

NRG4CAST

ENERGY FORECASTING

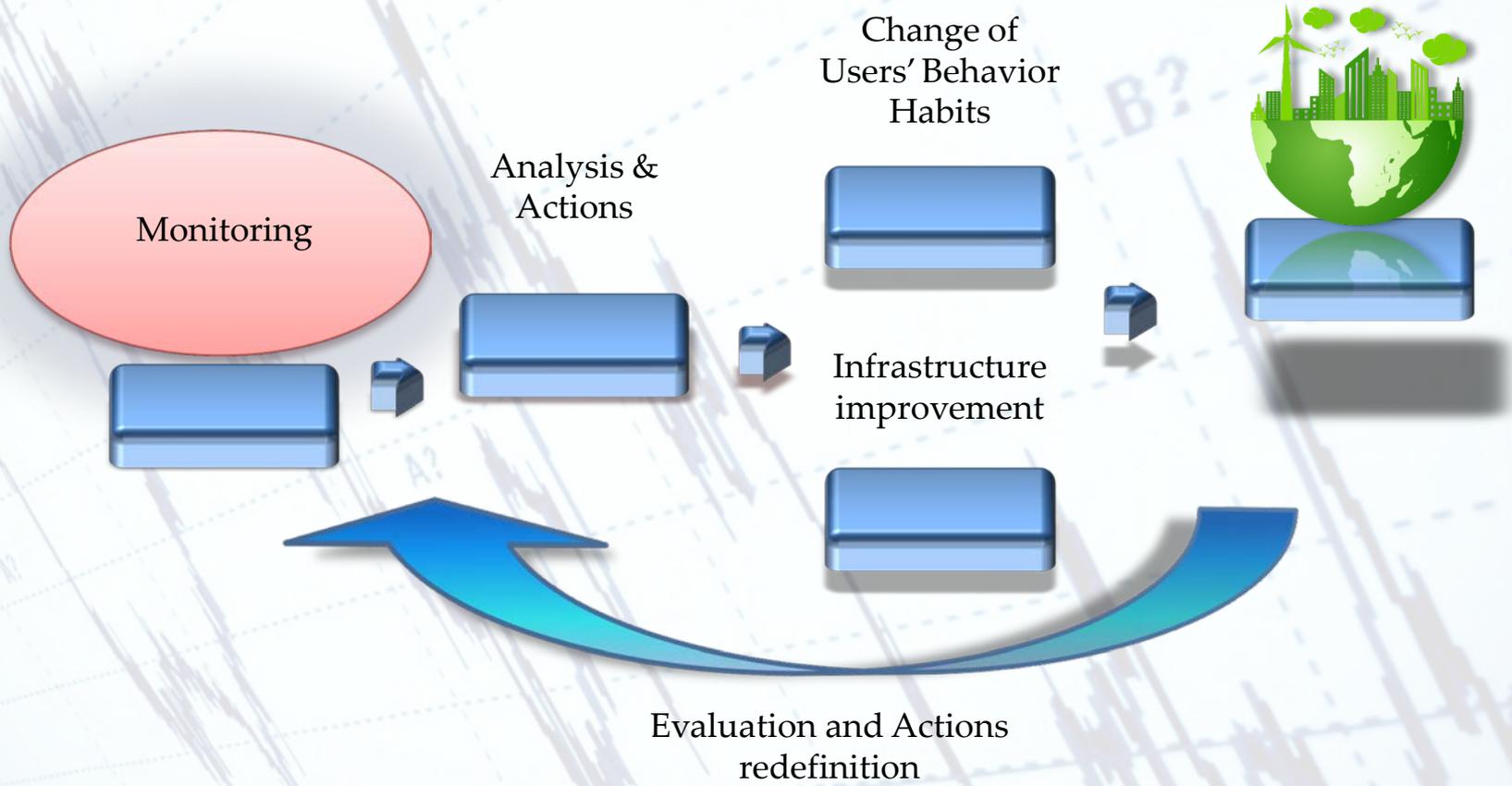
ΥΠΗΡΕΣΙΕΣ ΕΝΕΡΓΕΙΑΚΗΣ ΠΡΟΓΝΩΣΗΣ ΚΑΙ
ΔΙΑΧΕΙΡΙΣΗΣ

Τετάρτη 18 Νοεμβρίου 2015

NTUA Case Study
Ass.Prof. Irene P.Koronaki



NTUA Scope



NTUA Campus

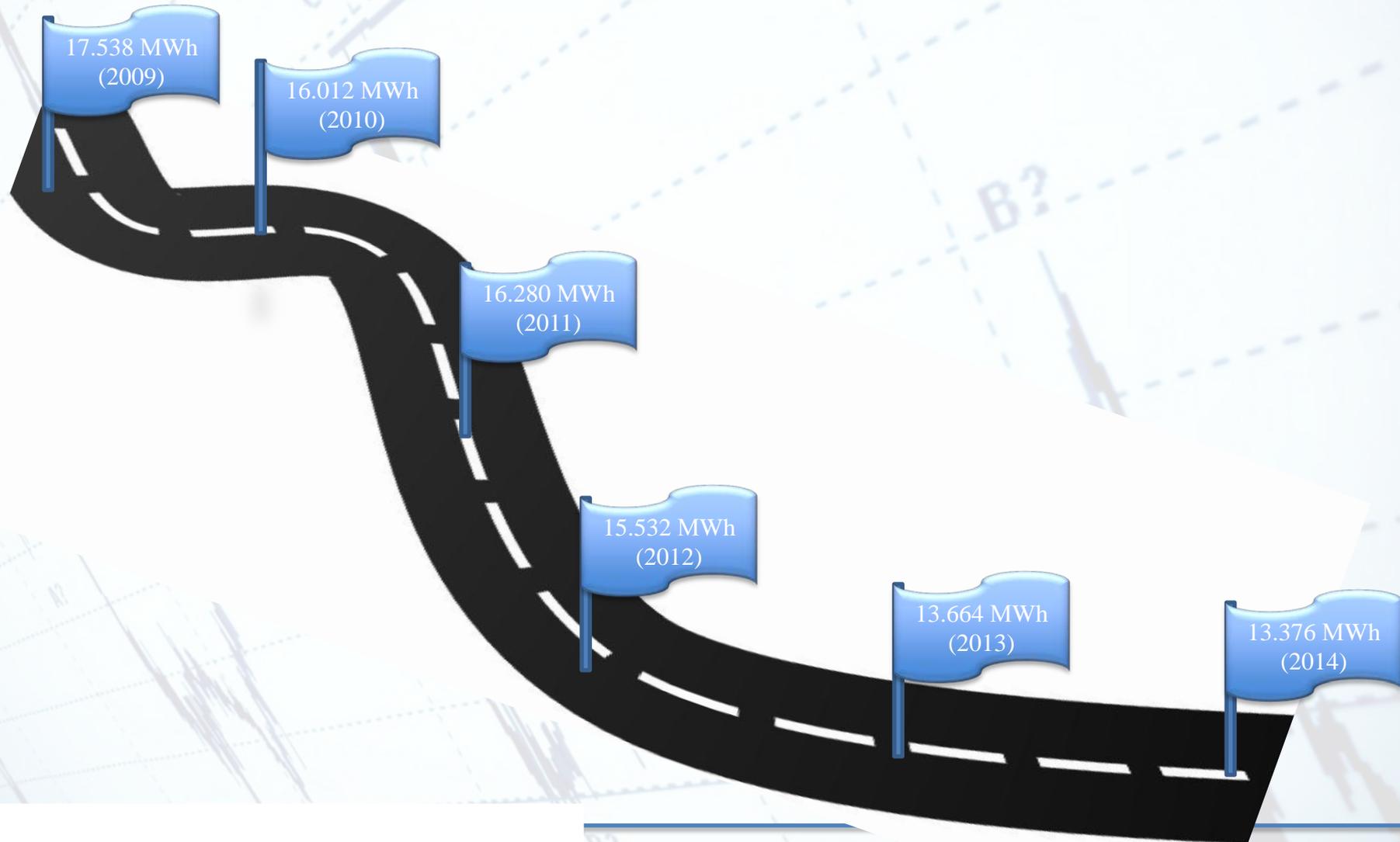
- School of Civil Engineer
- School of Mechanical Engineer
- School of Electrical and Computer Engineering
- School of Chemical Engineering
- School of Rural and Surveying Engineering
- School of Mining Engineering and Metallurgy
- School of Marine Engineering
- School of Applied Mathematical and Physical Science



