

GRUPPO TELECOM ITALIA

Forum on "Energy Efficiency and Future Data Centers"

Amsterdam, 22/10/2014

Future Evolution of Green Networks

Franco Regis

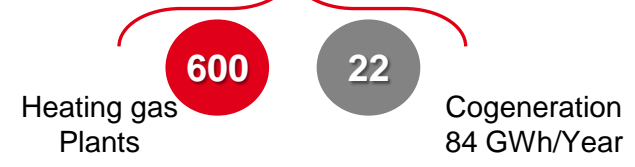
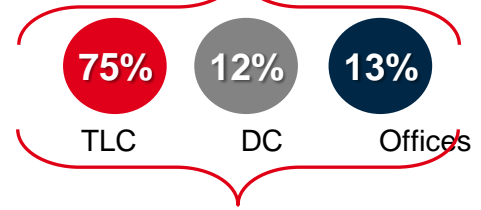
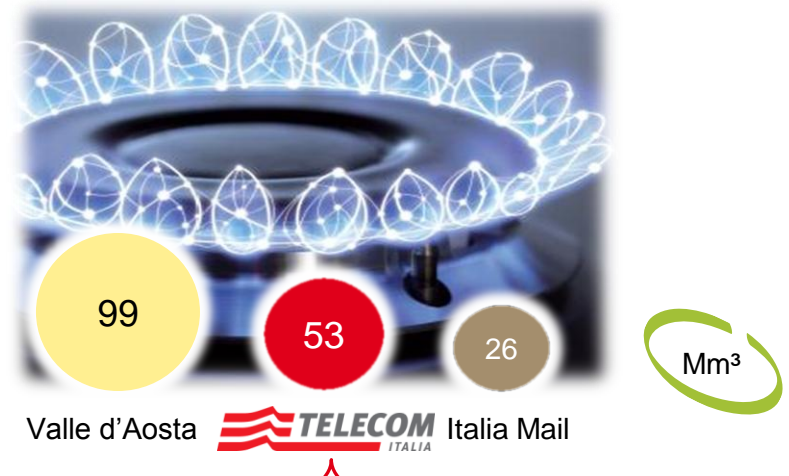
Telecom Italia,

Business Support Officer

Energy Purchasing & Management



Energy Consumption and Energy Efficiency in Telecom Italia - Our Energy needs



100% of the electricity consumed by TI, comes from a renewable source

100%

Energy Efficiency for Telecom Italia is a priority:

- Economical
- Ethical
- Social

widespread distribution

- ▶ ~ 35.000 Consumption Points
- ▶ ~ 1.000 sites in medium voltage (offices and large central offices, CED)
- ▶ thousands of sites in low-voltage (Small and medium Central offices, SRB)



Future Evolution of Green Networks

Energy Consumption and Energy Efficiency in Telecom Italia - Why TLC have to invest in energy efficiency

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ICT operators business implies to take less and less energy to move information all over the world in the shortest time and in the most efficient way possible

Since 2011 the mission of Telecom Italia's **Energy Purchasing & Management** unit is to provide energy to the whole Group in terms of resources, efficient distribution and use.

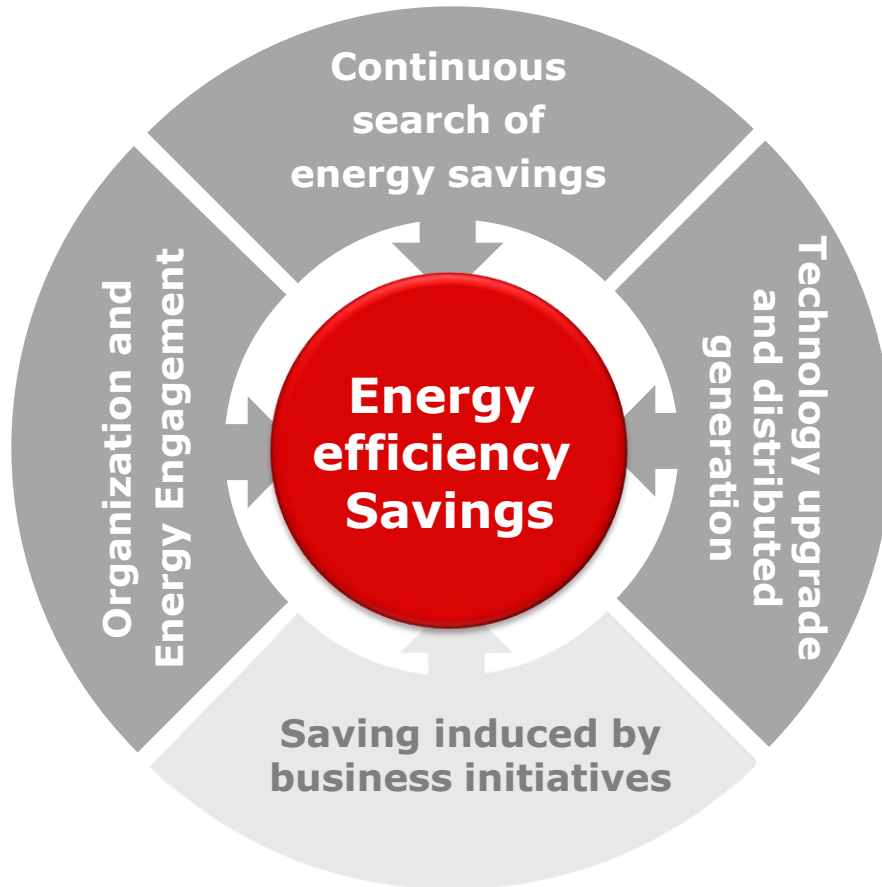
Today energy efficiency is not only a matter of economics, but also, and of equal importance, is a matter of sustainability.

