



# PrimeEnergyIT: criteria and approach

end-use Efficiency Research Group – eERG  
Energy Department Politecnico di Milano

Andrea Roscetti



# eERG activities

The Politecnico di Milano (PoliMi) is a state university consisting of curricula in Engineering and Architecture (about 40000 students)

The 9 schools are devoted to education whereas the 16 departments are devoted to research.

The Dipartimento di Energia, involves research in three sectors: electric power generation transmission and distribution, energy technologies in transports, thermal engineering and efficient final energy use.

The **end-use Efficiency Research Group**, active since 1996 comprises 5 researchers and a staff professor.

Teaching activities include "Thermodynamics" and "Building Physics", for Building Engineering students at the Politecnico di Milano, and ViceDirection of the post-graduate 12-months Master Course in Renewable Energy, Decentralised Generation and Energy Efficiency ([www.ridef.polimi.it](http://www.ridef.polimi.it)).

# The project consortium



Austrian Energy Agency - Austria

Berlin Institute of Technology (with Fraunhofer IZM) - Germany

Institute of Systems and Robotics - University of Coimbra - Portugal

French National Institute for Research in Computer Science and Control - France

Politecnico di Milano – Energy Department - Italy

BIO Intelligence Service - France

Association of Industries for Electronic and Information Technology in the Basque Country

