



EU4Energy



Armenian Building Energy Efficiency enforcement evaluation and comparison with best practice in European Union Member States

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Background

Buildings represent the largest energy end-use sector in Armenia, accounting for 37.5% of electricity and 25.3% of gas consumption. In the early 2000s, construction of new buildings began to increase on average by 15–20 % annually. According to the draft second National Energy Efficiency Action Plan (NEEAP), the projected energy consumption in residential buildings will continue to be between 27% and 29% of the total energy consumption until 2030.

A number of laws, regulations, construction norms and standards were adopted in Armenia recently that introduced some energy performance requirements to newly constructed residential buildings as well as for renovation of public buildings,

The Decision N120-N sets the minimum energy performance requirements (MEPR) for all new and renovated buildings in the Armenia, except certain type of buildings like temporarily constructions, religious buildings, etc. However, there is no clear procedure on the enforcement of these requirements and issuing the energy performance certificates as a part of control system.

Saving potentials

Energy efficiency requirements for new buildings can result in large savings no matter if these are based on prescriptive values or on energy performance. Experience shows that especially early attempts of building codes can impact energy consumption very significantly by ensuring that buildings start to use the more energy efficient solutions on the market.

Further they usually spur a development for the most efficient technologies and after few years it might be possible to tighten energy codes again to a higher level of efficiency or a better energy performance of these buildings. In some European countries a process has been demonstrated where building codes for energy performance over some years have been reduced to less than 25% of what it was before, without impeding additional costs over the lifetime of the buildings.

Even in markets with a very mature experience for energy efficiency the codes can still continue to be tightened regularly and improvements have been seen in the latest buildings codes even in some of the most experienced countries such as Denmark and Germany, with savings on 25 %, 33 % or even at the level of 50 % compared with the previous codes. Such updates is built into the European legislation through the EPBD requiring that countries update building codes every 5 years using the most cost efficient (cost optimal) solutions.

A part of this process is the pre-expectations, which makes the industry expect the upcoming changes and to prepare more energy efficient products and solutions. As companies therefore prepare new and more efficient products to gain marked advantage.

A special development has been on windows, where windows have doubled efficiency, halving the losses, multiple times over the last decades, moving from one layer of glass to double glazing, then to low energy windows and now on to triple low energy glazing. Every time the u-values have been approximately halved. Germany and Austria has been in a leading role for these with the drive towards passive construction where windows gain more useful energy than they lose.

For the whole building the European Union trend is towards nearly zero energy, where buildings have a very low energy use and here this energy is mainly supplied by renewable energy sources on sight or close by and the supply by traditional sources are minimal.

If a similar development is implemented in Armenia very significant savings can be achieved, with very significant reduction of the energy consumption of new buildings over a relative short span of years. In longer perspective sidelong with economic development it could be possible that Armenia could follow the leading examples on moving towards nearby zero energy buildings, where buildings could be almost free from supply by traditional energy sources.

Much of this saving potential can however be lost because of bad compliance. In the nature of this it is difficult to assess exactly how bad the compliance is and how strongly this can influence the consumption in these buildings. Some examples from the past can however illustrate the magnitude of the problem.

Older studies from the European countries showed bad compliance. A study from Belgium showed that buildings still stayed at the same level even if the code had been tightened very significantly. Construction industry simply continued with the same solutions. In Denmark two surveys 12-15 years ago showed that technical insulation of pipes in as well small as large buildings were non-compliant in 42 % versus 66 % of all new buildings. Owners didn't react and companies concerned more about keeping deadlines. In UK a survey made on a now old building code showed that there was lack of compliance, which could result in energy losses on more than 25 % and giving a significant reduction in the savings to be achieved.

All of these studies and were presented on a Compliance workshop in the international Energy Agency (IEA) in February 2008. The IEA workshop concluded that more than 25% of energy savings and perhaps up to 50% could be lost due to lack of compliance.

All European Union Member States have since done very significant efforts to ensure better compliance mainly in connection to the Energy Performance in Buildings directive, EPBD. For many states this includes certification of new buildings, which in many cases are used to check the compliance by an independent expert, doing a new survey.

Much of the compliance issues today focus on the quality control of the building assessors and to ensure they do a proper inspection with full liability and these can lose their approval as assessor for this work, if they allow bad solutions to pass. Training and information are other solutions to ensure higher compliance.