Annual energy needs are:

- Annual heating needs: 8100MWh
- Installed heating power: 25MW
- Installed cooling capacity: 14.5MW (70% due to heat pumps)
- Annual electricity needs are round 16000MWh and gradually decreasing

Annual Energy Consumption of NTUA



Current Situation



Analog Door instruments



Departures other (Tables of Low Voltage)
from 250 A to 2000 A.



Regulations

Regulations for the design and operation of buildings

- 2002/91/EK «Οδηγία για την ενεργειακή απόδοση των κτιρίων»
- 2006/32/EK «Οδηγία για την ενεργειακή απόδοση κατά την τελική χρήση
- Ν 3661/2008 «Μέτρα για την μείωση της ενεργειακής κατανάλωσης και άλλες διατάξεις». Εναρμόνιση με 2002/91/EK
- Υπ. Απ. Δ6/Β13826, ΦΕΚ 122/Β/07 «Μέτρα για την βελτίωση της ενεργειακής απόδοσης και την εξοικονόμηση ενέργειας στο Δημόσιο και ευρύτερο δημόσιο τομέα»
- ΚΕΝΑΚ ΚΥΑ Δ6/Β/οικ.5825/30-03-2010

Electrical Installations

- ΕΛΟΤ HD 384 «Απαιτήσεις για ηλεκτρικές εγκαταστάσεις»
- IEC standard 61140 «Protection against electric shock – Common aspects for installation and equipment»
- DIN VDE 0100-600 (2008-06) «Low Voltage Electrical Installations»

Regulations

Automation Standards

- ISO 16484 «Building automation and control systems – BACS»
- EN 14908 «Open data communication in building automation, controls and building management»
- EN 50090 «Home and building electronic systems – HBES»
- IEC 61850 «Power Utility Automation»
- Modbus Standard

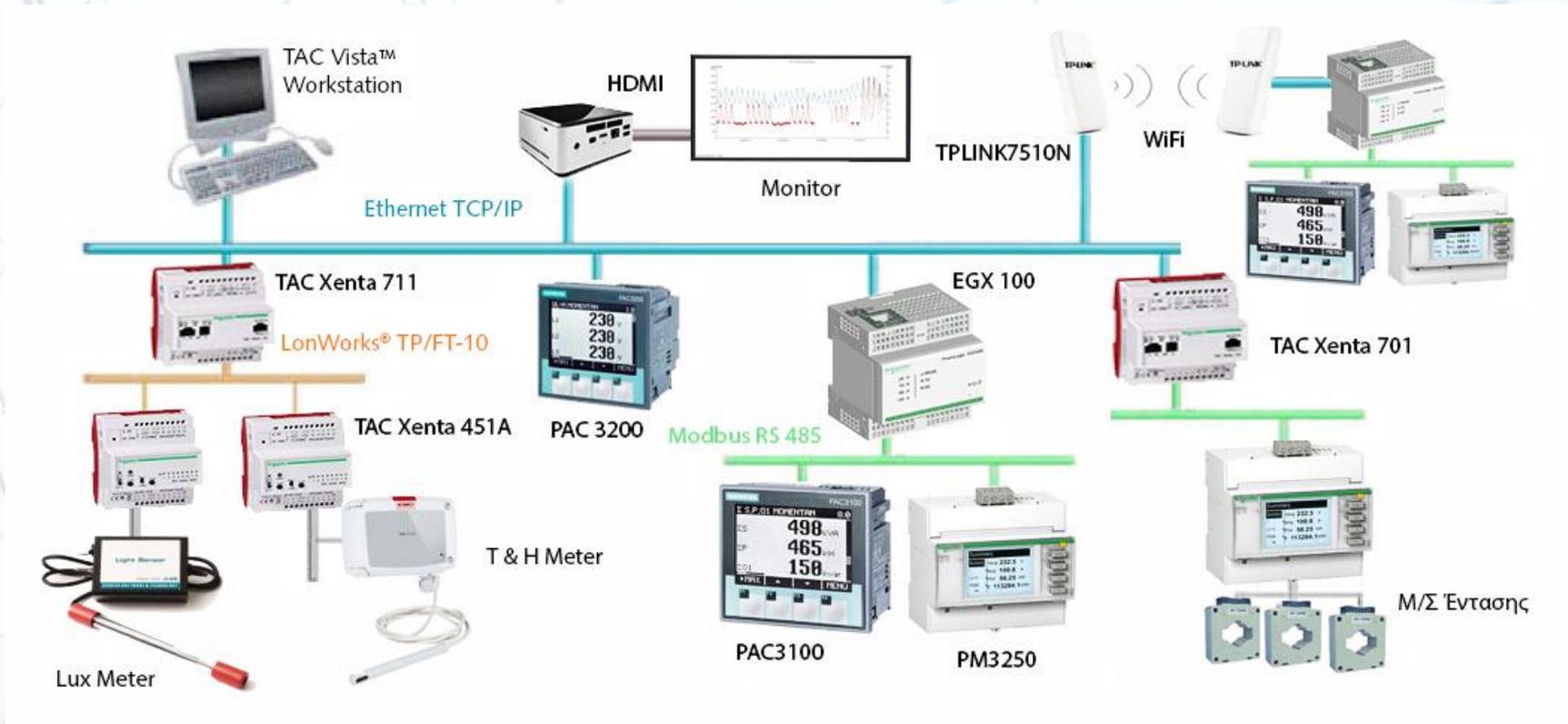
Additional Standards

- IEEE 802.3 «Ethernet Protocol»
- IEEE 802.11 «WiFi Protocol»

