Energy policy and regulatory tools for sustainable buildings

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Abstract: The European Union has established since 2002 a common policy for energy efficient buildings and low environmental impact materials and systems, promoting energy efficiency and reduction of greenhouse gas emissions (GHG), expressed by means of a series of directives, regulations and policies. Therefore, the European Parliament approved the Energy Performance of Buildings Directive (EPBD) 2002/91/EC and its recast, the Directive 2010/31/EU. Based on Article 9 of Directive 2010/31/EU, until the end of 2020 all buildings ought to be nearly Zero Energy Buildings (NZEB), when new buildings operated and owned by public authorities must be NZEB after January 1st 2019. An NZEB building is referred to as a building which has a high energy overall performance and its quantity of energy needed ought to be covered to a quite substantial range by energy from renewable sources, as well as energy from renewable sources generated on-site or nearby. For the case of Cyprus, the limit is set to 125 kWh/m² of primary energy consumption annually, with a minimum of 25% of this energy resulting from renewables. For Greece this goal has still to be determined. Except from those Directives, the EU set the main goals for energy, transport and GHG emissions not only for 2020 but also for 2030 and 2050. Considering GHG emissions, the legislation framework is supported by a series of international standards such as the Greenhouse Gas Protocol Initiative and the ISO 14064-65 series of standards which are fully compatible with the GHG Protocol and the Intergovernmental Panel on Climate Change. Considering the recast of the EPBD, in form of Directive 2018/844/EU, a detailed database is developed of the European, Greek and Cyprus energy and environmental legislation (Directives, Laws, Regulations and policies) for buildings focusing on commercial ones. It is presented in this paper, along with a comment of how a common framework can be adopted in two national regulations and how it can be effectively turned into practice.

1. Introduction: EU Roadmap for energy and carbon emissions

One of the major developments of the last decade is the existence of a quite explicit regulatory framework, setting specific goals and providing supportive laws, directives, standards and methodologies, focusing on clean energy, minimizing the energy consumption and reducing the CO2 emissions. The main targets set by the European Commission in chronological order are:

- Target of 20-20-20 (20% improvement in energy efficiency, 20% reduction of greenhouse gas emissions compared with the 1990s levels and 20% increase of the share of renewable energy to at least 20% of consumption [1])
- Revised target for 2030 (at least 40% cuts in greenhouse gas emissions (from 1990 levels, at least 32% share for renewable energy, at least 32.5% improvement in energy efficiency [1])
- Next target for 2050 (85%-90% reduction of greenhouse gas emissions compared to 1990s levels) [1]

In Figure 1 is depicted the EU with respect to the goals for 2020 and the projections for 2030. While in previous years, reports have confirmed that overall EU was on the right track to meet the 2020 targets, data for 2017 revealed that this might not be the case, as the increase in the share of RES slowed down and primary energy consumption was, for the first time, above the required level for the 2020 target.
Figure 1. EU progress towards 2020 and 2030 targets on climate and energy [2]

It is still expected that the 2020 reduction target will be met, however the policies and measures currently accounted for in national projections alone will not be sufficient to reach the saving targets in order to reach the EU’s next goals of at least 40% reduction by 2030 and of course the ambitious target of 2050. Similarly, the pace of GHG emission reductions is so far sufficient but is expected to slow after 2020, so in order to ensure the 2030 and 2050 targets faster reductions are undoubtedly required.

Hence, there is a clear policy supported by a quite elaborate legislative framework for the reduction of CO2 emissions through the control of energy consumption and the increase of RES. This policy can give the opportunity to reduce operational cost and increase productivity, and also lead to further benefits, with respect to their corporate identity in terms of environmental awareness. Finally, one has also to consider the benefits in indoor air quality, which affect health and well-being of the buildings’ users, employees, customers and clients. Hence, the vision for cleaner energy is supported by financial incentives, runs in parallel with the promotion of low carbon technologies and can be applied to all sectors of the economy [3].
Considering RES, both on- and off-site generation has been selected by Member States that consider different options of RES generation, such as solar thermal, geothermal, passive solar and passive cooling, heat recovery, and PV. The proportion of renewable energy production for each building has been defined by each Member States, with values expressed as a percentage, varying from 25% (Cyprus) up to 56% (Denmark) and 60% (Germany) or by absolute figures [4].