SEVEN, The Energy Efficiency Center – Czech Republic

Berlin Energy Agency - Germany

ICLEI European Secretariat GmbH - Germany

# From IEE E-Server project(2006-2009)

## EFFICIENT-SERVERS



**e-server-consortium**

**supported by**

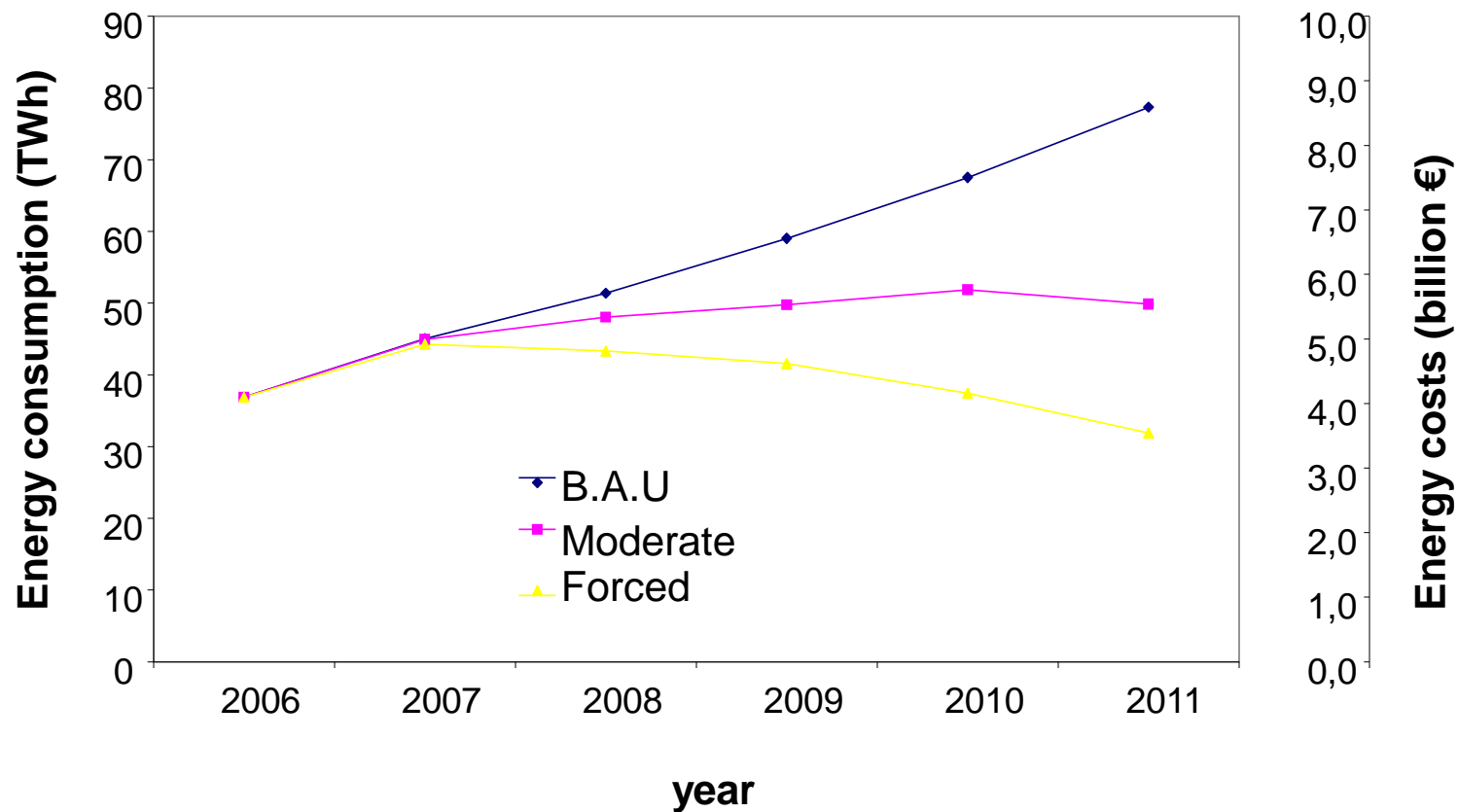


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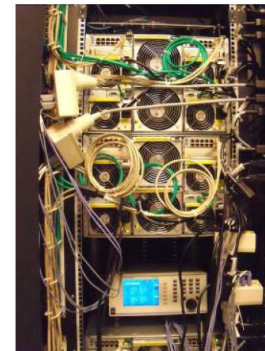
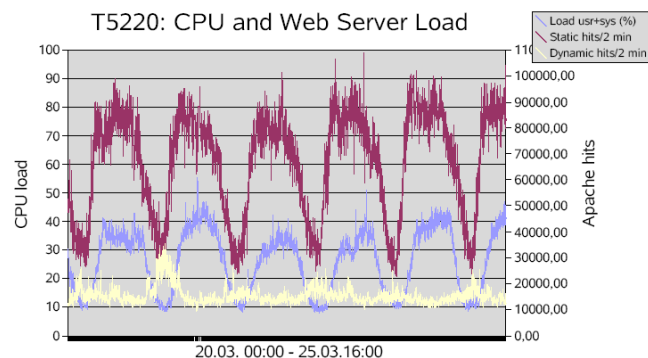
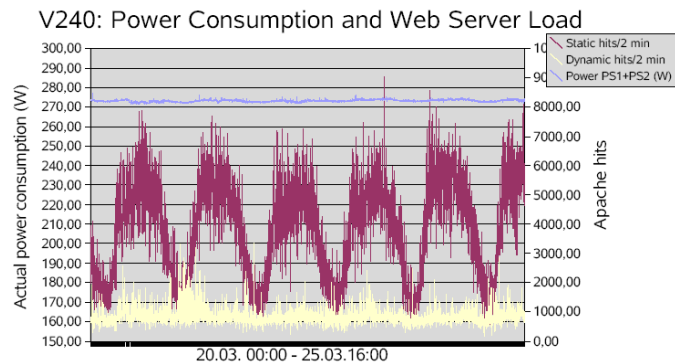
# E-Server



## *Energy consumption in data centres*



# E-Server 2006-2009

## Case studies – STRATO, WINCOR-Nixdorf etc.



System	Energy consumption (kWh)	Rack units	% Energy consumption
 14 old Systems	58.344,88	40 HE	
 T5220	2.241,92	2 HE	3,84%

# E-Server 2006-2009

## Case studies

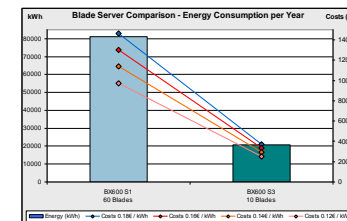
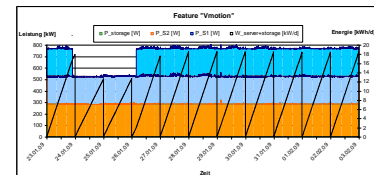
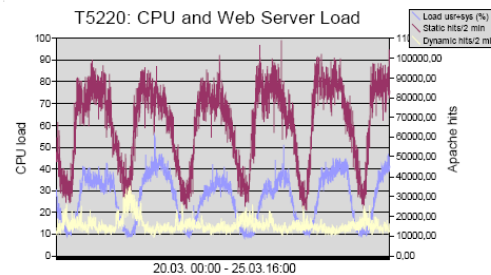
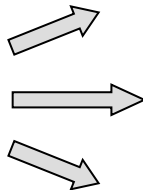
Consolidation on efficient rack servers