Recent studies for both new and existing buildings show good compliance with efficiency rules in many European Member States. Most experienced European countries now report compliance rates far beyond 80 %.

In many European Union member states there are high fines on non-compliance or false result both for Building Assessors and for construction companies. On top of this they can be requested to improve or compensate for these non-complying elements. Especially Italy and Germany have very high penalties, which can go up to many thousands of Euros.

It is difficult to say what the potential of compliance issues are in Armenia, as this would request collection of a large set of data for buildings as built and as they would have been if complying fully with the regulation for energy efficiency. It is however not unlikely that lack of compliance can result in loss of 25 – 50% of the total potential.

Many European countries rather focus on ensuring the compliance rather than to try to document the result of the lack of compliance for a large group of buildings.

Improved building codes for energy efficiency and improved implementation have many side effects in form of other benefits. If correctly done energy efficient buildings will have a better indoor climate, as temperature is more stable and warmer in the winter and colder in the hot part of the summer. They often also improve the control of ventilation and can ensure adequate exchange of the air. Such improvements therefore have significant benefits on comfort, health and will help to stimulate economy and create jobs in the construction industry. Energy efficiency in buildings are according to the IEA among those actions, which have the highest impact in form of co-benefits or multiple benefits, as these are called in a recent study.

Such other benefits also create economic saving for the society. A part of the IEA study showed that these societal benefits were often much higher than the direct savings. Alone job creation, social and health benefits could impede 4 times as much economic savings than the costs of the saved energy.

Buildings and climate in Armenia

Armenia is in a process to improve energy efficiency in buildings in general. Implementation of energy performance based building requirements and improved enforcement of the energy efficiency regulation is a central part of this work.

Armenia has some specific conditions with a central climate with hot summers and relative cold winters and with specific influence due to a high altitude in all major habited areas. This is an energy intense climate, which can result in large energy consumption due to the large differences in temperature both over the year and over the day. It is important to take these specific elements into consideration also when comparing with other countries and implementing new policies.

The economic development and the localisation of Armenia makes it difficult to import large amounts of building products as these often are bulky, heavy and difficult to transport over large distances especially when boat transport is limited. Armenia therefore needs to base a large part of the development on internal resources and local solutions.

Further all solutions must be strongly adapted to the earthquake safety needs in Armenia. These can especial impact solutions and products used for construction.

As Armenia have a challenging climate and also an increasing construction industry it is important to focus on energy efficiency in new buildings and in particular the compliance with the recent implemented improvements of requirements for energy efficiency and energy performance.

Armenia has however a relative short experience with energy performance and it has large geographical, political and cultural differences with neighbouring countries and in most Caucasian and Central Asian countries the experience with energy efficiency and especially with energy efficiency is limited.

The specific geographic, economic and climatic conditions will have large influence on levels for efficiency and also for costs for both savings and investments, this means that cost optimality will be very different in Armenia than in Europe.

Some elements of enforcement systems will however not be influenced by such differences and it is obvious that there is much to be learned in this comparison with European countries where energy performance based systems date back more than 10 years in almost all countries and where enforcement of building codes for energy efficiency goes back many decades in some of the most experienced countries.

The large experience in Europe has further been used for some harmonisation or convergence in the last years because of the EPBD directive, the associated Concerted Action and the many European projects bringing countries together in research and development projects, supported from the European Union.

It is therefore be logical for Armenia to tap into this large experience, which is what Armenia is already attempting to do through its Observer status to the Energy Community Treaty and active role in the EE Coordination Group supported by the Energy Community Secretariat. This project feeds into this process.

European best practice compared to current situation in Armenia

In the European Union there is a long tradition for energy efficiency regulation and especially for energy requirements for new buildings as well as a harmonised approach to energy performance. These lessons learned in EU Member states can to large extent serve as basis and inspiration for the development and implementation of building regulation in Armenia, but none of these systems can be directly transferred or copied directly in Armenia, without strong adaptation to local traditions, climate and the very specific conditions of the country.

In this project we therefore intend to combine analyses of systems and experience in Armenia with some elements of the best practices experience in the European Union and to develop this into some recommendations for improvements in the current regulation for new buildings energy efficiency based on the special local context.

The following tables will summarise elements of a review of current legislations and systems, the will to improve these, a mission to collect first hand experience on as well legislation. The review is compared to European Union policies and best practices.