The use of renewables for heating and cooling of buildings grew on average by 0.7% annually between 2005 and 2016, mainly by means of solid biomass and biogas, followed by solar thermal systems and of course by heat pumps. Finally, having a glance on the GHG emissions by sector one can notice that the building sector accounted in 2015 for some 36% of GHG emissions [5]. Decarbonization of all types of residential and commercial buildings is hence a priority and this is supported by a series of environmental tools and methodologies such as voluntarily certification schemes for buildings like BREEAM and LEED as well as methodologies which introduce and implement an integrated evaluation analysis, like the Carbon Footprint and the Life Cycle Analysis.

Carbon Footprint Analysis (CFA) is a tool that promotes the aforementioned goals, as it focuses on quantifying the CO2 emissions and their reduction and promoting sustainability and low environmental impact over the building’s life cycle. Carbon Footprint Analysis as a tool can follow other environmental tools and standards as they share common targets such as reduce environmental impacts and approach sustainability vision [4]. There are several tools and methods to establish integrated environmental management schemes such as Life Cycle Analysis (LCA), Ecolabel, Environmental Management Systems such as ISO 14001 and Energy Management Systems such as ISO 50001. The target of the
different methodologies is in general terms the same nevertheless each one of the tools has different approach and general strategy. The energy and environmental certification processes promote environmental evaluation aspects relevant to the building’s life cycle, as an expression of the overall legislative framework for sustainable management of buildings. Therefore, and aiming to improve energy efficiency in the overall life cycle of buildings, emphasis must be given to the materials’ selection focusing on low environmental impact during the production process and the use of natural, recyclable or recycled materials, originating ideally locally, so as to minimise energy consumed for transportation and the resulting emissions [6,7].

2. EU Directives that affect the energy performance of buildings

Europe set the goal for net-zero emission buildings increasing the RES use, introducing and implement circular economy, promoting clean and efficient mobility. The vision is not considering only the building sector it is also introduces a different attitude of citizens, industries towards environmental awareness and sustainability. Therefore the socio economic trend of decarbonisation effects the European Policy on the energy and the environment. Table 1 presents the European legislation framework for the energy and the environment which is related to energy and the environment at the building sector [8].

Europe aims to drastically reduce building-sector greenhouse gas emission by 88 to 91 % by 2050, compared to 1990 levels. The EPBD, the Energy-Efficiency Directive (EED) 2012/27/EU, the directive on renewable energy sources (2009/125/EC), and directives on eco-design and energy labeling (2009/125/EC and 2010/30/EU) provide the legal framework for the EU’s ZEB target. According to Article 2 (“Definitions”) part 2 of the recast Energy Performance of Buildings Directive, “nearly Zero-Energy Building means a building that has a very high energy performance, as determined in accordance with Annex I. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.”[2010/31/EU] After 31 December 2018, new buildings occupied and owned by public authorities should be nearly Zero-Energy Buildings (Article 9, paragraph 1). By 31 December 2020, all new buildings should be nearly Zero-Energy Buildings. So according to the defined legislation framework all the Member States should introduce national plans in compliance with the directives for zero energy buildings, for RES use, for carbon neutral buildings towards the EU energy vision on the building sector. The paragraph follows presents the national legislation framework for Greece in compliance with the European legislation framework [9].
Table 1. EU Legislation framework for the energy and environment at the building sector

