"Upgrading the energy performance of residential buildings in Cyprus
Energy Services, Barriers & Opportunities"

Gazzada Schianno, Varese, Italy 18-19 October 2017

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Cyprus Energy Agency

ΕΝΕΡΓΕΙΑΚΟ ΓΡΑΦΕΙΟ
ΚΥΠΡΙΩΝ ΠΟΛΙΤΩΝ

Member of Cyprus Consumers Association

1973 ΚΥΠΡΙΑΚΟΣ ΣΥΝΔΕΣΜΟΣ ΚΑΤΑΝΑΛΩΤΩΝ

The Cyprus Energy Agency

- Non Governmental Non profit organization
- Officially established 9/2/2009
- Funded for 3 years by the European Commission and the Cyprus Union of Communities (IEE)

Vision
"to contribute actively to the conservation of energy resources, protecting the environment and contributing to the quality of life!"

Specific objectives

"Promotion of renewable energy sources, sustainable transport, improvement of energy efficiency and contribution to the mitigation and adaptation to climate change"

Our team

- Education and Innovation
- Energy Efficiency
- Renewable Energy Sources
- Sustainable Mobility
- Energy and Climate Planning
- Environment Protection
- Green Public Procurement

Director

Savvas Vlachos

Environment officer and EU programmes Coordinator

Harris Kordatos

Mechanical Engineer

Giannis Kanaris

Electrical Engineer and Project Manager

Marios Petrakkas

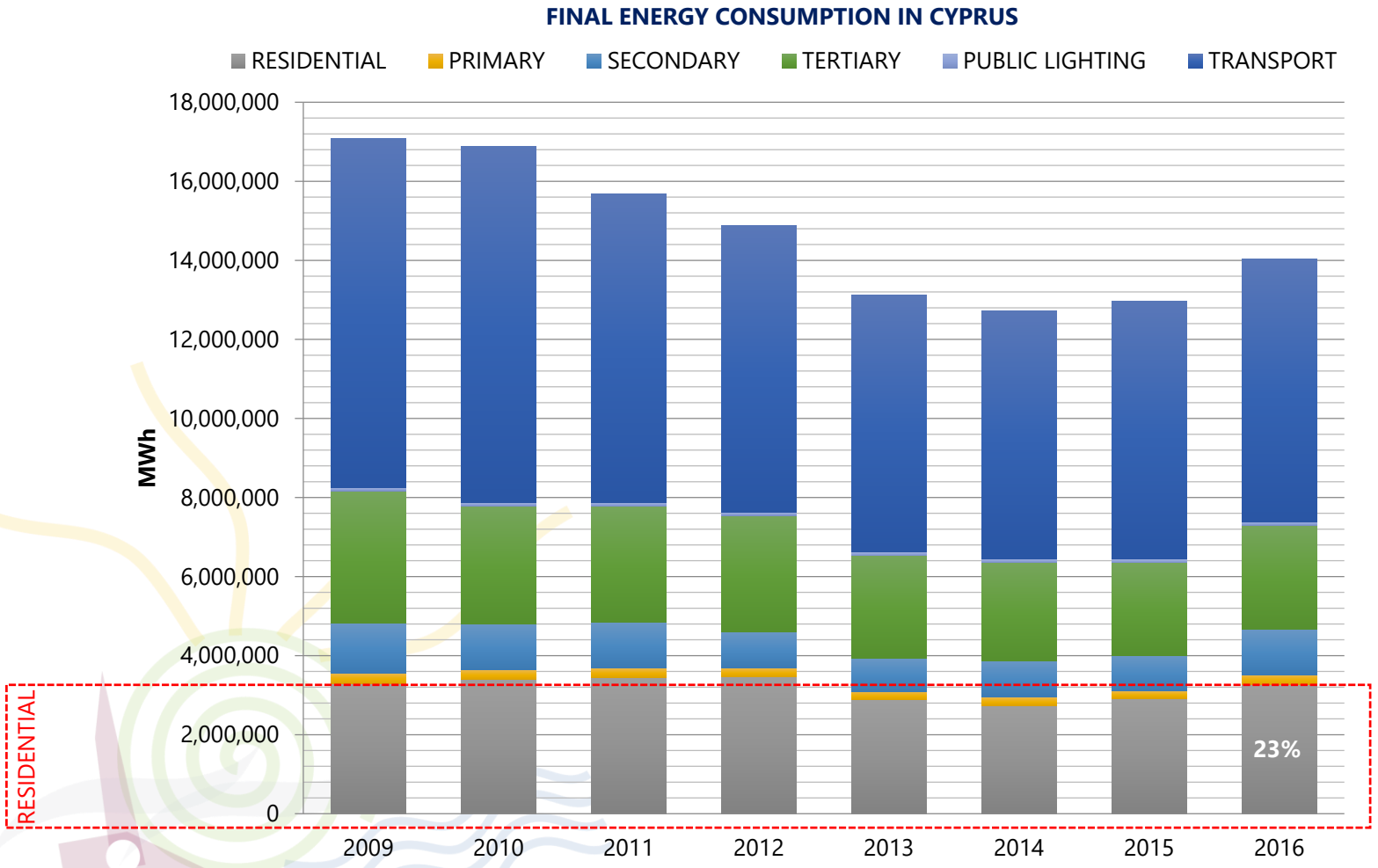
Architectural Engineer

Maria Achilleos

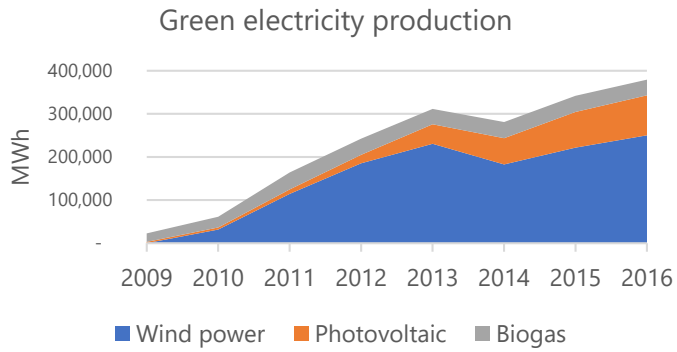
Environmental Engineer and Office administration

Myrto Skouroupathi

Introduction
Current Situation in Cyprus Analysis of Cyprus' energy sector



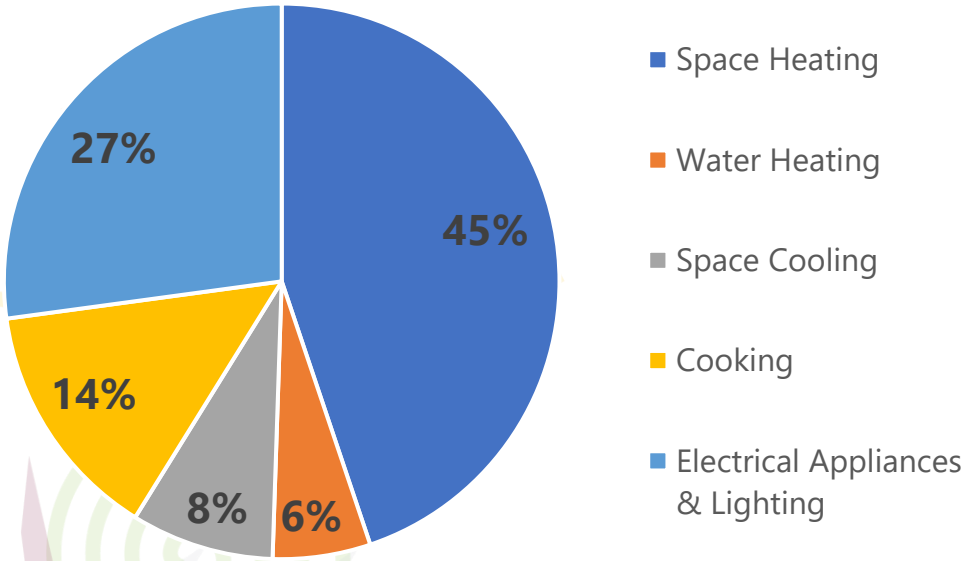
- **Population** of Cyprus is about **900,000**
- The residential sector represents the **23% of the final energy consumption** in Cyprus and **35% of the final electricity consumption**.
- Living quarters (occupied): 337,000
- Living quarters (vacant/of temporary residence): 165,000
- Households: **343,000**
- Average households size: 3 members