Issue	EU best practice	AM current status	Conclusions
<p>1. Building codes for new and existing buildings</p>	<p>All Member States have energy performance based building codes. In most member states these are supported by secondary demands i.e. with U- or R-values for building parts or maximum heat losses / gains. These are strongly enforced.</p> <p>Building codes must tend towards nearly zero energy consumption and some member states have already reached such a level. EPBD claims such buildings to be the norm from 2021, having very low energy use and mostly supplied from renewable energy.</p> <p>EPBD requests use of cost optimality, if it is economic over time it must be included in the building codes.</p>	<p>Armenia has already taken significant steps towards implementation of overall energy performance for new buildings. Performance based requirements have recently been introduced and experience with enforcement is still relative limited.</p>	<p>Armenia should continue the good progress in setting energy efficiency requirements in new buildings and for existing buildings by renovation and improvements.</p> <p>Compliance, enforcement and a robust structure for implementation are central issues.</p> <p>Many lessons can be learned from Europe, where Member States are driven by the EPBD directive.</p>
<p>2. Complexity in the system for new buildings</p>	<p>Many European States have very simple chains of development and enforcements. Roles and responsibilities are shared among few key actors. Often only two real actors are defined: the Owner is solely responsible for compliance and community for the compliance. Use of experts if at their decision. Or only licensed experts can apply for permits and these are due to significant control.</p>	<p>The process around the construction, approval and control of new buildings in Armenia seems complex and seems to involve many different actors with many different roles. The exact roles of each part or boundaries are not always clearly defined. Some actors found the functions could fall between two chairs.</p>	<p>As there are many parties involved and a strong pressure for cost reductions the roles in checking of compliance should be clearly defined and communicated. This includes roles on what elements are checked and how this is communicated for following levels.</p> <p>Armenia should consider including very clear checkpoints for the technical control of energy performance. This could include that results both on performance and on prescriptive elements should be part of the declarations.</p>

<p>3. Uniform calculation methodology</p>	<p>All Member States have clear procedures for energy performance calculations for buildings. This is a clear requirement from the EPBD. Procedures are clearly defined including default and standard values.</p> <p>Systems are mainly based on CEN norms, developed specifically for the Energy Performance incl. overall frame for combination of more than 30 standards. Much work has been done to combine procedures. Some have become ISO.</p> <p>These norms harmonise results and simplify control procedures.</p>	<p>In Armenia the standards are based on different systems: some developed specifically by the Armenian Standard (RACN), some using principles from Construction norms established by the USSR's GosStroy (SNIPs), while others are using European Norms (CEN) or Global International Norms (ISO). This leads to a less consistent and coherent system and in some cases the link between standards can be difficult and lead to much interpretation.</p> <p>Two experts can come to a different result without making mistakes – this makes compliance checking very difficult.</p>	<p>Armenia should develop a clear procedure for energy calculations and this should include and overall standard ensuring that all standards are combined in a harmonized and uniformed manner. The existing standard for labeling of buildings can serve as an important start for this work and also the work done by CEN in the European union.</p> <p>Different options can be used:</p> <ul style="list-style-type: none"> • Existing standards can be fitted better together and gaps can be filled with new national or international standards. • An international system can be adapted to the Armenian context. This could be based on the European CEN approach. • An existing national European system can be adapted to the Armenian context. • A mix of approaches where some national norms and existing adaptations are combined with overall standards / CEN. <p>These options will have different implications.</p>
<p>4. Systems / tools for calculations:</p>	<p>In the beginning systems was strongly based on descriptions of the calculation methodology and the capacity of the users to do these calculations themselves with or without supporting calculation tool. Today however most of the European systems are strongly integrated with computer tools or calculation cores.</p> <p>In some countries a calculation core or a specific calculation tool has to be used both in connection to applications for building permits and for the energy certification of new and existing buildings.</p>	<p>In Armenia it seems the process of calculation request a much higher expertise and more manual process. It also seems more complex calculation tools or a combination of such tools has to be used. This is a part of the rational for the larger part of involved experts in both the construction chain and the controlling part.</p> <p>Today the market for calculation tools is relative limited.</p>	<p>Armenia should encourage and support the development of specific tools which can be used as well in design as projecting work and finally also in control situations. All levels of the chain could use such a tool and this includes possible certification of the finalised buildings.</p>