| European Directive | Title |
|--------------------|-------|
| 1 2002/91/EU       | Directive on energy performance of buildings |
| 2 2004/8/EC       | Directive on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC |
| 3 2006/32/EC       | Directive on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC |
| 4 2009/125/EU    | Directive on establishing a framework for the setting of eco-design requirements for energy-related products |
| 5 2010/30/EU    | Directive on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products |
| 6 2010/31/EU   | Directive on the energy performance of buildings |
| 7 2013/12/EU | Directive on energy efficiency |
| 8 2012/27/EU    | Directive on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC |
| 9 209/28/EC   | Directive on promoting the use of renewable energy sources |
| 10 1253/2014/EU | Directive on eco-design requirements for ventilation units |
| 11 801/2013/EU | Directive on eco-design for electric energy equipment and office equipment. |
| 12 626/2011/EU | Supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of air conditioners. Directive on energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device |
| 13 811/2013/EU | Directive on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC |
| 14 1221/2009/EU | Directive on establishing a framework for the setting of eco-design requirements for energy-related products, with regard to eco-design requirements for air heating products, cooling products, high temperature process chillers and fan coil units. |
| 15 2281/2016/EU | Directive on the European Regional Development Fund as regards the eligibility of energy efficiency and renewable energy investments in housing. |
| 16 397/2009/EU | Directive with regard to eco-design requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment. |
| 17 1275/2008/EU | Directive on establishing a framework for the setting of eco-design requirements for energy-using products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament. |
| 18 2005/32/EU | Directive on energy labelling of household electric refrigerators, freezers and their combinations |
| 19 2003/66/EU | Directive on energy efficiency labelling programme for office equipment |
| 20 2422/2001/EU | Directive on energy efficiency labelling programme for office equipment |
| 21 78/170/EU | Directive on the performance of heat generators for space heating and the production of hot water in new or existing non-industrial buildings and on the insulation of heat and domestic hot-water distribution in new non-industrial buildings |

3. National Legislation Framework

An NZEB building is referred to as a building which has a high energy overall performance and its quantity of energy needed ought to be covered to a quite substantial range by energy from renewable sources, as well as energy from renewable sources generated on-site or nearby. For Greece this goal has still to be determined.

The responsibility of the implementation of the EPBD in Greece lies on the Ministry of Environment and Energy (YPEN) [10]. The adoption of the Directive 2010/31/EU was approved by the Greek Parliament under Law 4122/2013. New buildings must meet minimum energy performance...
requirements set out in the “Regulation on the Energy Performance of Buildings” (KENAK). In combination with the obligation set in Law 4122/2013 and the revised one Law 4342/2015, these regulations ensure that every new building of the public sector, from 1 January 2019 should be NZEB. This obligation applies also for all new buildings constructed after 1 January 2021. The Laws and the corresponding Ministry Regulations which support the Laws implementation are presented in detail below (Table 2 & 3) [11,12,13].