Energy Management in Telecom Italia

Energy strategy pillars

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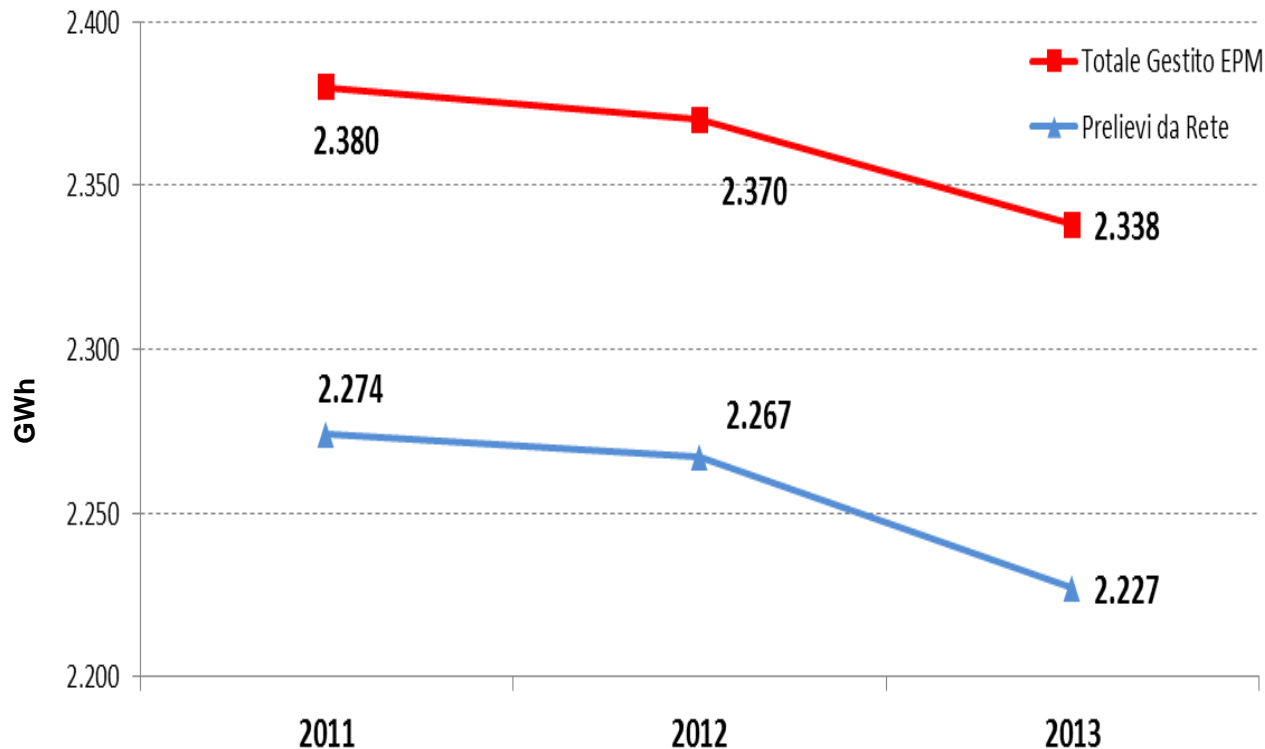


Our energy efficiency strategy is based on three pillars

- **Continuous search of energy savings**
- **Technology upgrade and distributed generation**
- **Organization and Energy Engagement**