<p>5. Setting values of performance:</p>	<p>All EU Member States must set minimum requirements for energy performance of new buildings. These requirements must be based on overall energy performance. These must be updated every 5 years based on cost optimality calculations. These must develop towards Nearly Zero Energy Buildings in 2021.</p> <p>The level is set in MS individually and they vary significantly.</p> <p>Some countries have very low / passive energy as standard and high supply by renewable energy. Many have been updated several times.</p>	<p>The Armenia values for performance are of recent date and still to some extent under implementation. Experience with such values and enforcements are limited.</p>	<p>Armenia should continuously evaluate the level of requirements and when feasible and economic possible these should be updated. Cost optimality could be used in this process.</p>
<p>6. Secondary level demands:</p>	<p>Although all Member States have taken significant steps towards fully performance based building codes many have still kept simpler secondary requirements. Often these have to be complied with as a complementary measure. In some cases however they substitutes the overall performance i.e. by small buildings or by renovation.</p> <p>Secondary demands are often u-values or R-values, maximum heat losses and gains or over all u-values. Some countries even have 3 levels.</p>	<p>In Armenia steps have been taken towards overall performance, and the current regulation is mainly based on performance, but as many of the calculation and testing facilities are missing, secondary and more prescriptive values could be easier to enforce.</p>	<p>Armenia should consider if there could be simpler ways to support the overall compliance until a very rigor system can be in place for overall performance. Especially until a harmonised calculation is developed such systems could ensure higher efficiency and better compliance. For a while these could further co-exist and performance could be a solution to allow for optimisation of element and for special cases while prescriptive values could be a simpler way for compliance.</p>

<p>7. Standardised values / testing:</p>	<p>In European Member States there are in general requirement for testing of materials and technical systems / components. These testing have to be done at independent laboratories and can be used cross over Europe once products have been tested at a recognised laboratory in one MS.</p> <p>Many rules are set in connection to the ECO Design directive and include labelling of products.</p> <p>Many countries have set conservative (high) default values unless tested or proven and fixed values i.e. primary energy factors must be used.</p>	<p>In Armenia the capacity for testing is available for some products, but the testing is only used to a smaller concern. There is a need to upgrade testing and ensure these are done for the mostly used materials. A specific problem in testing in Armenia is windows, where the testing is very limited, (non existent) even if these play a significant part in the overall performance.</p>	<p>Armenia should evaluate the current situation with testing of products and should implement activities to ensure better knowledge and independent test results for products. In particular such testing should focus on local produced material and products where no international values for efficiency and be found.</p>
<p>8. Use of certification for compliance</p>	<p>The EPBD requires all Member States to ensure certification of all new constructions. Most countries use this certification in the process of compliance. An independent assessor checks the compliance of individual building parts, systems as well as the overall performance of these buildings. This control usually also include the secondary requirements. Most often this certification takes place after construction to ensure label to document as built.</p> <p>Strong penalties and liability ensures independent valuation. Quality control has many layers and assessors can loose approval.</p>	<p>Armenia has been working with implementation of energy performance certification. Some examples / case studies have been done. Some of the buildings considered for mandatory certification are new buildings and this could be used directly in the support for better compliance. If an independent assessor certify a building before it is given the permission to use this assessor could check the full compliance with the energy efficiency requirements.</p>	<p>Armenia should consider developing and implementing certification for new buildings. In order to ensure documentation of compliance such certificates must be made after construction and made available before the final approval to use the building. The must be made by independent assessors with liability and with a system with strong quality assessment.</p>

<p>9. Training and information</p>	<p>All Member States recognise that compliance with building codes for energy efficiency and overall energy performance require new skills and information for different experts in the chain of construction. This is as well for professionals, such as architects, engineers, construction companies and those controlling or checking, but it also require information and material for non-technical partners such as experts in finance, developer and house owners.</p> <p>Both national programs and common EU projects supports training and information and some countries have very significant experience and current programs in this field.</p> <p>The EPBD directive requests for such programs to be done and reported to the European Commission. Part of this is under the EED directive.</p>		<p>Armenia should be developed a strategy and material to inform and help users in all parts of this work and also for the general public. Building professionals should be offered training and this could in some cases be mandatory or combined with acknowledgement of this training or learning.</p>
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