**Table 2. Hellenic legislation framework for the energy and environment at the building sector**

| National Laws | Title |
|---------------|-------|
| 1 Law 4122/2013 | Energy Efficiency of Buildings in compliance with the directive 2010/31/EU |
| 2 Law 4342/2015 | In compliance with directive 2012/27/EU for the "Energy Efficiency", and update of the directives 2009/125/EU, 2010/30/EU. |
| 3 Technical Guide for the Implementation of the Law 4342/2015 | Technical Guide for Energy Audits implementation. |
| 4 Law 3661/2008 FEK A’89/19.05.2008 | Measures for reducing energy consumption in buildings. |
| 5 Law 3851/2010 FEK A’85/04.06.2010 | RES for reducing the environmental impact of climate change. Measures for reducing energy efficiency at the end use, energy services. |
| 6 Law 3855/2010 FEK A’95/23.06.2010 | |
| 7 Law 3734/2009 | Cogeneration |
| 8 Law 3468/2006 | Electric energy consumption from RES and cogeneration Methodology for calculating energy performance of buildings and energy certification procedure. |
| 9 Technical Guide TOTEE 20701-1/2017 | |
| 10 Law 4533/2018 - FEK 75/A/27-4-2018 | Measure for Electricity Market |
| 11 Law 4513/2018 - FEK 9/A/23-1-2018 | Microgrids |
| 12 Law 3855/2010 | Measures for improving the energy efficiency at the enduse and energy services. |
| 13 Law 2165/1993 (FEK 127/A/29-7-1993) | Electrical energy production. |
| 14 Law 2244/1994 - FEK 168/A/7-10-1994 | Regulation of electrical energy production, RES and conventional fuels. |
| 15 Law 2364/1995 - FEK 252/A/6-12-1995 | Regulations for the Energy Audit Body, natural gas transmission and market. |
| 16 Law 2773/1999 - FEK 286/A/22-12-1999 | Liberalisation of the energy market, Energy policy. |
| 17 Law 2837/2000 - FEK 178/A/3-8-2000 | Regulatory Authority for Energy |
| 18 Law 2941/2001 - FEK 201/A/12-9-2001 | Licences for RES |
| 19 Law 4203/2013 - FEK 235/A/1-11-2013 | Regulations for RES market |
| 20 Law 4342/2015 | Law for Energy Efficiency in compliance with 2012/27/EU Framework for the safety of Hydrocarbons exploitation based on 2013/30/EU, amending PD 148/2009. |
| 21 Law 4409/2016 | |

The Hellenic Laws are supported by a series of Ministerial Decisions which are presented in detail below. The YA DEPEA/178581, the YA 17178, the YA D6/B/4826/2008 (FEK 1122 B’), the YA 17178 FEK 1387 B (02/09/2010), the YA D6/B/5825 are supportive regulations to Law 4122/2013 for Energy Efficiency of Buildings in compliance with the directive 2010/31/EU and Law 4342/2015 in compliance with directive 2012/27/EU for the "Energy Efficiency", and update of the directives 2009/125/EU, 2010/30/EU.
Table 3. Hellenic legislation framework for the energy and environment at the building sector

| Ministerial Decisions | Title                                                                 |
|-----------------------|----------------------------------------------------------------------|
| 1 YA D6/B/17682  B-1407 | Energy efficiency of fluorescent lamps in compliance with 2000/55/EU  |
| 2 YA D6  B-266         | Indication for the energy consumption of air conditioning for residential use |
| 3 YA A7  B-651/2007    | Maintenance of air conditioning in public buildings for reducing energy consumption |
| 4 D6/B/5825 FEK B’     | Regulation for Buildings Energy Efficiency                            |
| 5 YA D6/7094 FEK B’    | Framework for measuring and verification of the energy reduced towards the national energy target at the end use. |
| 6 YA DEPEA/178581      | Regulation for the Energy Efficiency of Buildings (KENAK).            |
| 7 YA 17178            | Technical Guides (TOTEE) for the Energy Efficiency of Buildings      |
| 8 YA D6/B/4826/2008    | Measures for improving energy efficiency and reducing energy consumption in public buildings. |
| 9 YA. 178679/04.07.2017 FEK B’ 2337 | Qualification and Certification of Energy Auditors. Energy Auditors’ Body. |
| 10 YA APEEK/A/F1/184573/2017 | Promotion of technologies for electric energy production from RES and Combined Heat and Power |
| 11 - FEK 4488/B/19-12-2017 | Implementing PV plants, introducing net metering and virtual net metering |
| 12 YA 17178 FEK 1387 B (02/09/2010) | Technical guides for Energy Efficiency of Buildings (TOTEE) |
| 13 YA D6/B/5825        | Regulation for the Energy Efficiency of Building (KENAK).            |
| 14 YA A 7/2007         | Maintenance of air-conditioning systems in public buildings as a measure for reducing energy consumption. |
| 15 YA D6/2003          | Indication for energy consumption in air conditioners at residential buildings. |
| 16 YA 41766/2013       | Regulation for the procedure on electricity production from solar energy up to 100 kWp based on paragraph 1 and 2 Law 4072/2012. |
| 17 YA 308/2013         | Amending FEK B’ 103/31-01-2012 on the Electricity Transmission System. |
| 18 YA D6/F1/8295 /19.4.1995 | Regulation on the procedures for the installation of electrical energy production stations. |
| 19 YA PE/F1/14810/2011 | Regulation on the procedures for the installation of electrical energy production stations with RES and cogeneration. |
| 20 YA 12400/1108/2011  | Regulation on Energy Labelling.                                      |
| 21 YA A7  B-651/2007   | Maintenance of air-conditioning systems in public buildings as a measure to reduce energy consumption. |