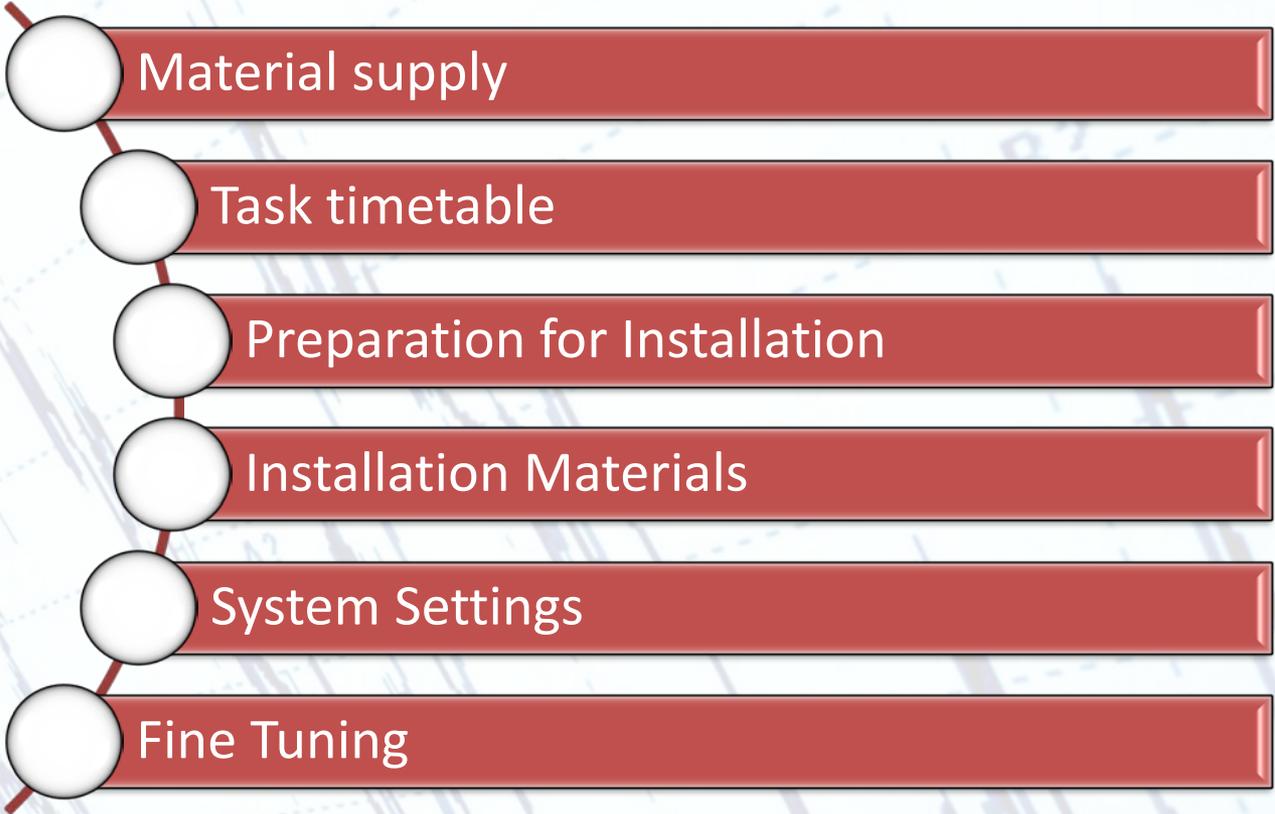
System's Definition



System's Topology



Implementation phases



System Installation



Εγκατάσταση Μ/Σ έντασης



Εγκατεστημένος μετρητής πόρτας PAC3100

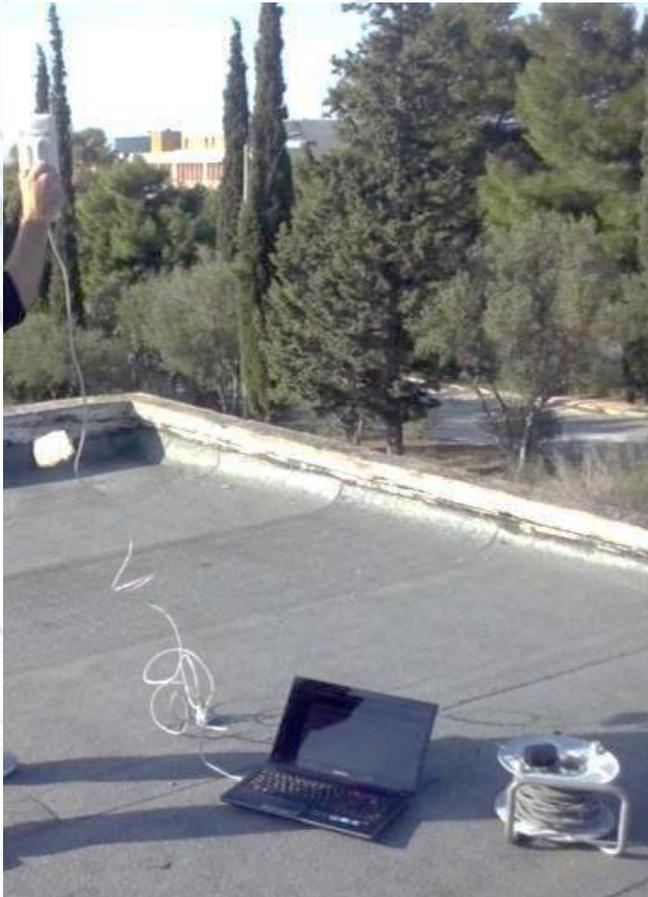


Μετρήσεις σε
αναχωρήσεις άλλων ΠΧΤ



Εγκατάσταση μετρητών ράγας
σε εξωτερικό επίτοιχο πίνακα

System Installation



Control point with the strongest signal transmission

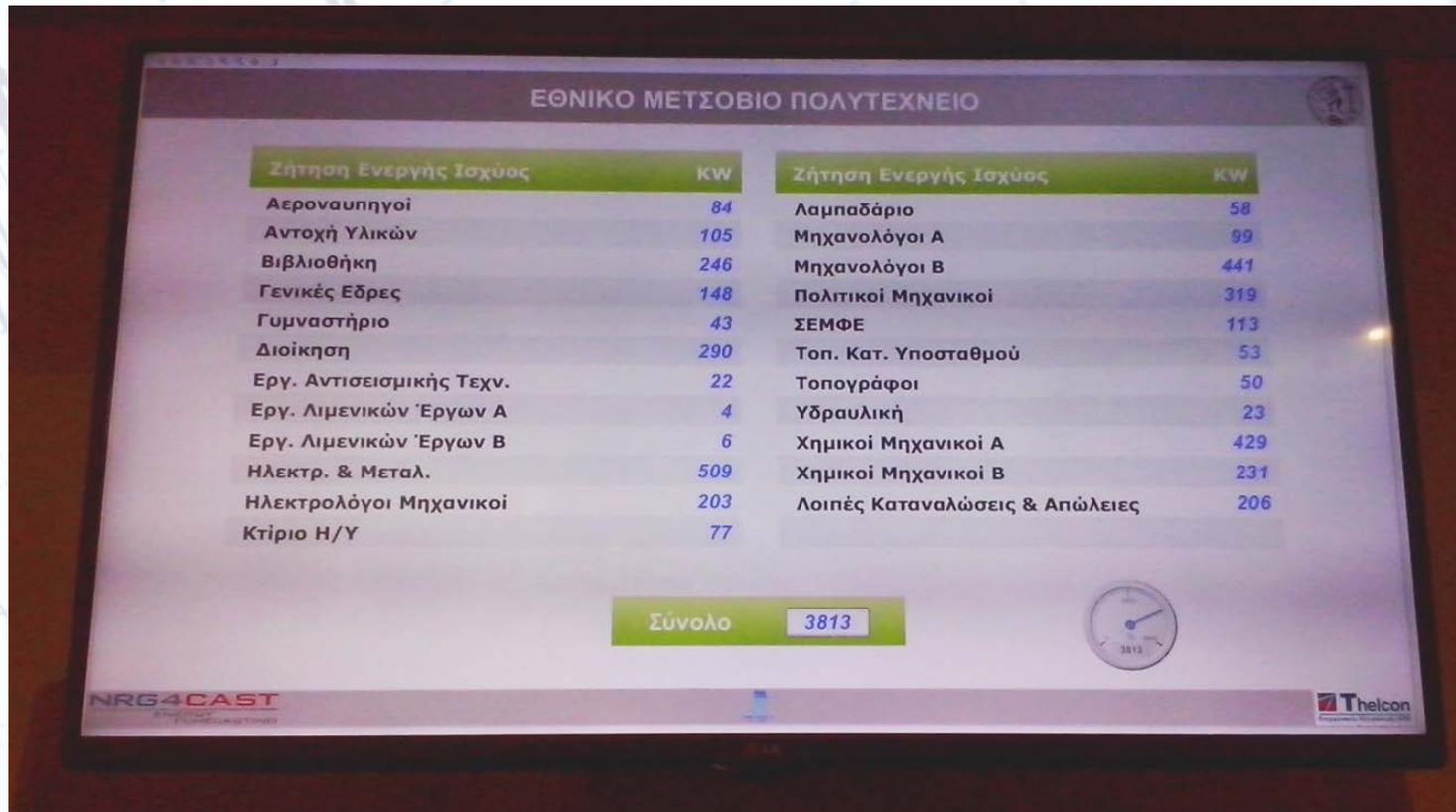