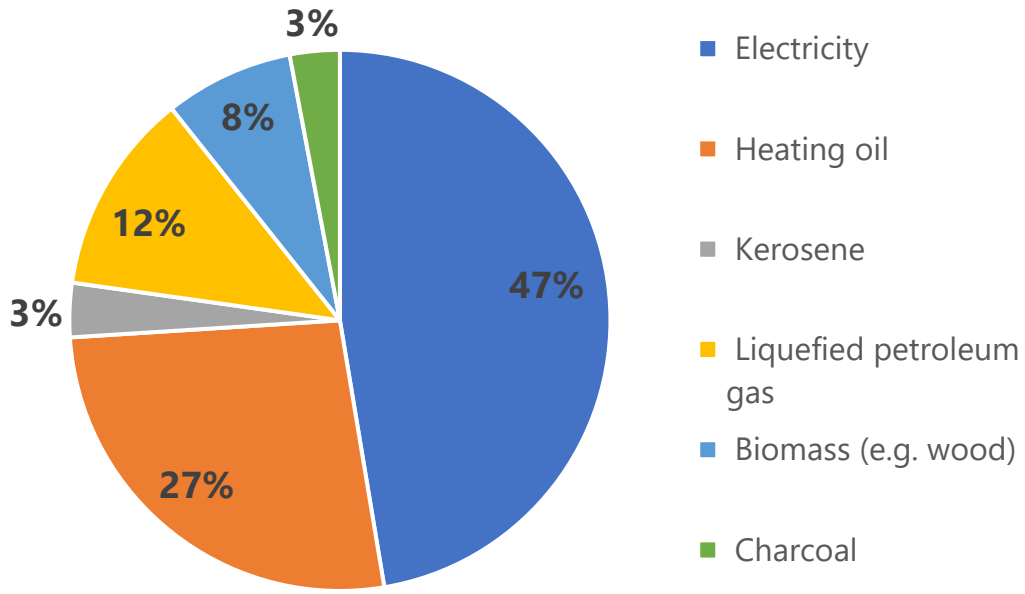
Source: [Electricity Authority of Cyprus, Cyprus Energy Agency, Statistical Service of Cyprus]