4. Energy efficiency of buildings in Cyprus

Cyprus adopted Directive 2010/31/EU into their national legislation in December 2012. Based on this new legal framework, technical requirements for NZEB were defined, detailed requirements for technical building systems were issued and minimum energy performance requirements have since been twice revised, based on the calculation of cost-optimal levels. The new minimum energy performance requirements were implemented on 1 January 2017 and are considered to be the final step for leading Cyprus into a smooth transition towards NZEB. The overall responsibility of the implementation of the EPBD in Cyprus lies with the Ministry of Energy, Commerce, Industry and Tourism (MECIT) [14].

The national action plan for increasing the number of NZEB, which was issued in 2012 and revised in 2016, identifies a number of actions to be taken up to 2020. The requirements for NZEB specify lower U-values, maximum heating demand for residential buildings, maximum lighting power installation for office buildings, maximum primary energy consumption and a minimum contribution of RES. The
requirements differ only between residential and non-residential buildings, but the same requirements apply for new and existing buildings.

**Table 4. Legislation framework for the energy and environment at the building sector in Cyprus**

| Law | Title |
|-----|-------|
| 1   | Law 142(I) 2006 | Law on the minimum requirements on buildings’ energy efficiency, calculations of the energy efficiency and certification of building’s energy efficiency |
| 2   | Law 174(I) 2006 | Law on combined heat and power generation |
| 3   | Law 30(I) 2009  | Law on energy efficiency, amending Law 142(I) 2006 |
| 4   | Law 31(I) 2009  | Law on energy end-use efficiency and energy services |
| 5   | Law 210(I) 2012 | Law on energy efficiency of buildings, amending Law 142(I) 2006 and Law 30(I)-2009 |
| 6   | Law 53(I), 2012 | Law on energy end-use efficiency and energy services, amending Law 31(I) 2009 |
| 7   | Law 54(I), 2012 | Law on combined heat and power generation, amending Law 174(I) 2006 |
| 8   | Law 56(I), 2014 | Law on energy end-use efficiency and energy services, amending Law 31(I) 2009 and Law 53(I) 2012 |
| 9   | Law 149(I), 2015 | Law on energy end-use efficiency and energy services, amending Law 31(I) 2009, Law 53(I) 2012 and Law 56(I) 2014 |
| 10  | Law 150(I), 2015 | Law on combined heat and power generation, amending Law 174(I) 2006 and Law 54(I) 2012 |
| 11  | Law 15(I), 2017 | Law on energy efficiency of buildings, amending Law 142(I) 2006, Law 30(I)-2009 and Law 210(I) 2012 |
| 12  | KDP 429/2006 | Regulation on the energy efficiency of buildings |
| 13  | KDP 164/2009 | Regulation on the energy certification of buildings |
| 14  | KDP 184/2012 | Regulation on the energy end-use efficiency, on energy services and on energy audits and certification of energy auditors |
| 15  | KDP 185/2012 | Regulation on heat and electricity co-generation |
| 16  | KDP 39/2014 | Regulations on the energy certification of buildings, amending KDP 164/2009 |
| 17  | KDP 61/2014 | Regulations on the energy efficiency of buildings, amending Law 429/2006 |
| 18  | KDP 374/2015 | Regulations on the promotion and encouragement of the use of RES (Certification of Installers of Small-scale RES Systems) |
| 19  | KDP 63/2017 | Regulations on the energy efficiency of buildings-energy audit of heating systems |
| 20  | KDP 413/2009 | Regulations on the energy efficiency of buildings-energy audit of air-conditioning systems |
| 21  | KDP 446/2009 | Presidential Decree on the energy efficiency of buildings (Minimum Requirements for buildings) |
| 22  | KDP 163/2012 & KDP 218/2012 | Presidential Decree on energy end-use efficiency and energy services |
| 23  | KDP 343/2013 | Presidential Decree on energy efficiency of buildings (methodology for calculating cost optimal minimum energy performance requirements) |
| 24  | KDP 148/2013 | Presidential Decree on energy efficiency of buildings (energy audits of heating systems with boilers with nominal output power from 20kW to 100kW) |
| 25  | KDP 244/2013 | Presidential Decree on energy efficiency of buildings (adjustment and control of heating systems with boilers with nominal output power >20kW) |
| 26  | KDP 432/2013 | Presidential Decree on energy efficiency of buildings (Minimum energy efficiency requirements of buildings) |
| 27  | KDP 433/2013 | Presidential Decree on energy efficiency of buildings (Recommendations for improving the energy performance of a building, Energy Efficiency Certificate) |
| 28  | KDP 366/2014 | Presidential Decree on energy efficiency of buildings (definition of net zero energy buildings) |
| 29  | KDP 421/2014 | Presidential Decree on energy end-use efficiency and energy services |
| 30  | KDP 435/2015 | Presidential Decree on the definition of energy service auditors |
| 31  | KDP 33/2015 | Presidential Decree on the energy efficiency of buildings (Methodology for calculating the energy efficiency of buildings) |
| 32  | KDP 437/2015 | Presidential Decree on the Methodology of energy audits |
| 33  | KDP 436/2015 | Presidential Decree on energy audits for transportation sector |
On the road towards Nearly Zero Buildings, a comparison of the current situation for Greece and Cyprus is presented in Table 5 [15].