Xenta Controller 711 & I/O Modules



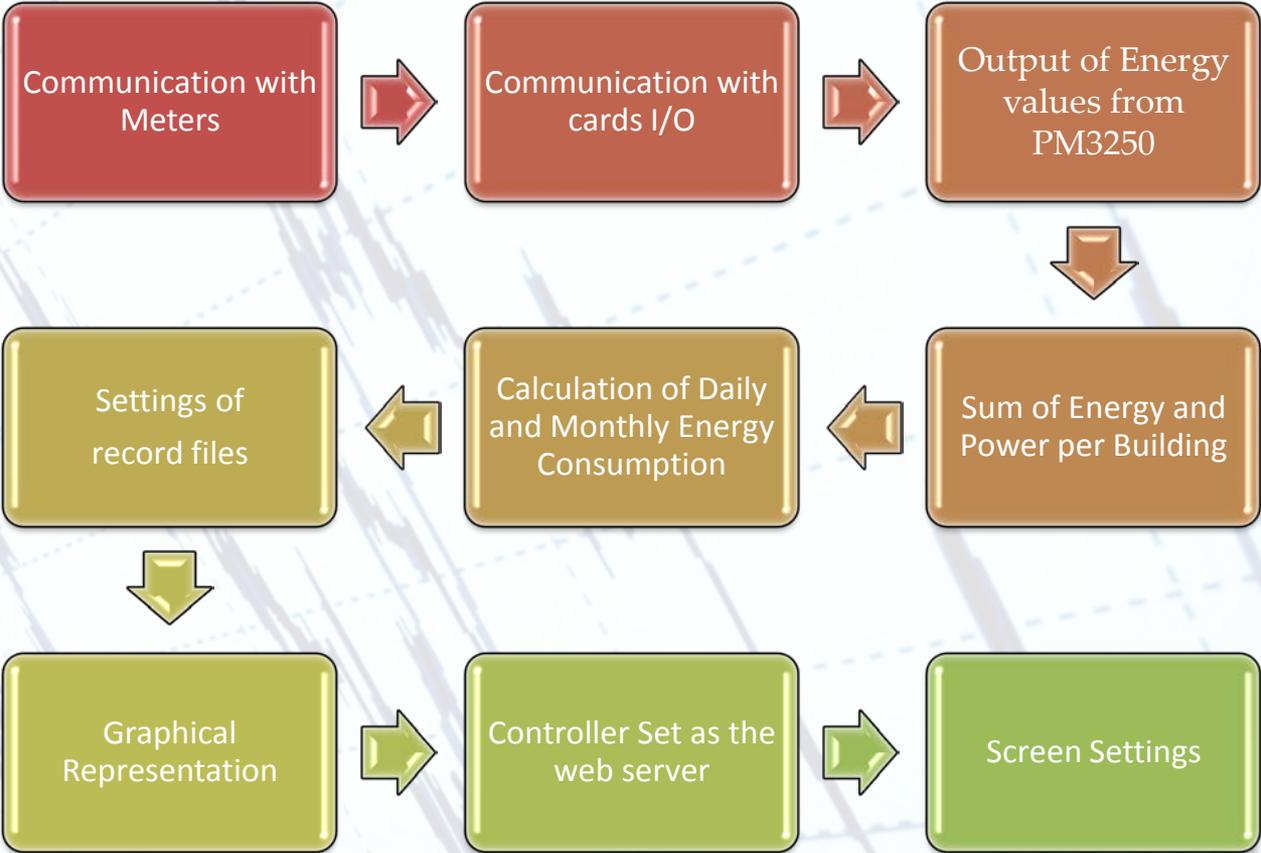
Xenta Controller 701

System Installation



Projection screen showing buildings power demand

System Settings



Management System's Environment

The screenshot displays the TAC Vista Workstation interface, which is used for energy monitoring and management. The main window shows a list of buildings (BUILDING1 to BUILDING10) and a table for 'Active Power'.