Consolidation on blades

Server virtualisation

Desktop virtualisation

Power management



➡ Energy savings between 24 and 90%,



# E-Server project

## *Energy Star for Servers – Version 1*

**Table 3: Base System Idle Power Requirements**

Computer Server System Type	Idle Power Limit
Category A: Standard Single Installed Processor (1P)	55 Watts
Category B: Managed Dual Installed Processor (1P)	65 Watts
Category C: Standard Dual Installed Processor (2P) Servers	100 Watts
Category D: Managed Dual Installed Processor (2P) Servers	150 Watts

**Table 4: Additional Power Allowances for Extra Components**

System Characteristic	Additional Idle Power Allowance
Additional Power Supplies (Greater than one for the purposes of power redundancy)	20 Watts/PSU
Additional Hard Drives (Greater than one)	8 Watts per Drive
Additional Memory over (4 Gigabytes)	2 Watts / GB
I/O Devices (Greater than 1Gbit)* Base: One or two port onboard Ethernet <=1 Gbit Additional Ethernet less than 1Gbit Additional 1 Gbit Ethernet Additional 10 Gbit Ethernet Fibre Channel or Infiniband	No Allowance No Allowance 2 W per Active Port 8 W per Active Port 5W per Device



# EU Ecodesign Directive activities

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PCs and Monitors - Regulatory Committee postponed, expected in April 2011

Imaging Equipment – voluntary agreement proposed in 2009 and 2/2011

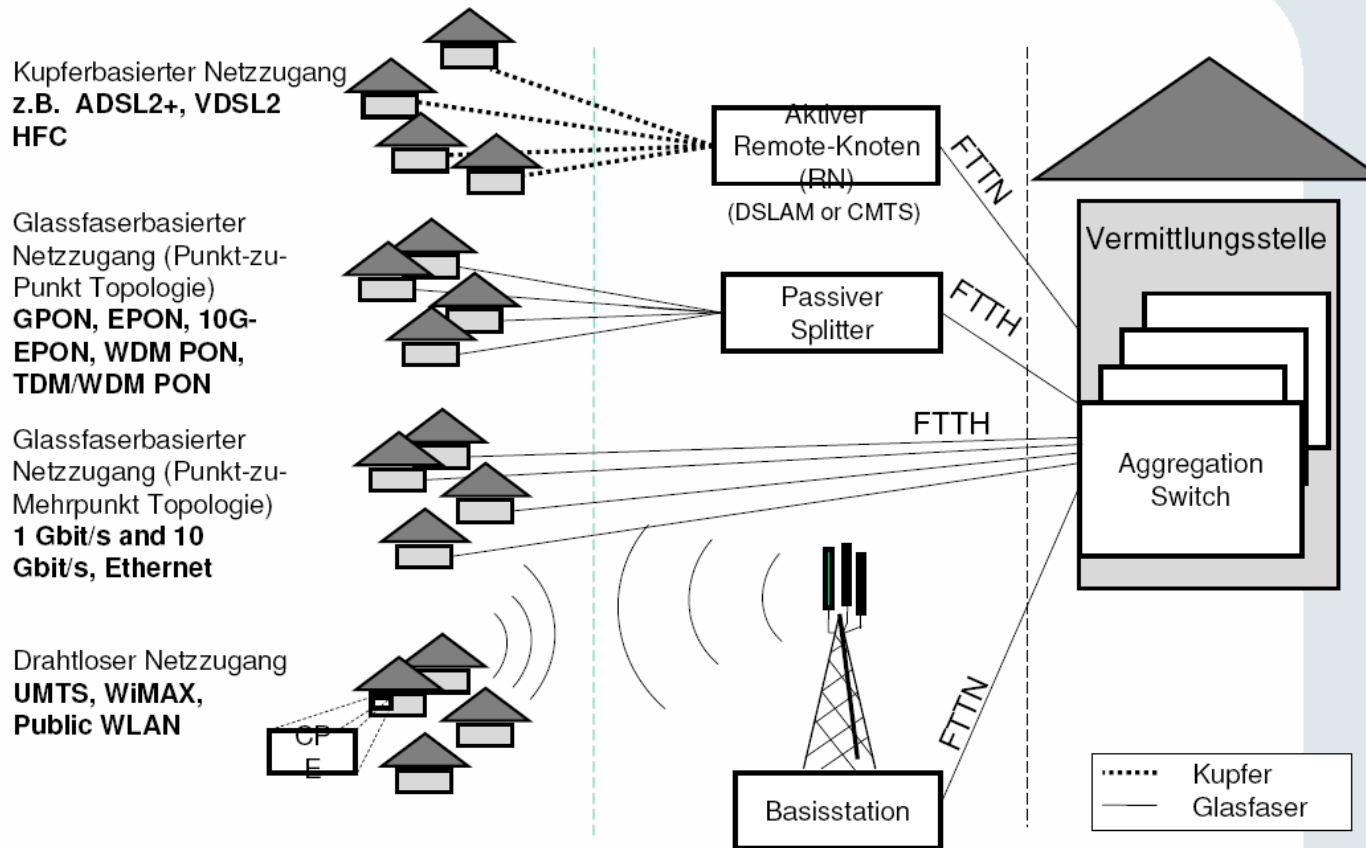
Central IT Equipment (Servers, Storage, Network Equipment)....

