussels	30th – 31st June 2011	Belgacom
14 – Budapest	24th – 25th November 2011	Magyar Telekom
15 – Genoa	18th – 19th June 2012	University of Genoa

Nevertheless, the physical meetings are just a small part of the ETNO ETF activities: rather, the Group widely uses and encourages audio and video conference services.

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