Building	Active Power
BUILDING1	
BUILDING2	
BUILDING3	
BUILDING4	
BUILDING5	
BUILDING6	
BUILDING7	
BUILDING8	
BUILDING9	
BUILDING10	

The TAC Menta window shows a detailed view of 'Menta Object 1' with a network diagram. The diagram illustrates the flow of data from 'HFAI' (High-Frequency Analog Input) modules through 'RAW' (Raw) and 'COD' (Coded) stages to 'HFB' (High-Frequency Binary) modules. The diagram is organized into two columns of HFB modules, with labels B09 through B19. The left column includes HFB B09, B10, B11, and B12. The right column includes HFB B15, B16, B17, B18, and B19. Each HFB module is connected to a 'RawVal' (Raw Value) module, which is in turn connected to a 'CODDelay' (Coded Delay) module. The 'CODDelay' modules are connected to the 'HFAI' modules. The diagram also shows a 'COD' (Coded) module connected to the 'HFAI' modules. The diagram is labeled with 'Menta' and 'Close Menta' buttons.

The TAC Vista Workstation interface includes a menu bar (File, View, Graphics, Tools, Window, Help), a toolbar, and a folder tree on the left. The folder tree shows the following structure:

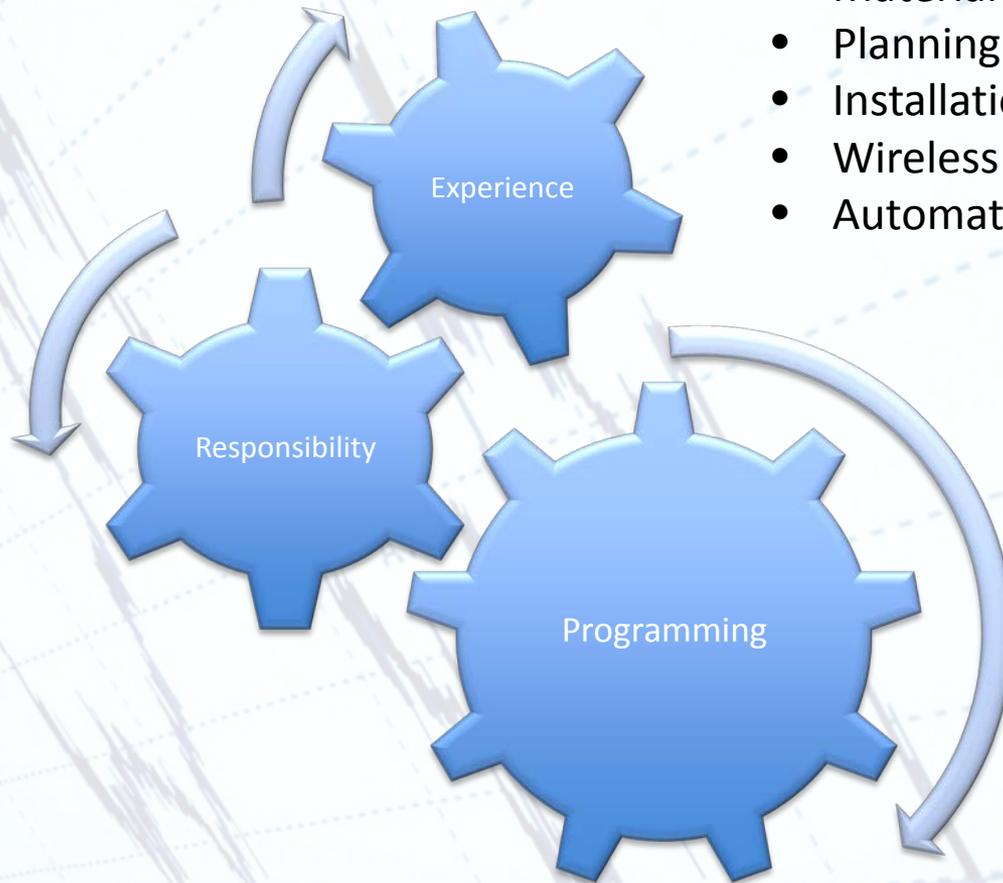
- TAC Vista
 - Graphs
 - Graph Templates
 - LV Panel 1 PAC
 - LV Panel 1 PM
 - LV Panel 2
 - LV Panel 3
 - PAC3100
 - PAC3200
 - PM32
 - Daily Cor
 - Monthly
 - Power De
 - Reception
 - Meters
 - Reports
 - Transactions
 - VistaServer
 - 701*
 - Xenta701
 - Xenta711

The TAC Vista Workstation interface also includes an 'Alarms' section with 138 alarms, a table of alarm data, and a 'Status' section with buttons for 'Generate', 'File Transfer', and 'Find Results'.

S...	C...	P...	Last C
24	9	15/7/2	
19	9	15/7/2	
18	9	15/7/2	
19	9	15/7/2	
19	9	15/7/2	

Arranges windows so they overlap.

Obstacles



- Users enrollment
- Material supply
- Planning of tasks
- Installation work
- Wireless link
- Automation of Operating screen



Actions – Scenarios for NTUA savings

**Scenario 1: Lighting Schedule according to daylighting
Lecture Rooms Building (2000 m2) May**

**Scenario 2: Awareness Energy Savings Campaign –
Turn off Computers and printers
Administration Office Building (2500m2) July**