Households energy consumption

Annual energy consumption by end use category

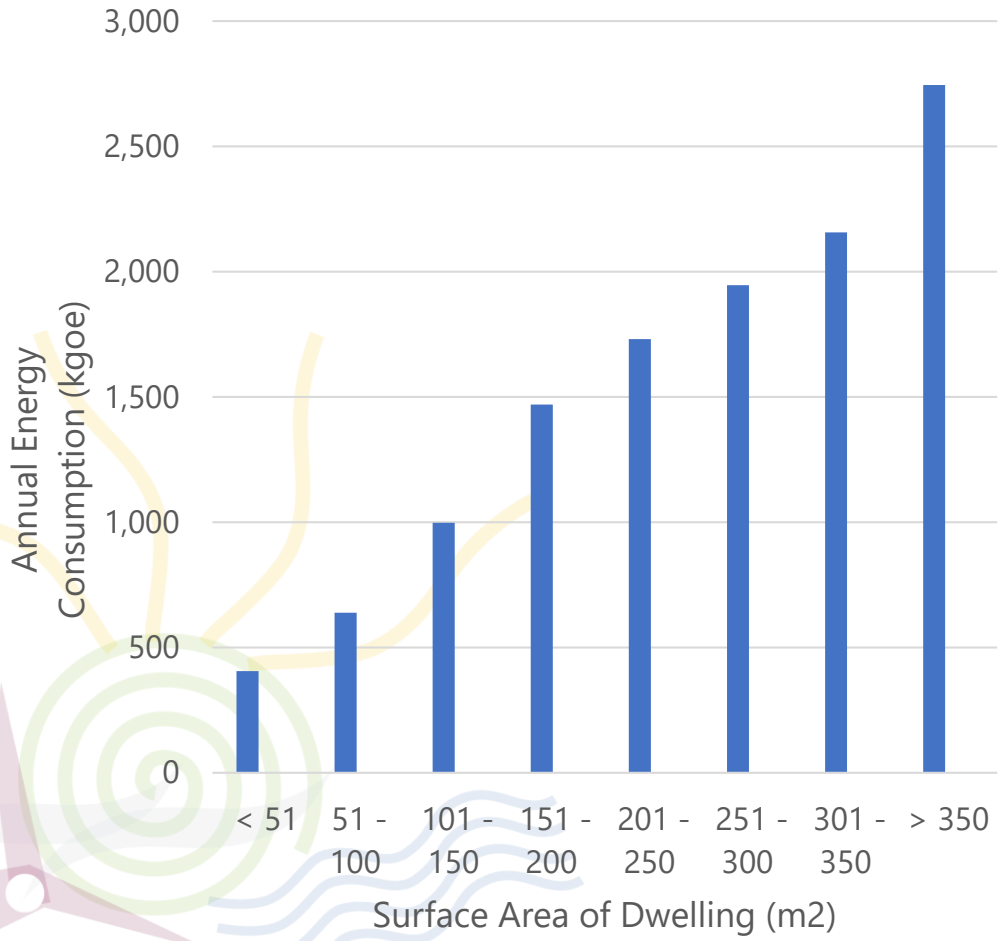


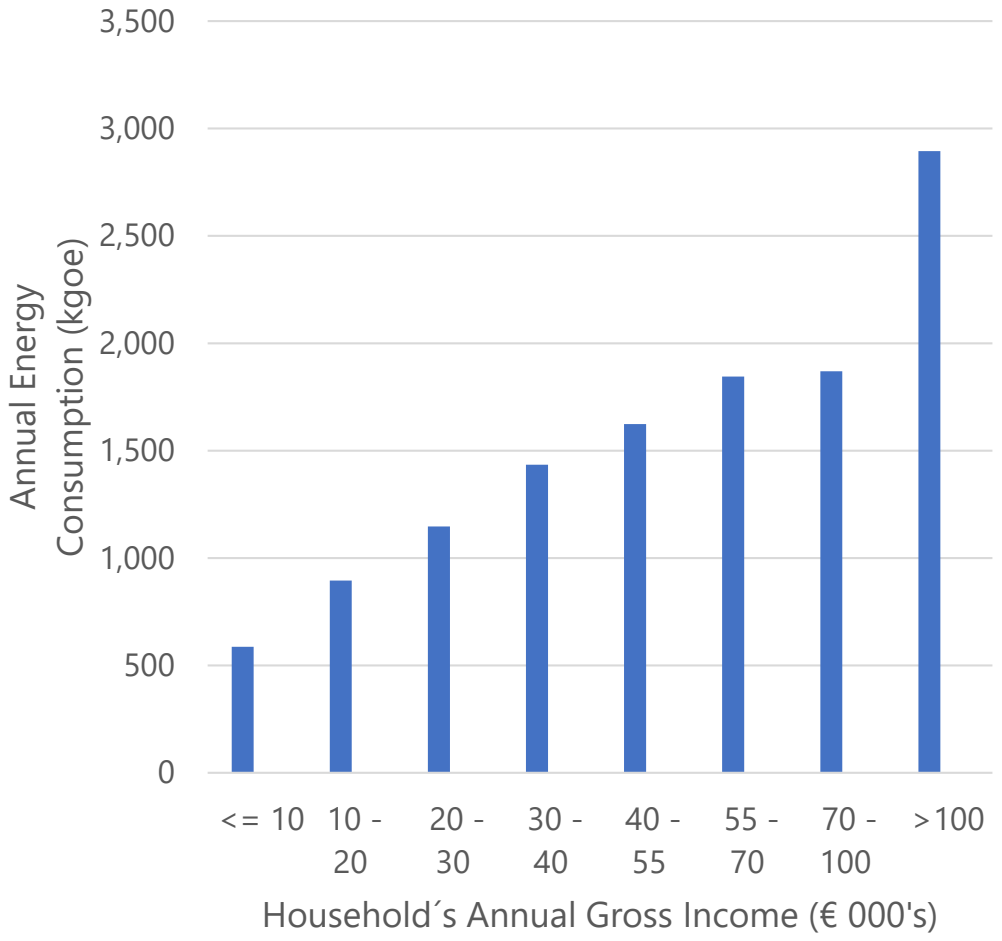
Annual energy consumption by energy source



Source: [Statistical Service of Cyprus]

Households energy consumption





Source: [Statistical Service of Cyprus]

Space heating

- **Main type** heating system: **39% portable heater**, 29% central heating, 17 % split units
- **Surface area** of dwellings heated: **41% <51m2**, 26% 51-100m2
- **Months** of operation: **42% for 4 months**, 26% for 3 months
- **Hours** of daily operation: **46% 3-5 hours**, 30% 6-8 hours

Source: [Statistical Service of Cyprus]