# Home ICT

## Network and domestic IT



### Relevante Netzzugangstechnologien



# PrimeEnergyIT

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Project duration: May 2010 – October 2012

# Project objectives

- I. Support of the development and implementation of **energy efficiency criteria** for storage and network equipment.  
Development and implementation of a set of service based metrics for central IT equipment (linked to the EnergyStar activities)
- II. **Evaluation, demonstration and dissemination** of energy efficient storage, network, server and cooling technology including best practise.
- III. Development and implementation of **education/training** for IT and infrastructure managers in the member states.
- IV. Development and implementation of **energy efficiency criteria for public procurement** of central IT equipment.
- V. Evaluation and dissemination of **certification schemes** for large data centres in national campaigns.

# Project objectives – long term

- I. Reduction of energy consumption in EU
- II. Implementation of mandatory efficiency criteria in EU for IT central equipment
- III. Implementation of energy efficiency criteria strategies on the side of target groups (IT experts, designers, manufacturers, managers, procurers, ...)

# Project outcomes – criteria for...

Evaluation of **energy efficiency** for storage and network equipment, with the development and implementation of a set of service based metrics for central IT equipment: at least 5 technologies will be covered with practical testing

Public procurement of **energy efficient** central IT equipment: case studies and guidelines will be available for different target groups

Evaluation and dissemination of **certification schemes** for large data centres in national campaigns.