**Scenario 3: Changing schedule of Lecture Rooms
2 Lecture Rooms Buildings (3400 m2) September**

**Scenario 4: Night Cooling
Laboratory Building (14000 m3) July**

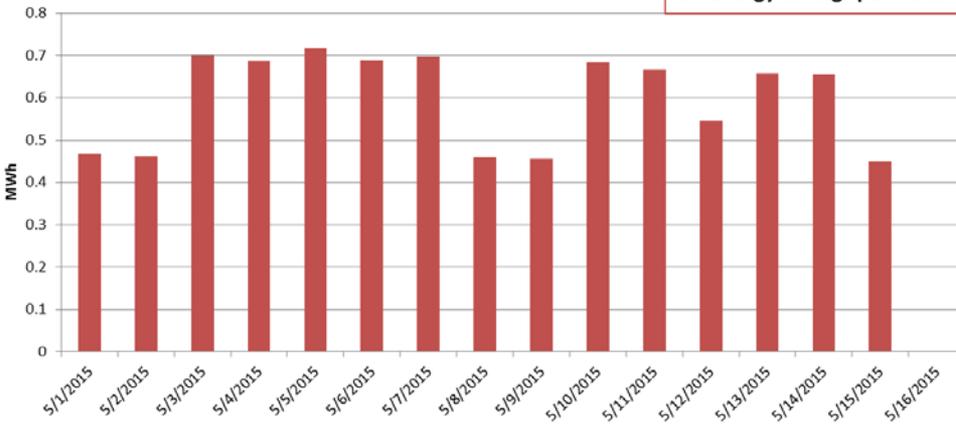
Different periods,
Buildings
from
May to September 2015

Actions – Scenarios for NTUA savings

Scenario 1: Lighting Schedule according to daylighting

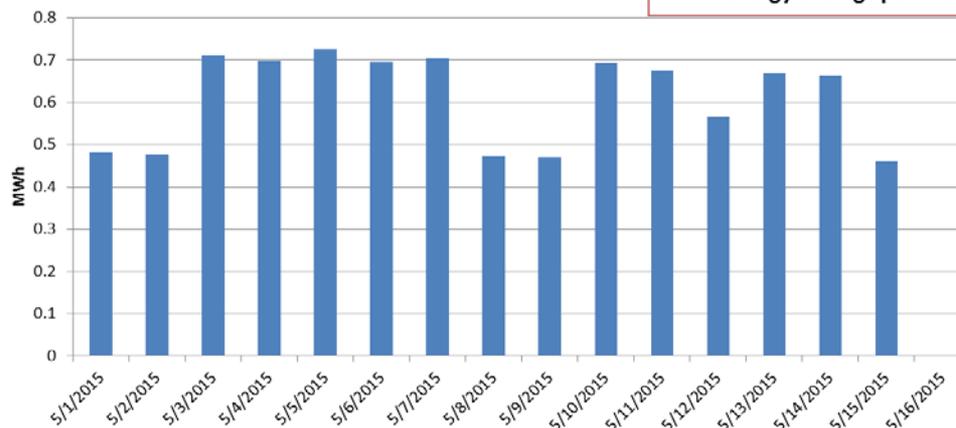
Lecture Rooms 1
May 2015

Lighting Schedule
according to Daylighting
8% Energy Savings per week



Lecture Rooms 2
May 2015

Lighting Schedule
according to Daylighting
7.4 % Energy Savings per week



Estimation
for whole Campus
1052 MWh
85000 Euros



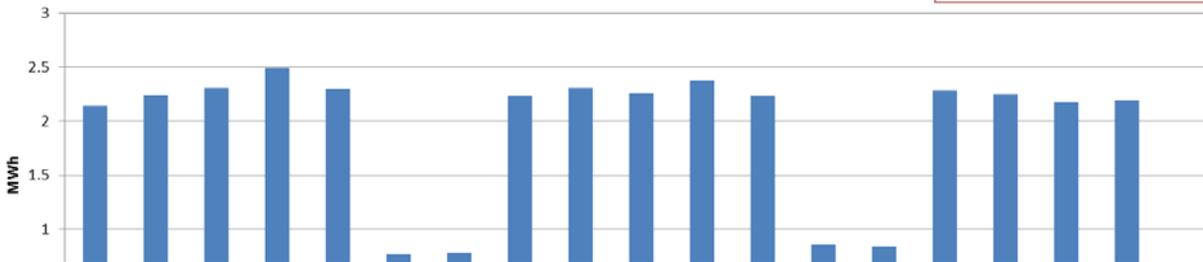
NRG4CAST CONTRIBUTION
High Level of Daily Lighting Consumption