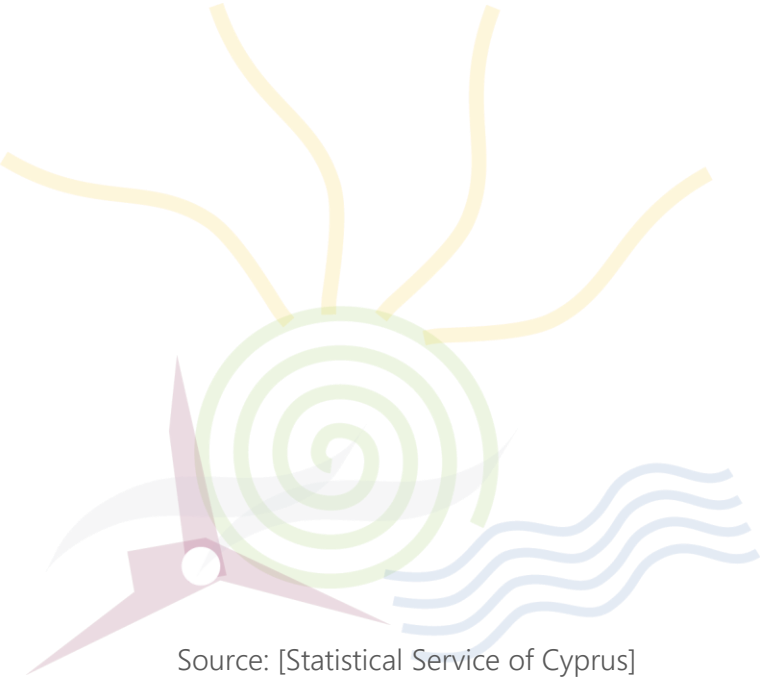
Hot water demand

- Availability of different type of systems: **92% Solar heater**, 29% system connected to central system
- Hot water storage tank: **79% 150-200 litres**

Source: [Statistical Service of Cyprus]

Cooling

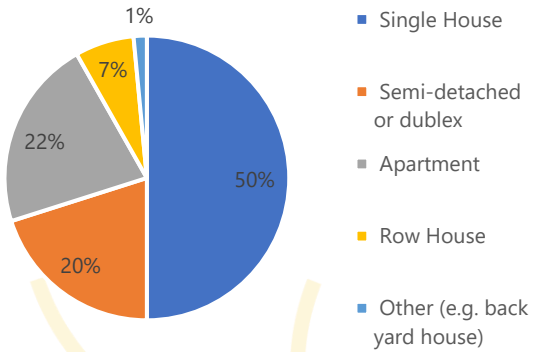
- SPACE COOLING
  - **Having air conditioning equipment: 81%**
  - **Surface** area of dwellings cooled: **64% <51m2**, 24% 51-100m2
  - **Months** of operation: **34% for 4 months**, 28% for 2 months, 25% for 3 months
  - **Hours** of daily operation: **41% 3-5 hours**, 27% 6-8 hours, 18% <2 hours



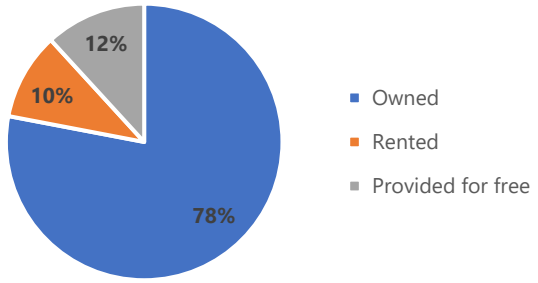
Source: [Statistical Service of Cyprus]

Buildings characteristics

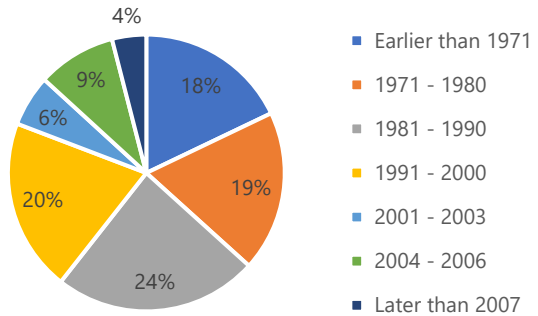
HOUSING TYPE OF DWELLING



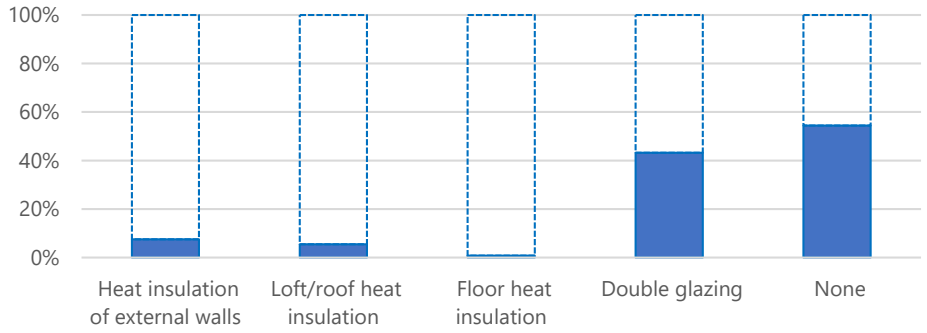
TYPE OF TENURE OF DWELLING



YEAR OF CONSTRUCTION OF DWELLING



PROPORTION OF TOTAL DWELLINGS HAVING DIFFERENT TYPES OF HEAT INSULATION INSTALLED



Source: [Statistical Service of Cyprus]