Table 5. Current status of Nearly Zero Energy Buildings regulation, Cyprus and Greece

| Category | Cyprus | Greece |
|----------|--------|--------|
| Legislation: Definition of NZEB | Yes (National Plan) | Expected to be finalized |
| Maximum primary energy consumption (kWh/m²/year) | 100 for Residential Buildings | Expected to be 50 |
| | 125 for Non-Residential Buildings | Expected to be 100 |
| Maximum energy consumption for heating (kWh/m²/year) | 15 Residential Buildings | None |
| Maximum energy consumption for cooling (kWh/m²/year) | No | No |
| Life Cycle Cost Assessment | Not mandatory | Not mandatory |
| CO₂ emissions limit | No | No |
| Renewable Energy Sources (%) | 25 | Expected to be 20 |

It is obvious that in Cyprus, the legislative and regulative framework regarding NZEB, is quite firm and on the right track. It basically concerns new buildings, due to the fact that retrofitting towards NZEB has high initial investment costs in relation to building’s lifetime, so it is not an attractive solution. On the other hand, in Greece the adaptation of NZEB is at an early stage. So far, no definition for NZEB is set and the minimum energy efficiency of NZEB regarding final and/or primary energy consumption has not yet been defined.

Table 6. Timeline of Laws for energy efficiency in buildings according to EU in Greece and Cyprus

| EU | Greece | Cyprus |
|----|--------|--------|
| 2002/91/EU | 1979: Thermal Insulation Regulation | Law 142(I) 2006 |
| 2006/32/EU | L.3661/2008 | Law 30(I) 2009 |
| | L. 3851/2010 | Law 31(I) 2009 |
| | L. 3855/2010 | Law 210(I) 2012 |
| 2010/31/EU | L. 3855/2010 | Law 56(I) 2014 |
| | 1.4342/2015 | Law 150(I) 2015 |
| 2012/27/EU | L. 4122/2013 | Law 151(I) 2017 |

In compliance with 2010/31/EU the national laws in Greece and Cyprus share common approach and evaluation methodology nevertheless there are some difference concerning U values, energy rating classes, lighting contribution, thermal bridges evaluation and other parameters concerning the energy...
performance of the building examined. The main parameters for Greece and Cyprus are presented in Table 7.