Actions – Scenarios for NTUA savings

Scenario 2: Energy Savings Campaign – Turn off Computers and printers

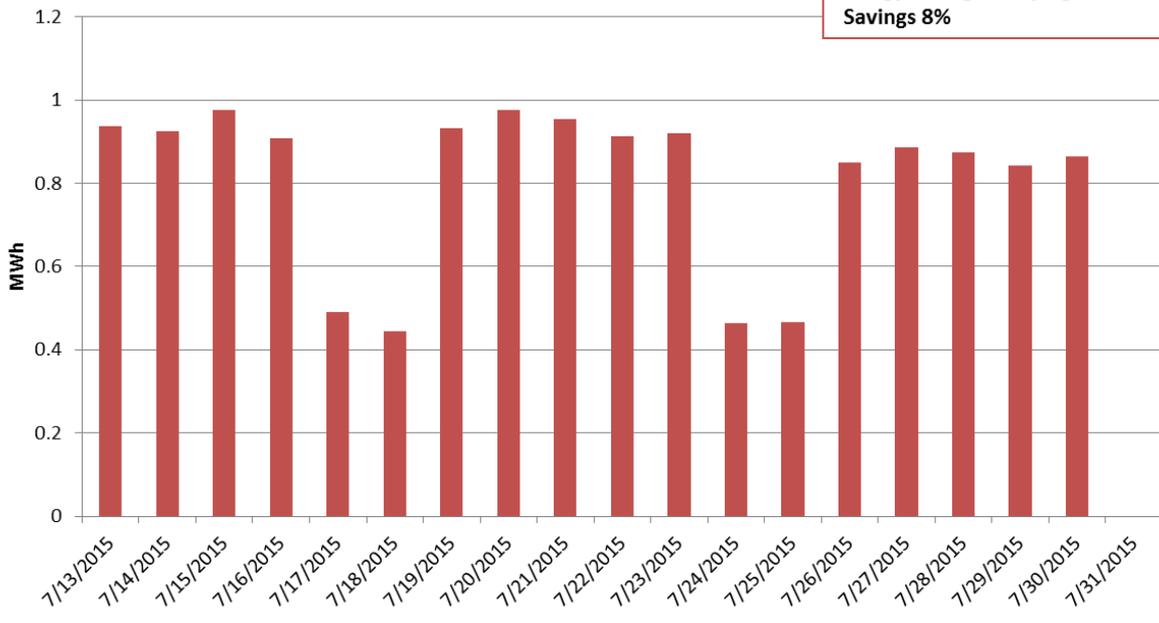
Administration Building - Offices

Scenario 2:
Energy Savings Campaign
Savings 4%



Genikes Edres Building - Offices

Scenario 2:
Energy Savings Campaign
Savings 8%



Yearly
Estimation for whole
Campus 7300 MWh
430000 Euros



NRG4CAST CONTRIBUTION
High level Base Load

2015
November 17



ELECTRICITY CONSUMPTION



now
13243.4 MWh
predicted today
n/a

CARBON FOOTPRINT



so far this week
3.4 Tons of CO2
last year
86.9 Tons of CO2

TEMPERATURE



now
23.2 C
predicted tomorrow
14.5 C

CLOUDCOVER

today
40 %
predicted tomorrow
0 %

20:49



ELECTRICITY LOAD

ELECTRICITY CONSUMPTION

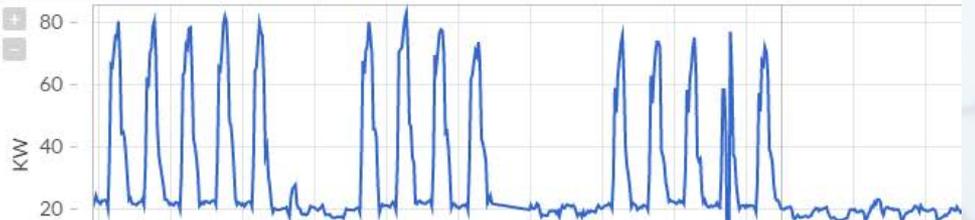
ACTUAL MEASUREMENTS

SAVINGS

FORECAST

- AGRO TOPO KT MS1
- AGRO TOPO KT MS2
- ANTOCHIS YLIKON
- CHEM ENG A1
- CHEM ENG B MS2
- CIVIL ENG AS S1
- CIVIL ENG AS S2
- CIVIL-ENG-HYDR-KT
- CIVIL-ENG-LMENIKA-A
- CIVIL-ENG-LMENIKA-B
- GEN-EDRES-MS-1
- GEN-EDRES-MS-2
- HLMHX MHXHY MS2
- HLMHX MHXHY NEW BUILDING
- LIBRARY
- MECH ENG MN MS1
- MECH ENG O MS1
- MECH ENG O MS2
- NAYP MHX MHX KT MS1
- NAYP MHX MHX KT M
- NTUA ADMIN MS1
- NTUA ADMIN MS2
- GYM ST
- MHX METAL MS1
- MHX METAL M

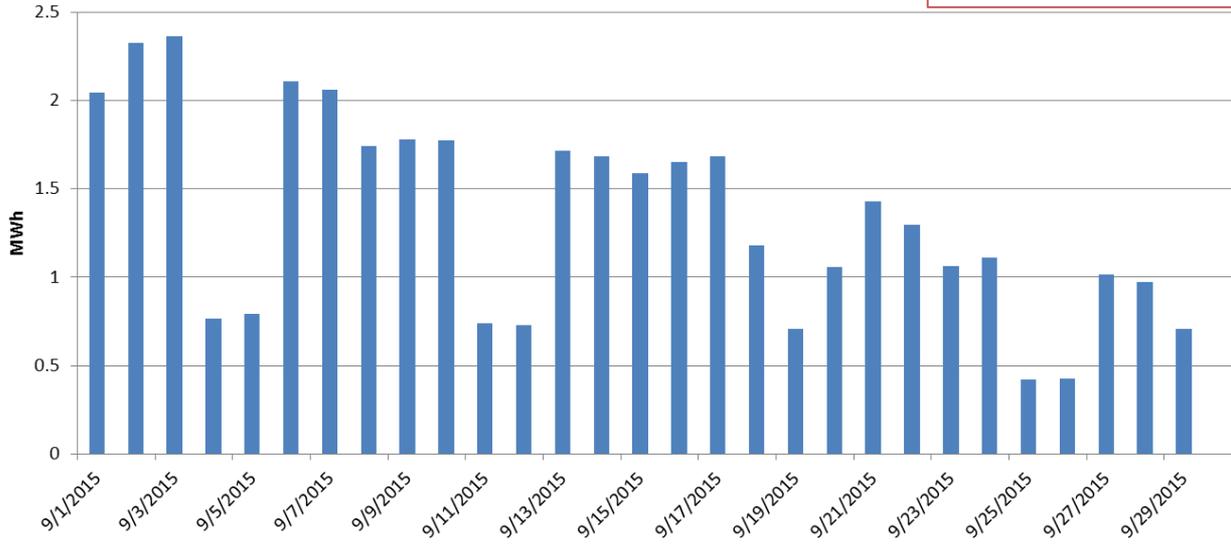
Electricity load of the GEN EDRES MS 2, 2015: Electricity load ntua-BUILDING-GEN-EDRES-MS2



Actions – Scenarios for NTUA savings

Scenario 3: Changing schedule of Lecture Rooms

**Mechanical Engineering Department
Buildings Z and E**



Scenario 3:
Changing schedule of
Lecture Rooms use
Minimum Savings 12%
Maximum Savings 37%