Buildings characteristics

Period	Types
Before 2007	Description 1-2 floors, Reinforced Concrete structure, flat concrete roof or inclined roof with tiles, brick walls, no insulation, **single** or double glazing with aluminium frame Energy characteristics Walls 1,42 W/m2K, roof 0,32 W/m2K, door/windows 6,05 W/m2K, floor 2,00 W/m2K
After 2007	Description 1-3 floors, Reinforced Concrete structure, flat concrete roof or inclined roof with tiles, brick walls, envelope thermal insulation 5 cm, double glazing with aluminium or u-pvc frame Energy characteristics At least B on EPC, walls 0,85 W/m^{2}K, roof 0,75 W/m^{2}K, windows 3,8 W/m^{2}K, floor in covered and non-air-conditioned space 2,0W/m^{2}K, average factor 1,3W/m^{2}K (residential) and 1,8W/m^{2}K (non-residential), solar heater for DHW, provision for electricity production by RES systems, maximum shading factor for openings 0,63.
2017 and after	Description 1-3 floors, Reinforced Concrete structure, flat concrete roof or inclined roof with tiles, brick walls, envelope thermal insulation 8-10 cm, double glazing with aluminium and thermal break or u-pvc frame Energy characteristics At least B on EPC, **walls 0,4 W/m^{2}K, roof 0,4 W/m^{2}K, windows 2,9 W/m^{2}K, maximum shading factor for openings 0,63, for residential buildings (detached) at least 25%** of the total primary energy consumption must be produced by RES, for building blocks used as residential buildings at least 3% of total primary energy consumption must be produced by RES, for non-residential buildings at least 7% of total primary energy consumption must be produced by RES

Legislation – energy performance of buildings

All of our national legislations on Energy Efficiency of Buildings, are adoptions of the relevant European Directives

- The first regulation for thermal insulation of buildings, introduced from **2007**
- The "Energy Performance of Buildings" law was introduced in **2009** – various regulations have been implemented since then
- From **2010** the Energy Performance Certificate (EPC) is obligatory for all new buildings and for all the buildings that are available for sale or rent
- The definition* for the **near Zero Energy Building (nZEB),** was introduced in **2014**
- All new buildings must be nZEB from the **01/01/2021**

Cyprus: *' "Nearly zero energy building" means a building that has a very high energy performance, determined in accordance with the methodology for the calculations of the energy efficiency. The nearly zero, or very low amount of energy required, should -to a very significant extent (min 25%) - be covered by energy from renewable sources, including renewable energy produced on-site or near.'*