Energy Consumption and Energy Efficiency in Telecom Italia

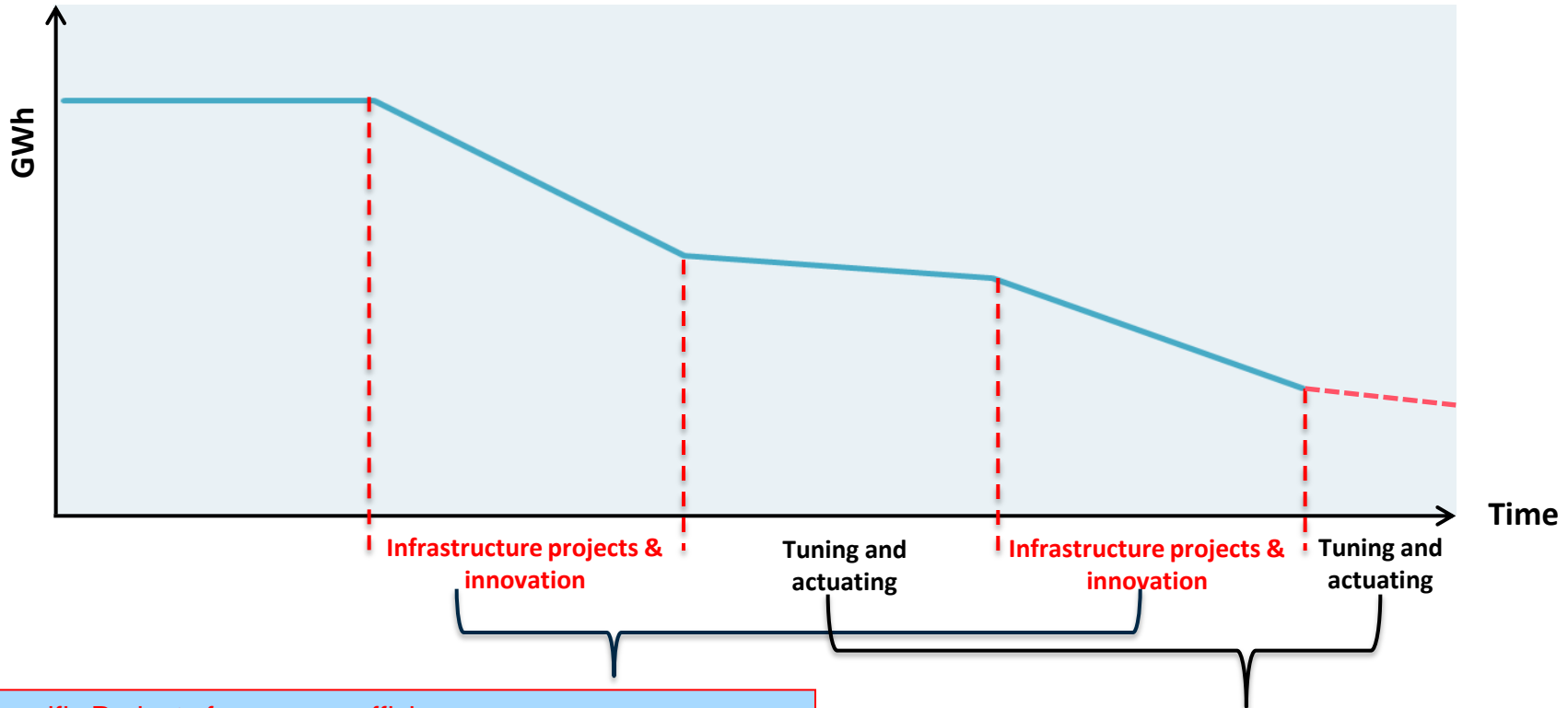
Trend in 2011-2013



The TLC are physiologically subject to an annual consumption increase of about 4-5%.

Despite this, Telecom Italia has reduced the growth trend of bringing energy consumption to the values lower than those of 2011