## Project outcomes – support to...

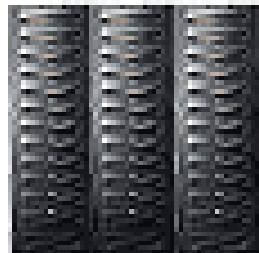
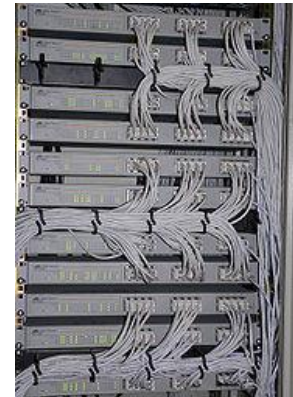
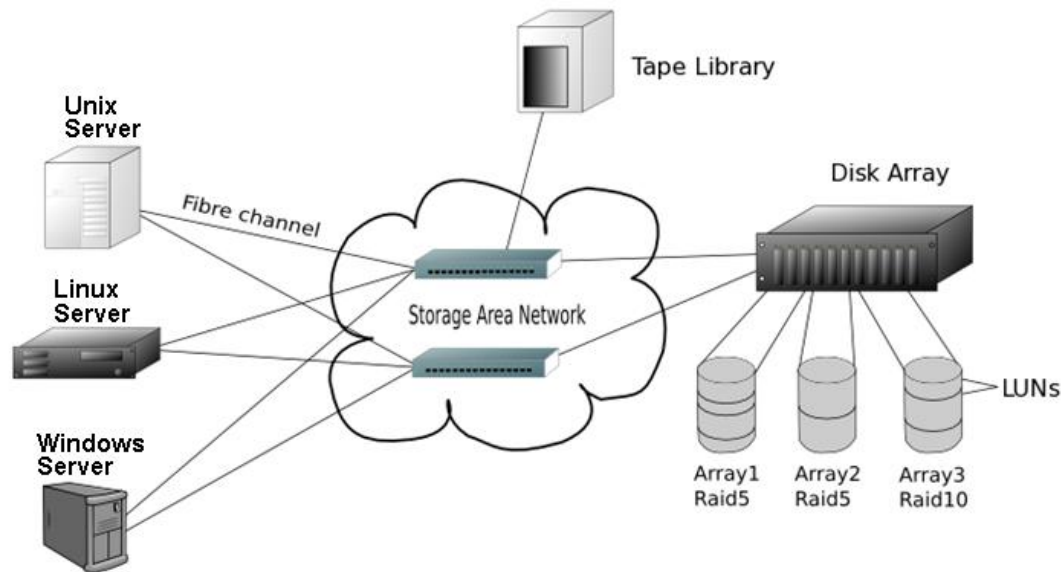
Education and training: one program in each country for IT and infrastructure managers

A training and education program for public procurers of energy efficient central IT equipment, in each country

Evaluation and dissemination of certification schemes for large data centres in national campaigns.



# PrimeEnergyIT- Product technology



# PrimeEnergyIT- Product technology

- Server
- Network
- Storage (disk, tape, flash, NAS, DAS, SAN, ..)
- Cooling
- Other services

# Project partner – industry

[Fujitsu Technology Solutions](#)

[EMC Europe](#)

[DELL](#)

[CISCO](#)

[Knürr](#)

[STULZ](#)

[Alcatel-Lucent](#)

[Arch Rock](#)

## Network

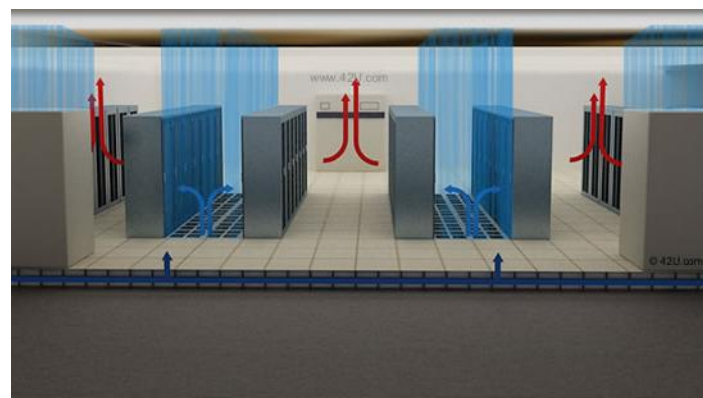
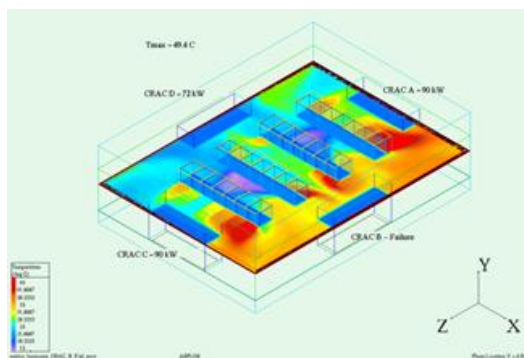
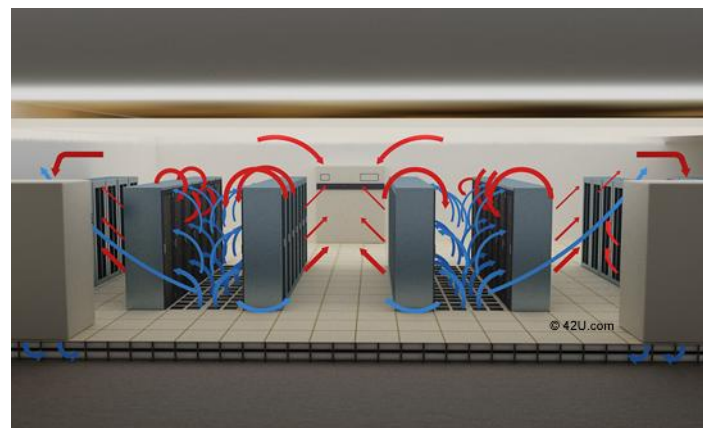
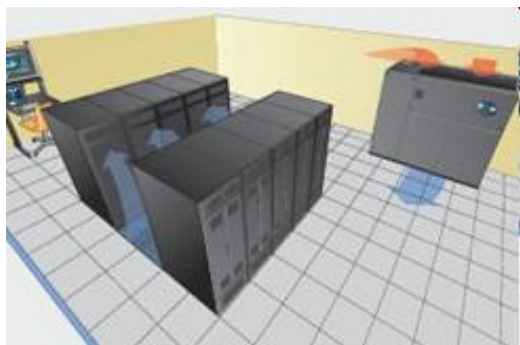
[EU Code of Conduct for Data Centres](#)