Legislation – energy performance of buildings

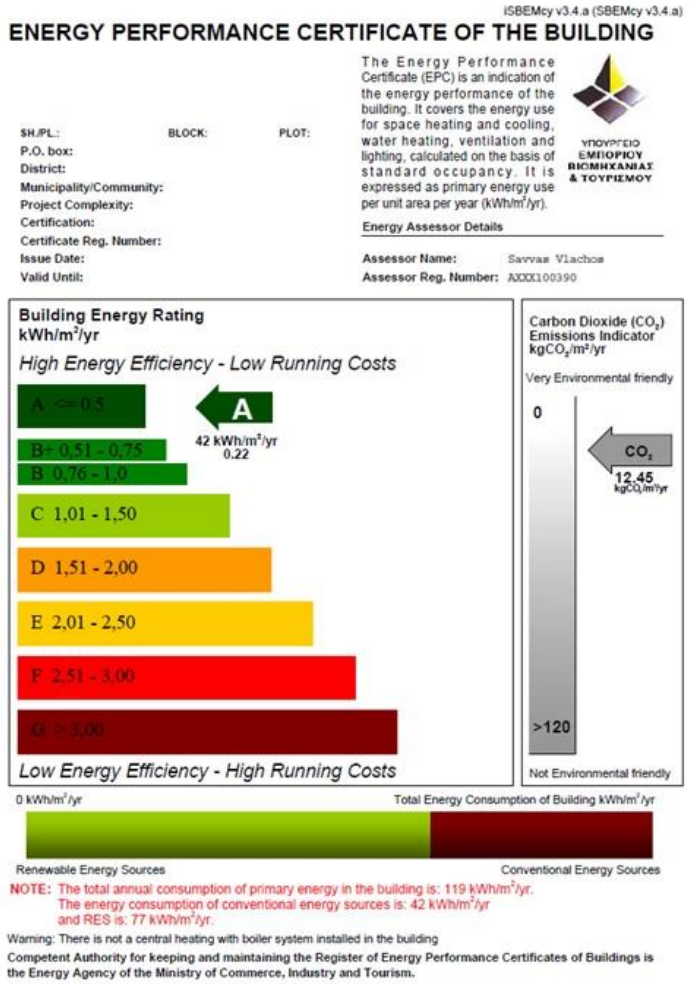
	Minimum Energy Efficiency Requirements					nZEB
	21.12.2007 - 31.12.2010	**01.01.2010 - 10.12.2013**	**11.12.2013 - 29.10.2015**	**30.10.2015 - 31.12.2016**	**01.01.2017 - 31.12.2020**	**01.01.2019 (P.B.) 01.01.2021 and afterwards**
	ΚΔΠ 568/2007	**ΚΔΠ 446/2009**	**ΚΔΠ 432/2013**	**ΚΔΠ 359/2015**	**ΚΔΠ 119/2016**	**ΚΔΠ 366/2014**
Ranking - Class	-	≥ B	≥ B	≥ B	≥ B	A
U value - Walls	≤ 0.85 W/m².K	≤ 0.85 W/m².K	≤ 0.72 W/m².K	≤ 0.72 W/m².K	≤ 0.40 W/m².K	≤ 0.4W/m².K
U value – Horizontal structural elements	≤ 0.75 W/m².K	≤ 0.75 W/m².K	≤ 0.63 W/m².K	≤ 0.63 W/m².K	≤ 0.40 W/m².K	≤ 0.4W/m².K
U value of a ground (over non - heated spaces)	≤ 2.0 W/m².K	≤ 2.0 W/m².K	≤ 2.0 W/m².K	≤ 2.0 W/m².K	-	-
U value of the windows	≤ 3.8 W/m².K	≤ 3.8 W/m².K	≤ 3.23 W/m².K	≤ 3.23 W/m².K	≤ 2.90 W/m².K	≤ 2.25 W/m².K
U value – Mean (Walls & Windows)	-	1.3 W/m².K	≤ 1.3 W/m².K	≤ 1.3 W/m².K	≤ 1.3 W/m².K	-
Maximum consumption of primary energy	-	-	-			100 kWh/m².year 125 kWh/m².year
Maximum energy demand for heating	-	-	-			15 kWh/m².year
Maximum window shading coefficient	-	-	0.63	0.63	0.63	0.63
Maximum power of lighting installations at office buildings					10 W / m²	10 W / m²
Share of RES in primary energy consumption	-	Solar Thermal & PVs Providence	Solar Thermal & PVs Providence	Solar Thermal & PVs Providence	25% (Detached) 3% (Apartments) 7% (Non Residential)	25%

Legislation – energy performance of buildings

Energy Performance Certificates

Residential buildings

A	1950
B+	5793
B	23014
Γ	828
Δ	446
E	403
H	175
Z	237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ENERGY PERFORMANCE CERTIFICATE OF THE BUILDING

The Energy Performance Certificate (EPC) is an indication of the energy performance of the building. It covers the energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard occupancy. It is expressed as primary energy use per unit area per year (kWh/m²/yr).

ΥΠΟΥΡΓΕΙΟ ΕΜΠΟΡΙΟΥ ΒΙΟΜΗΧΑΝΙΑΣ & ΤΟΥΡΙΣΜΟΥ

SH./PL.: BLOCK: PLOT:
P.O. box:
District:
Municipality/Community:
Project Complexity:
Certification:
Certificate Reg. Number:
Issue Date:
Valid Until:

Energy Assessor Details
Assessor Name: Savvas Vlachos
Assessor Reg. Number: AXXX100390

Building Energy Rating kWh/m²/yr
High Energy Efficiency - Low Running Costs
A <= 0.5
B+ 0,51 - 0,75
B 0,76 - 1,0
C 1,01 - 1,50
D 1,51 - 2,00
E 2,01 - 2,50
F 2,51 - 3,00
G > 3,00
A
42 kWh/m²/yr
0.22
Low Energy Efficiency - High Running Costs

Carbon Dioxide (CO_2) Emissions Indicator kgCO_2/m²/yr
Very Environmental friendly
0
CO_2
12.45 kgCO_2/m²/yr
>120
Not Environmental friendly

0 kWh/m²/yr
Total Energy Consumption of Building kWh/m²/yr
Renewable Energy Sources
Conventional Energy Sources

NOTE: The total annual consumption of primary energy in the building is: 119 kWh/m²/yr.
The energy consumption of conventional energy sources is: 42 kWh/m²/yr
and RES is: 77 kWh/m²/yr.