Energy Consumption and Energy Efficiency in Telecom Italia - our approach

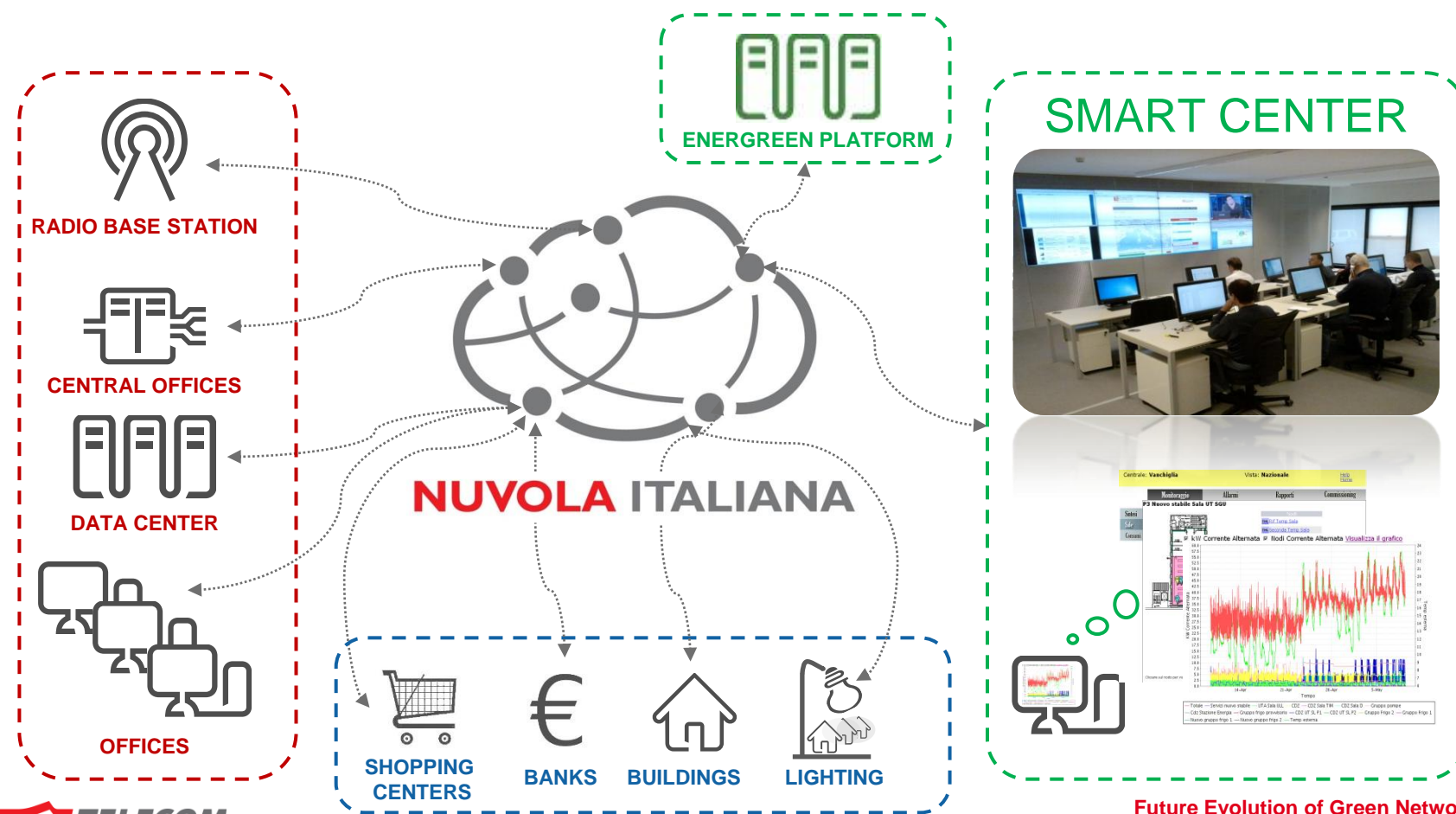


- Specific Projects for energy efficiency
- ▶ Higher Temperature policy for CO and RBS
 - ▶ Massive free cooling deployment
 - ▶ Infrastructural projects (new power system, new chillers)
 - ▶ Trigenerator plants
 - ▶ Innovative technology development (mobile, ...)
 - ▶ (Next Generation Data Center)
 - ▶ LED massive deployment

- ▶ **Monitoring and Tuning**
- ▶ **Consumption profile**
- ▶ Data analysis (site, cluster)
- ▶ Energy management