[The Green Grid](#)

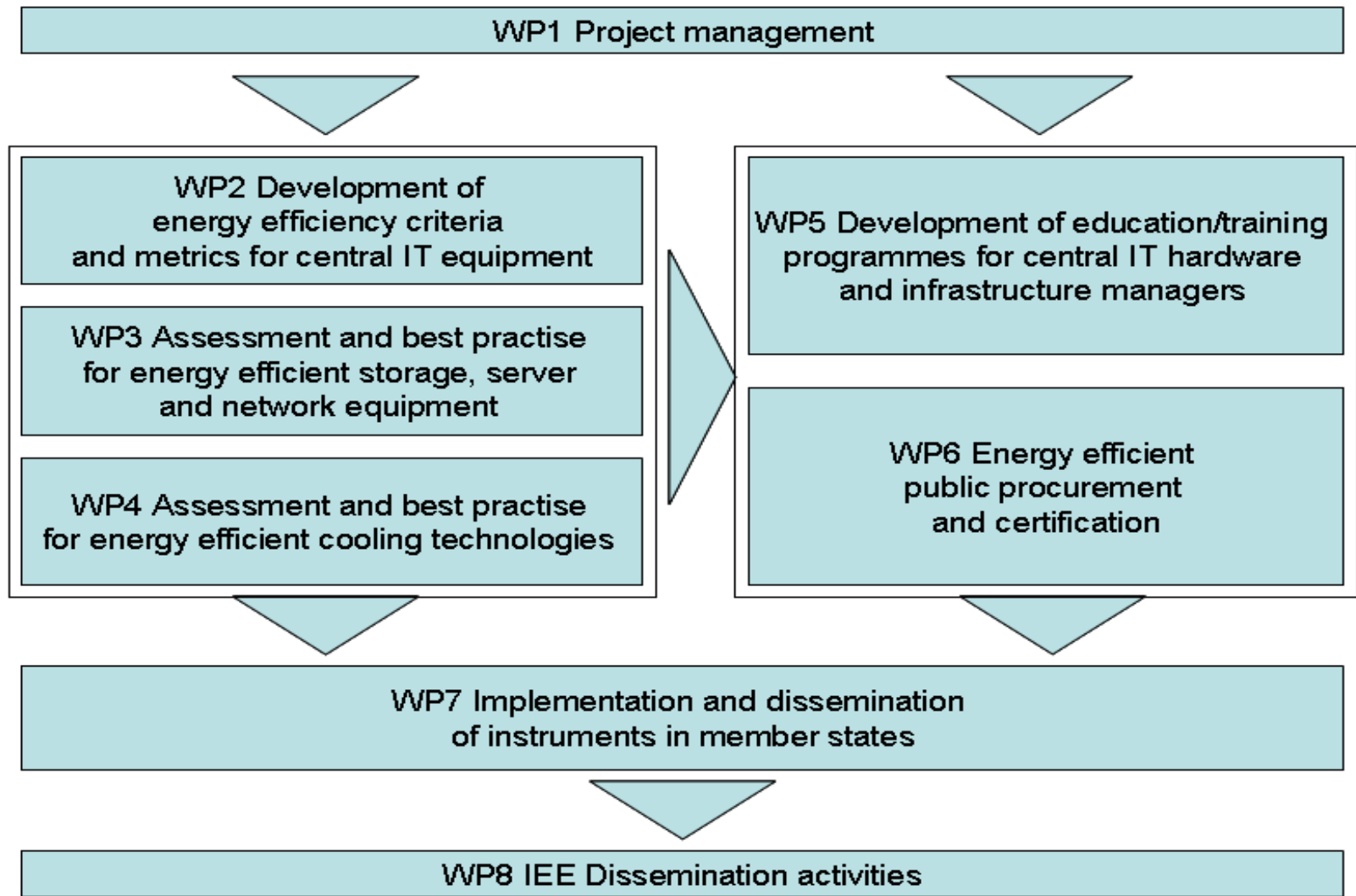
[SPEC - Standard Performance Evaluation Corporation](#)