Yearly
Estimation for
whole Campus 5200
MWh
31000 Euros

**NRG4CAST CONTRIBUTION
Due to High level
Daily Energy Consumption
in Lecture Room Buildings**

November 17

20:49

CONSUMPTION

now
13243.4 MWh

predicted today
n/a

so far this week
3.4 Tons of CO2

last year
86.9 Tons of CO2

now
23.2 C

predicted tomorrow
14.5 C

today
40 %

predicted tomorrow
0 %

today
60 %

predicted tomorrow
0.81 %

MECH-ENG-O

COUNTRY
Greece

STREET
undefined

LATITUDE
37.98003

CITY
Zografou

STREET NUMBER
0

LONGITUDE
37.98003

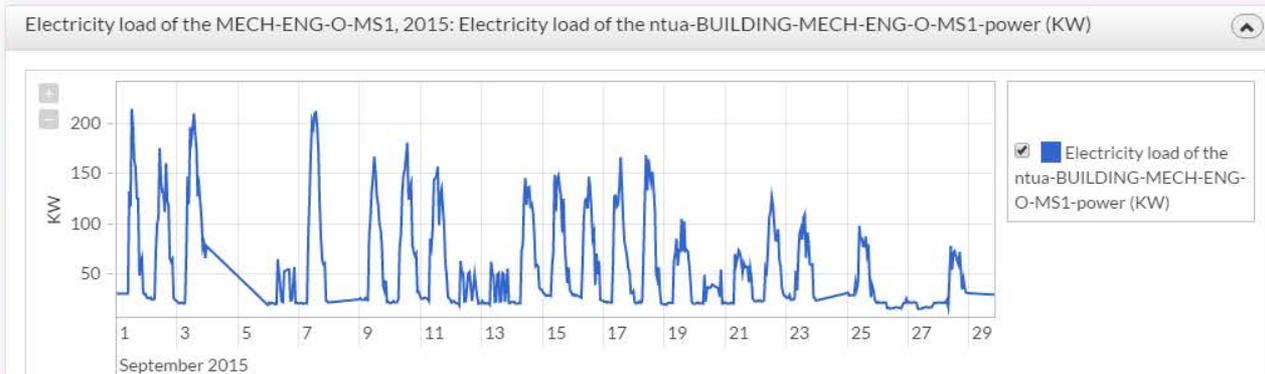
LAST UPDATE 2015-11-15 23:45

ENERGY POWER
346.58 MWh 25.12 KW

ENERGY POWER
16.54 MWh 11.46 KW

ELECTRICITY LOAD | ELECTRICITY CONSUMPTION | ACTUAL MEASUREMENTS | SAVINGS | FORECAST | **ADVANCED SEARCH**

AGRO TOPO KT MS1	AGRO TOPO KT MS2	ANTOCHIS YLIKON	CHEM ENG A1	CHEM ENG A2	CHEM ENG B MS1
CHEM ENG B MS2	CIVIL ENG AS S1	CIVIL ENG AS S2	CIVIL-ENG-HYDR-KT	CIVIL-ENG-KT-MS1	CIVIL-ENG-KT-MS2
CIVIL-ENG-LMENIKA-A	CIVIL-ENG-LMENIKA-B	GEN-EDRES-MS-1	GEN-EDRES-MS-2	HLMHX-MHXHY-MS1	
HLMHX MHXHY MS2	HLMHX MHXHY NEW BUILDING	LIBRARY	MECH ENG MN MS1	MECH ENG MN MS2	
MECH ENG O MS1	MECH ENG O MS2	NAYP MHX MHX KT MS1	NAYP MHX MHX KT MS2	NAYP MHX MHX KT MS3	
NTUA ADMIN MS1	NTUA ADMIN MS2	GYM ST	MHX METAL MS1	MHX METAL MS2	

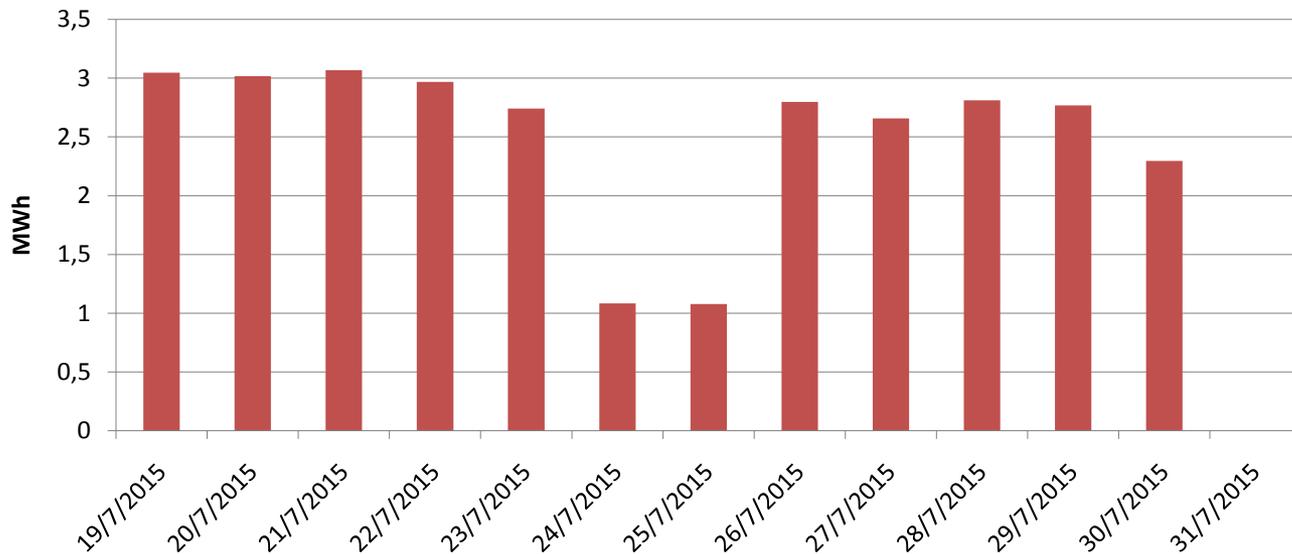


Actions – Scenarios for NTUA savings

Scenario 4: Night Cooling

Mechanical Engineering Department Laboratories

Scenario 4:
Night Ventilation
Savings 11%



Yearly
Estimation for
whole Campus
(Laboratories)
700 MWh
36000 Euros

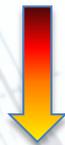
NRG4CAST CONTRIBUTION:
Weather and Energy Forecasting

Conclusions

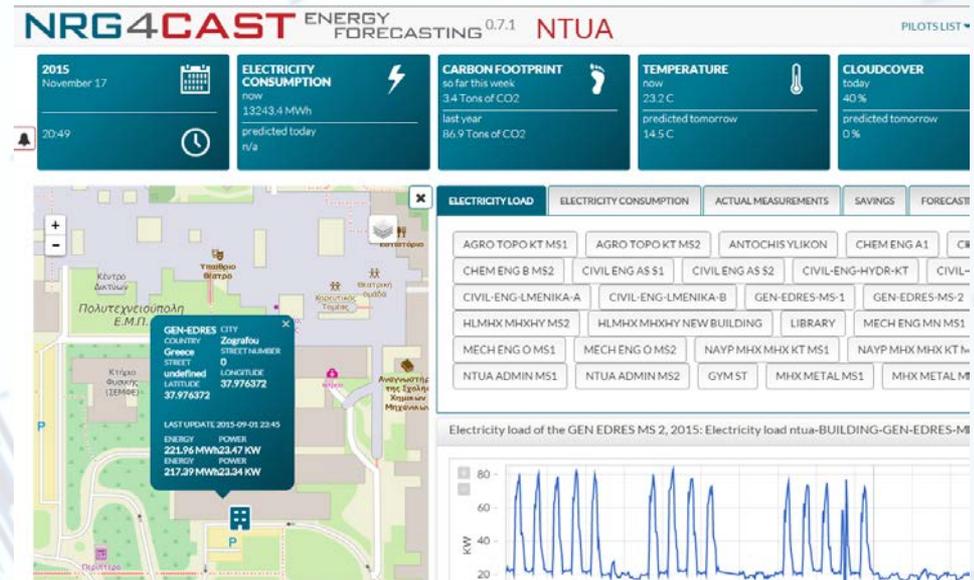
Πρόγνωση
Χρήσης
Καιρικών συνθηκών



Μέτρα Εξοικονόμησης



Εξοικονόμηση μέχρι και 30%



THANK YOU
FOR YOUR ATTENTION