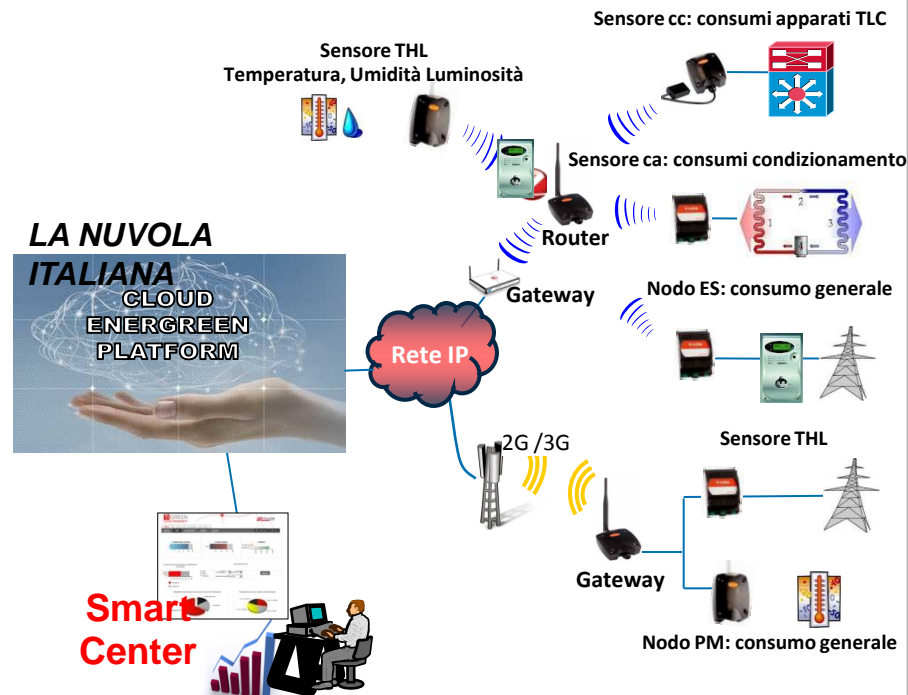
SMART CENTER: applying technology and innovation

The Smart Center of TI oversees the design, testing and proper functioning of sensor networks for the collection of energy data of Telecom and its customers. It is also involved in Business Intelligence, Business Analysis and Energy Management.



Smart Center: TI internal near real time submetering

- ▶ **Central Offices**
400 CO 19.500 submeters (nodes/sensors)
- ▶ **Radio Base Stations (SRB)**
2.163 SRB 9.700 nodes/sensors
- ▶ **Data Centers**
7 DC 700 nodes/sensors
- ▶ **Offices**
23 sites 3.000 nodes/sensors
- ▶ **Shops**
10 sites 170 nodes/sensors

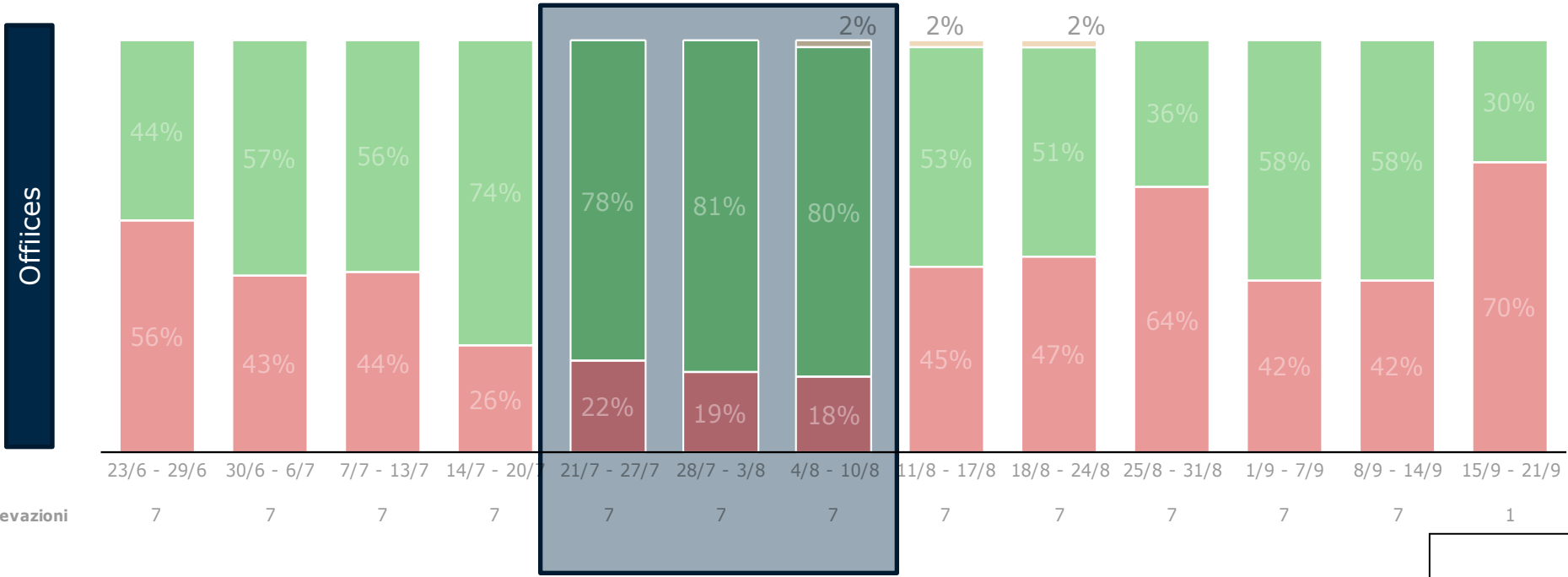


33.000 nodes/sensors ➡ **1.250 GWh** ➡ **54% of total Telecom Italia energy consumptions, 0,5% of Italy consumption**