[Energy Star programme](#)

# DC / CR Cooling



# Project structure

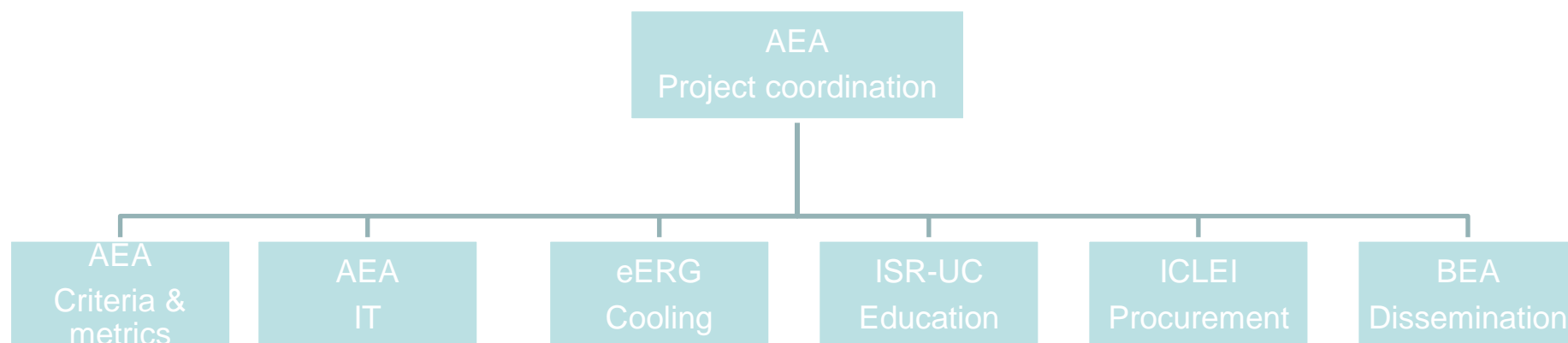


Start

Project

End

# Project structure – partners and responsibilities



# Project schedule

Project phase / Duration of the project (in months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<b>WP 1: Management</b>																														
T 1.1 Planning and controlling of WPs																														
T 1.2 Implementation of intranet																														
T 1.3 Preparation and lead of meetings																														
T 1.4 Lead of WPs																														
T 1.5 Reporting to EACI																														
<b>WP 2: Efficiency criteria &amp; metrics</b>																														
T 2.1 Hardware focussed metrics and criteria																														
T 2.2 Evaluation of metrics in DC level																														
T 2.3 Service based metrics																														
<b>WP 3: IT Hardware</b>																														
T 3.1 Efficient technologies (storage, network servers)																														
T 3.2 Best practice																														
<b>WP 4: Cooling</b>																														
T 4.1 Efficient cooling technologies																														
T 4.2 Best practice																														
<b>WP 5: Education concept</b>																														
T 5.1 Selection of co-operation partners																														
T 5.2 Design of education																														