Warning: There is not a central heating with boiler system installed in the building

Competent Authority for keeping and maintaining the Register of Energy Performance Certificates of Buildings is the Energy Agency of the Ministry of Commerce, Industry and Tourism.

Source: [Energy Service]

Legislation – energy efficiency

All of our national legislations on Energy Efficiency, are adoptions of the relevant European Directives

In 2009 the European Directive 2006/32/EC partially introduced to National Legislation

- N 31(I)/2009 – Energy efficiency on final use (modifying laws N 53(I)/2012, N 56(I)/2014, N 149(I)/2015 adoption of 2012/27/EU

Important milestones:

- 2012 Introduction of regulations for energy audits (experts, qualifications, methodology, certification bodies)
- 2014 Introduction of regulations for Energy Service Companies (ESCO's)

Registry of Energy Auditors and ESCO's

- 64 certified energy auditors
- 3 categories of energy auditors
  A. Buildings, airports, harbors and street lighting
  B. Industrial facilities and processes, agricultural facilities
  C. Transports

- 22 registered ESCO's
  A. Photovoltaic installations
  B. Lighting
  C. Energy refurbishments

Funding energy refurbishments

GRANT SCHEME "I SAVE I RENOVATE" 2014-2016
Source of funding: Structural funds
Operated by the Energy Service, Ministry of Energy Commerce, Industry and Tourism

- 1100 applications received for upgrading energy efficiency of existing residential buildings
- Budget 8 M€
- 2 basic categories of funding
  - Improvement of existing energy efficiency of a residential building by at least 40% or to reach B energy class based on the methodology for Energy Performance Certificates. GRANT up to 50% of the cost of energy renovation for regular families and up to 75% for vulnerable/low income households. Maximum grant €15,000
  - Upgrade of a residential building to NZEB. Grant up to 75%. Maximum grant €25,000
- Eligible expenses
  - Thermal insulation, Replacement of windows, boilers, heat pumps, air conditioning, lighting, smart meter, solar thermal for HWD, external shading, ventilation with heating recovery, CHP.

Funding energy refurbishments

MOST COMMON PRACTICES OF ENERGY REFURBISHMENT OF HOUSEHOLDS IN CYPRUS

- Improve from E class to B class with an average budget of €12,000 - €15,000
  - Single house 100-150 m2
  - Thermal insulation of roof
  - Thermal insulation of walls OR/AND replacement of single glazing with double glazing
  - Energy efficient lighting
  - Air conditioning split units (heating/cooling) with improved efficiency

Potential energy savings €800-€1000/year

- Improve from E class to NZEB with an average budget of €24,000 - €28,000
  - Single house 100-150 m2
  - Thermal insulation of roof (with at least 8 cm insulation)
  - Thermal insulation of walls (with at least 8 cm insulation)
  - Replacement of single glazing with double glazing (with Uw less than 2.3 W/m2.K)
  - Energy efficient lighting
  - Air conditioning split units (heating/cooling) with improved efficiency (A++ or higher)
  - External shading
  - Energy efficient boiler with improved energy efficiency (>92%)
  - Photovoltaic system 3 KWp (net metering) – not eligible for grant

Potential energy savings €1500-€1800/year

Conclusions

- The building stock of residential buildings in Cyprus has an important energy efficiency potential
- However in many cases, as a result of the energy behaviour of households, the savings in € are not so promising
- Improvement of thermal comfort is an important aspect for residential buildings but is not easy to translate it in € savings
- Energy Performance Contracting is very complex to apply to residential buildings
- ESCO market is quite new in Cyprus
- The energy savings potential of residential buildings in many cases is not sufficient for ESCO's to make business
- In many cases, the utilisation of renewable energy sources (photovoltaics) is preferred by the households in order to minimize their energy bills without improving the energy efficiency of their dwellings.
- Governmental grant schemes for energy refurbishments considered as important incentive to improve the energy efficiency of existing buildings. However, the building sector should not only depend on grant schemes.
- Other financing tools like "green loans" should be promoted
- External factors such as oil prices influence the attractiveness of energy efficiency

Thank you

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ΚΥΠΡΙΩΝ ΠΟΛΙΤΩΝ