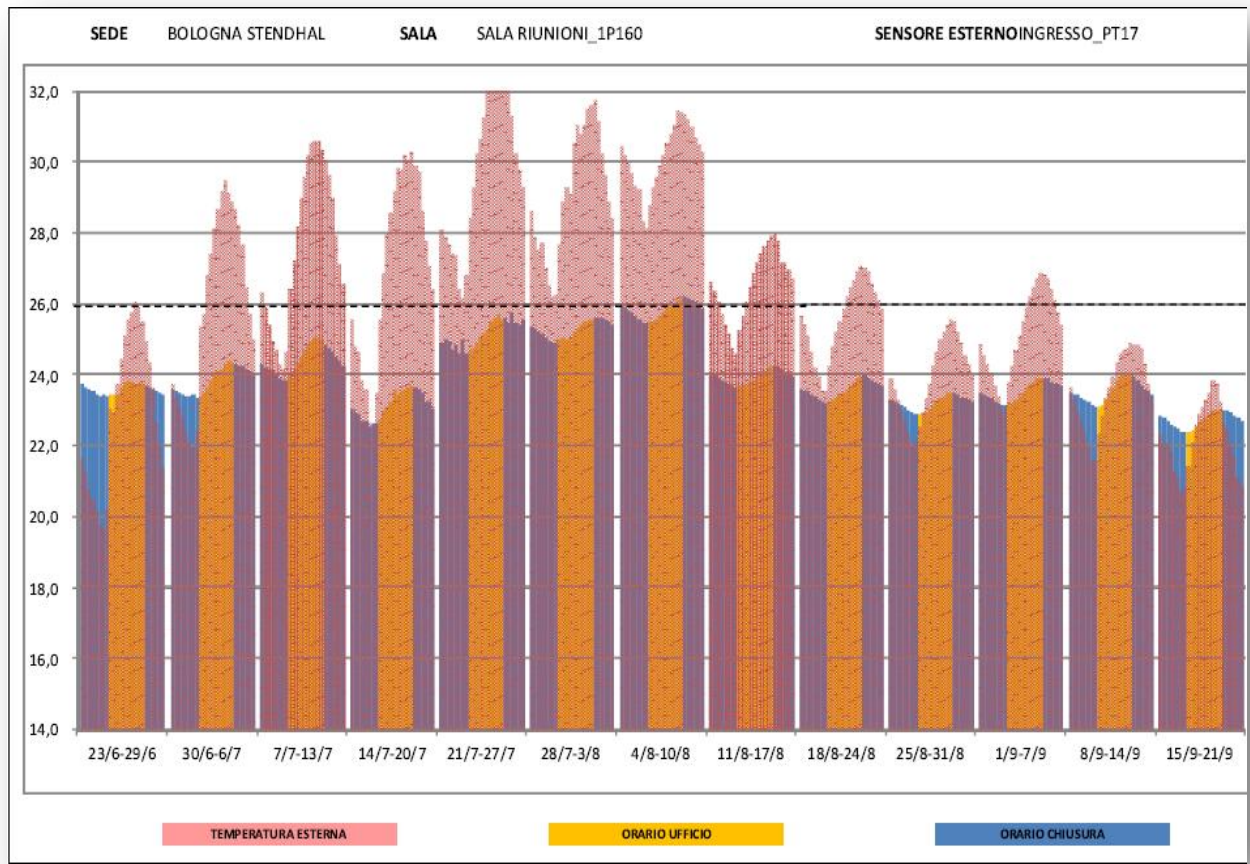
- ▶ **26 Trigeneration Plants**
- ▶ **106 Phovoltaic small installations**

- ▶ **6 Geothermal plants**
- ▶ **1 Solar Cooling plants**
- ▶ **Gas & Water Meters**

Policy monitoring– Office Temperature Weekly Snapshots % temperature vs policy



Policy monitoring– Office Temperature summer Snapshot – Hourly profile vs external temperature