# Project schedule

[illegible]

# Performance indicators

- **Support of the development and implementation of energy efficiency criteria for storage and network equipment. Development of a set of service based metrics for central IT equipment.**  
***Result Indicator:*** Significant contribution to the development and implementation of energy efficiency criteria for storage and network equipment as well as servers in the Energy Star program. Development and practical testing of a set of service based metrics for at least 5 services
- **Evaluation, demonstration and dissemination of energy efficient storage, network, server and cooling technology including best practise.**  
***Result indicator:*** Production and dissemination of best practise and procurement guidelines (brochures) focusing on storage and network equipment as well as new server and cooling technologies to 10000 representatives of the target group

# Performance indicators

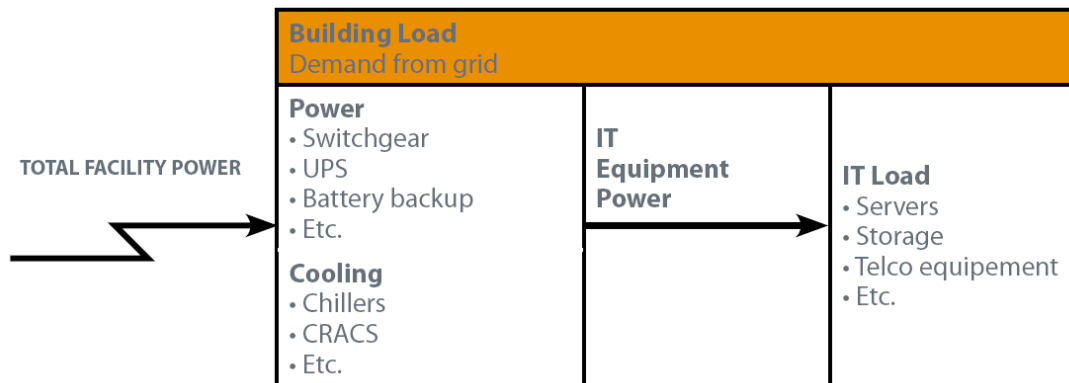
- **Development and implementation of education/training for IT and infrastructure managers in the member states.**  
***Result indicator:*** Development and implementation of one education and training programme per country targeting at training of overall 300 IT experts within the project period and 2000 experts in the upcoming years.
- **Development and implementation of energy efficiency criteria for public procurement of central IT equipment.**  
***Result indicator:*** Dissemination of concept and criteria to 3000 public service organisations. Implementation of energy efficiency criteria in 50 municipalities or organisations of the public service sector
- **Evaluation and dissemination of certification schemes for large data centres in national campaigns.**  
***Result indicator:*** Dissemination to 6000 companies. Implementation of certification in 100 companies due to the projects promotion activities

# Development of energy efficiency criteria and metrics for central IT equipment

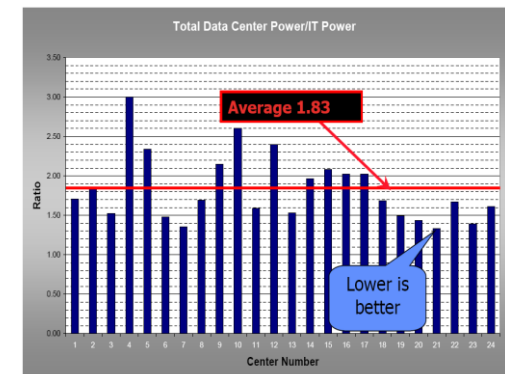
Supporting the development and implementation of criteria, metrics and labels at appliance level especially for storage, network and cooling equipment but also for servers with a focus on the Energy Star program and related initiatives.

Service based metrics (as also proposed by the Green Grid) shall be adapted or developed and tested for practical application. These metrics shall allow the assessment of the energy efficiency of IT in relation to the specific IT services and thus will go beyond the classic energy efficiency criteria for IT hardware.

# PUE Power Usage Effectiveness



$$\text{PUE} = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}} \quad \text{DCIE} = \frac{1}{\text{PUE}}$$



Quelle: Greenberg et al. 2006, LBNL 2006