Table 7. Buildings’ energy rating in Greece and Cyprus

| Parameters | Cyprus | Greece |
|------------|--------|--------|
| U value reference building for the ceiling (A climatic zone) | 0.6375 | 0.45 |
| U value reference building for the masonry (A climatic zone) | 0.7225 | 0.55 |
| U value reference building for the floor (A climatic zone) | 0.6375 | 0.45 |
| Lighting loads for the energy certification of buildings | The lighting loads are included in the certification rate in comparison with the reference building | The lighting loads are not included in the certification rate for residential buildings whereas they are included for commercial buildings |
| Thermal bridges | | Upper limit values are not defined |
| Energy rate definition | Comparison of the primary energy consumption of the examined building with the one at the reference building |
| Rating expressed as the percentage % of the primary energy consumption of the reference building | Energy rating from A to H | Energy rating from A to H Extra rating A+ and B+ |
| Conversion Coefficient of the end use energy consumption to the primary energy consumed for the examined building | Electricity: 2.7 Heating: 1.1 | Electricity: 2.9 Heating: 1.1 |

5. Conclusions
One of the major developments of the last decade is the existence of a quite explicit regulatory framework, setting specific goals and providing supportive laws, directives, standards and methodologies, focusing on clean energy, minimizing the energy consumption and reducing the CO2 emissions. The timeline of the goals on energy and greenhouse gas emissions are in brief the following. The 20-20-20 goal (20% improvement of energy efficiency, 20% greenhouse gas emission reduction compared to the ones of the reference year 1990 and 20% contribution to the energy used from Renewable Energy Sources) which has been almost reached. The energy goal for 2030 which practically means 27%-30% improvement of energy efficiency, 40% greenhouse gas emission reduction compared to the ones of the reference year 1990, at least 27% contribution to the energy used from Renewable Energy Sources and 15% electricity interconnection target. And finally the energy goal for 2050 (greenhouse gas emission reduction 80%-95% compared to the reference year 1990). It is a strong interpretation of CO2 emissions and energy consumption. Taking into consideration that energy goals have been reached the same conclusion is stated for CO2 emissions too. The forcoming prediction based on the existing measures is not far from the goals set for 2030 but in case some extra measures are implemented there is a strong possibility to reach the EU target. Nevertheless EU there is some serious work to be done especially if we take into consideration the goals set for 2050.
Cyprus adopted Directive 2010/31/EU into their national legislation in December 2012. Based on this new legal framework, technical requirements for NZEB were defined, detailed requirements for technical building systems were issued and minimum energy performance requirements have since been twice revised, based on the calculation of cost-optimal levels. The new minimum energy performance requirements were implemented on 1 January 2017 and are considered to be the final step for leading Cyprus into a smooth transition towards NZEB.

The responsibility of the implementation of the EPBD in Greece lies on the Ministry of Environment and Energy (YPEN). The adoption of the Directive 2010/31/EU was approved by the Greek Parliament under Law 4122/2013. New buildings must meet minimum energy performance requirements set out in the “Regulation on the Energy Performance of Buildings” (KENAK). In combination with the obligation set in Law 4122/2013 and the revised one Law 4342/2015, these regulations ensure that every new building of the public sector, from 1 January 2019 should be NZEB. This obligation applies also for all new buildings constructed after 1 January 2021.

Even though the legislative framework and the policies for low carbon, energy efficient buildings are developing rapidly, there is undoubtedly much work left to be done in order to reach the future requirements and targets for RES and GHG emissions. The pace of RES use and GHG emission reductions is so far sufficient based on 2020 targets but considering the 2030 and 2050 goals faster evolution is undoubtedly required.

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