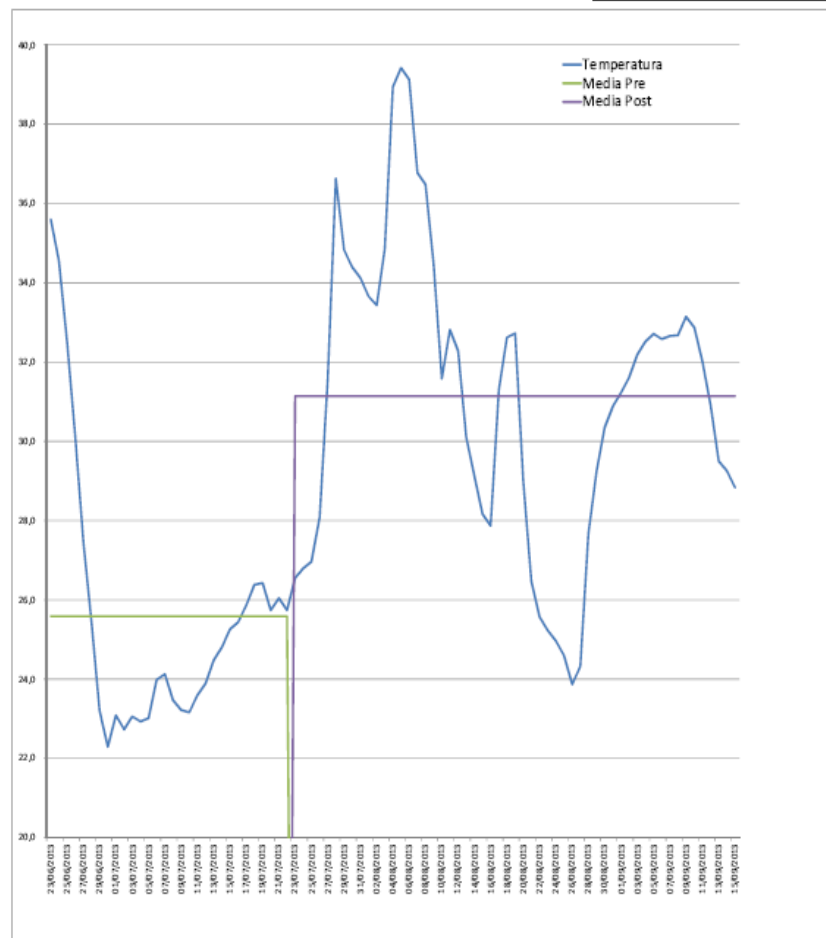
Off time temperature equal or lower than working time temperature

Temperature policy in Central Office

Snapshot – trouble ticket analysis

IA	SEDE	Data Verifica	TIPO_SALA	SALA
CE	ROMA TUSCOLANA	23/07/2013	CMX	SALA CX_PCO004
IMPRESA				
ATI E&T				
Temperatura prevista da normativa °C	Sala con Free Cooling Si/No	Problema reale Si/No	Apparato o tecnologia che vincola la temperatura max di sala	Note
30,3	NO	SI	NV	set point errato

T media pre	T media post
25,6	31,1



IA	SEDE	Data Verifica	TIPO_SALA	SALA
CE	ROMA TUSCOLANA	23/07/2013	CMX	SALA CX_PCO004
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t target °C	Temperatura prevista da normativa °C	Sala con Free Cooling Si/No	Problema reale Si/No	Apparato o tecnologia che vincola la temperatura max di sala
30,3	30,3	NO	SI	NV

T media pre	T media post
25,6	31,1

- Wrong **set point** brought a new TT
- **After the set point fixing, Central Office temperature increased (5 degrees more)**
- **Free Cooling to be installed**



Trials originated through relationships with research centers, universities, innovative suppliers and the support of the R&D of Telecom Italia

Projects implemented in 2012/2013

- ▶ FV shelter for Radio Base Stations
- ▶ Public Telephony project
- ▶ Energy BOX
- ▶ Low energy light bulbs to LED technology
- ▶ Geocooling Plants
- ▶ SMART lighting for offices with presence detectors
- ▶ Solar Cooling

Projects to be implement 2014/2015

- ▶ Free air cooling
- ▶ Mini- micro wind turbine
- ▶ Shelter with passive Cooling
- ▶ Battery Cooling
- ▶ Fuel Cell (including hydrogen production on site)
- ▶ UPS Smart Grid ready (high efficiency)
- ▶ new types of sensors (harvesting)
- ▶ Sustainable mobility for engineers territory
- ▶ energy engagement for employees

From 2011 to now:

more than **50**
innovative **solutions**
analyzed ;

17 of these have
turned into **field tests**
which are followed
specific energy saving
projects

Smart Lamps in offices

R&D success case

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In collaboration with Telecom Italia R&D (TILab) and the competence center IEEM, we have written technical specifications and a test protocol for a tender in order to have smart lamps with:

- Easy replacement
- Low consumption light bulbs (preferibly led)
- Dimmer switches
- Switch on/off system based on the presence of people in the offices
- 2 years payback

The samples received were tested in the energy laboratory in Testing Labs where a special test bench has been prepared. This test was followed by a trial phase in which samples were evaluated in the offices. This permitted us to refine and consolidate the technical solution.

With this strong collaboration between suppliers and R&D, we have set up smart lamps with the required characteristics, that **weren't on the market.**

•28 samples from 9 different suppliers are tested:
•Only 4 suppliers passed the tests and now are being massively deployed in the offices

a collaboration with IEEM- politecnico of Turin (**Indor Environment & Energy Management**) has been active in supporting Telcom Itaia in innovative energy and research solutions

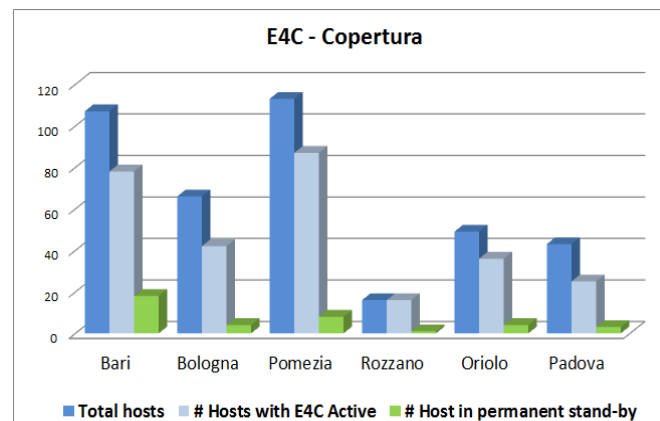
Working Capital-Success case:

Born as a project of Working Capital in 2011, Eco4Cloud aims at reducing power consumption in the data center by balancing the computational load on the smallest possible number of hosts on the farm VMware, turning off those in excess

After a field test on a Data Center in Telecom Italia, we were able to **refine the prototype into a commercial solution**, which will be installed in all Telecom Italia's Data Centers.

The E4C consolidation will cover about 70% of the perimeter expected and permanently turns off 13% of the host

FARM	Total hosts	# Hosts with E4C Active	# Host in permanent stand-by
Bari Consolidation (Production)	17	12	5
Bari Consolidation (Test & Dev)	21	21	3
Bari NGDC (Test & Dev)	60	36	8
Bari vCloud (Test & Dev)	9	9	2
Bologna Consolidation (Production)	22	15	2
Bologna NGDC (Production)	44	27	2
Oriolo Consolidation (Production)	30	18	2
Oriolo NGDC (Production)	19	18	2
Padova Consolidation (Production)	16	16	3
Padova NGDC (Production)	27	9	0
Pomezia Consolidation (Production)	26	0	0
Pomezia NGDC (Production)	56	56	4
Pomezia NGDC (Test & Dev)	31	31	4
Rozzano NGDC (Production)	16	16	1
GrandTotal	394	284	38



Energy Strategy pillar

Technology upgrade and distributed generation in DC

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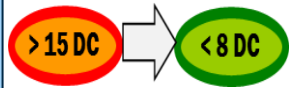
Technology upgrade



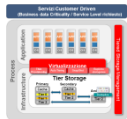
▶ Legacy platform decommissioning



▶ Next Generation Data Center



▶ Consolidation DC



▶ Consolidation Storage



▶ Wake on LAN

UNIX

VS



▶ Infrastructure evolution



▶ Eco4cloud

Distribuite generation and more efficient new solution



▶ Cogeneration



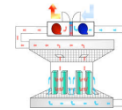
▶ New Green Data Center



▶ Warm Plenum and hot cold aisles



▶ Rotating UPS



▶ Free Cooling



▶ Self conditioning
Rack



▶ Timing on lights

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2013-2014 Results:

- ▶ Saving 2013: 142 GWh - compensate inertial growth and savings
- ▶ ISO 50001 Certification TelecomItalia: April 2013 extended in 2014
- ▶ Partnership with the Ministry of Environment 2013/2014: Project Carbon Footprint
- ▶ ISO 14064 Certification: Bologna Corticella site- by 2014
- ▶ Certification PUE CED Rozzano: April 2014
- ▶ TEE: approved 25 projects (corresponding to 50.000 TEP/year) and 20 submitted pending approval
- ▶ 'Real time' Monitoring of energy consumption: over 50% of total consumption TelecomItalia (0,5% of Italian consumption).
- ▶ Networks with 33,000 nodes / sensors installed.
- ▶ Autogeneration: 11 new plants to increase production capacity by over 70%.
- ▶ Lighting: replaced NEON lamps with LED lamps in our buildings . Reduced spending by 30%



These activities have allowed Telecom Italia to obtain a Rating of *Best in Class* in the TLC sector in the Dow Jones Sustainability Indexes World and Europe.

**The cheapest energy is
energy that hasn't been used.**

Thank you