German Federal Environment Ministry's Advisory Assistance Programme (AAP) for Environmental Protection in the Countries of Central and Eastern Europe, the Caucasus and Central Asia

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Information on the project

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Recipient of the advice:	Bulgarian Ministry for Environment and Water, Ministry of Economy, Energy and Tourism, Ministry of Regional Development and Public Works, national and local political actors, private sector companies, non-governmental organisations
Implementing organisations:	Bulgarian School of Politics “Dimitry Panitza”, German Embassy in Sofia
Project identification:	22816

Information on the reporting organisation

Name of organisation:	Bulgarian School of Politics „Dimitry Panitza“
Address:	Bulgaria, Sofia, Tsar Shishman 17, app.4
Contact person:	Aleksandar Ilchev
Phone:	+359892205967
E-mail:	ailchev@schoolofpolitics.org

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Context

The key objectives of EU environmental and energy policies are summed up in the communication of the European Commission "20 20 by 2020"[1]. The 20:20:20 targets refer to 20% of improvements in energy efficiency, 20% of energy consumption to come from renewable energy sources and to achieving a reduction of CO_2 emissions of at least 20% below the 1990 level. The target makes energy efficiency one of the major priorities of the EU.

As a member of the EU, energy efficiency is recognized as a high level priority by the Government, President and business in Bulgaria. Recently the President and the Government of Bulgaria have reconfirmed their commitment to that, thus making it one of the major driving forces for the socio-economic development of Bulgaria.

Bulgaria has already transposed the European legislation into national laws. According to Directive 2006/32/EC[2] Bulgaria has adopted as target for national indicative energy savings not less than 9% of final energy consumption for 9 years (average 1% per year) by 2016, which means that the country should provide fuel and energy savings of 627 ktoe/year[3].

Moreover as far as Bulgaria is dependent on external providers of energy in terms of both resources and production, energy efficiency becomes even more important in terms of improving energy security of the country.

A further reason to seek energy efficiency is the Bulgarian engagement in the Kyoto Protocol. Bulgaria has ratified the United Nations Framework Convention on Climate Change in March 1995 and the Kyoto Protocol in August 2002, by which it has made commitment to maintain the greenhouse gases (GHGs) below the level of 1988, adopted as a base year.

Buildings account for a large share of CO_2 emissions in Bulgaria. This is due to the old and inefficient building stock and to a big number of relatively old buildings in Bulgaria which require more energy - especially for heating. Bulgarian residential sector accounts for 21% of the country's total energy use and 39% of the total electricity use.[4] For that reason, implementation of energy efficiency measures is worthwhile. Additionally, securing energy efficient homes that incur lower energy bills is a good option for the population to reduce the expenditures for energy.

Although much has been done in the area after the Bulgarian accession to the EU Bulgaria still has one of the lowest energy efficiency in the EU.[5] Bulgaria has EU emissions commitment and energy efficiency is the best way to address them, but the financial mechanisms are not in place. Currently the country has considerable potential for the realization of economically profitable energy efficiency measures because after a period of stabilization the final energy consumption and the primary energy consumption have begun to grow again. Therefore, urgent measures are needed to change this trend because energy efficiency is the best way for citizens and business to save funds especially in the times of economic hardships. What is more, by improving the energy efficiency Bulgaria will also increase the competitiveness of its economy.

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[1] European Commission (2008): 20 20 by 2020. Europe's climate change opportunity. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2008) 30 final. 23.01.2008

[2] Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC

[3] Second National Energy Efficiency Action Plan, 2011-2013, June 2011, Sofia, Bulgaria

[4] Second National Energy Efficiency Action Plan, 2011-2013, June 2011, Sofia, Bulgaria

[5] Second National Energy Efficiency Action Plan, 2011-2013, June 2011, Sofia, Bulgaria

Therefore shifting the use and production of energy towards a more sustainable level is not merely a technical issue for a group of experts within the country but needs the attention and support of the society and requires the exchange of experiences between the different stakeholders. Currently, public dialogue on energy efficiency measures is weak, making the introduction and implementation of necessary societal initiatives, targeting higher energy efficiency difficult. Discussions are often limited to narrow expert circles, not reaching broader segments of society.

Objective and expected results

Objective:

The overall objective of the project is to propose suitable policy mechanisms that could bring sufficient investment flows into energy efficiency projects in the building sector and the industry in Bulgaria.

Expected results:

- **Explore the energy efficiency situation in Bulgaria.** As one of the EU members on the Balkans with ambitions in the sector declared in the positions both of the Prime Minister and the President, Bulgaria has the potential to be a catalyst for improving the energy efficiency in the whole region. The conference will discuss the advantages and challenges for the country of such an ambition.

- **Provide examples** from German business for investment possibilities in energy efficiency measures. The conference will discuss the German experience in the field and will provide concrete examples to be implemented in Bulgaria.

- **Identify energy efficiency investment opportunities.** The conference will explore different national, EU and global investment sources which potentially could be used for improving the energy efficiency in Bulgaria. The discussion will look into potential streams from EU and national government funds, private funds, catalysing the investment potential of personal savings and others.

- **Provide a clear view** on problematic areas which prevent the successful implementation of energy efficiency mechanisms. The discussion will focus on the institutions that are responsible for the implementation of energy efficiency measures and the difficulties they face in the process.

Activities

The major activity of the project has been the conference “Energy Efficiency Investment Mechanisms”. It has been held on 14.11.2012 at the premises of the German Embassy in Sofia. The event has been organized by the Bulgarian School of Politics "Dimitry Panitza" and the Embassy of the Federal Republic of Germany to Bulgaria. It has been organized with the financial support of the German Federal

Ministry for the Environment, Nature Conservation and Nuclear Safety with means of the Advisory Assistance Programme for Environmental Protection in the Countries of Central and Eastern Europe, the Caucasus and Central Asia. It has been technically supervised by the German Federal Environment Agency (Umweltbundesamt, UBA).

Lecturers:

Alexandar Hadzhiivanov, Principal Manager, Energy Efficiency, EBRD
Bogdan Atanasiu, Senior Energy Efficiency Expert, Building Performance Institute Europe (BPIE)
Delyan Dobrev, Minister of Economy, Energy and Tourism of Bulgaria
Desislava Yordanova, Director, Directorate "Housing Policy", Ministry of Regional Development and Public Works"
Diana Mangalagiu, Smith School of Enterprise and the Environment, University of Oxford
Evgeny Angelov, Presidency of Bulgaria
Julian Popov, Chairman of the Board, Bulgarian School of Politics "Dimitry Panitza"
Krasimir Naidenov, Director, Sustainable Energy Development Agency
H.E. **Matthias Hoepfner**, Ambassador of Germany to Bulgaria
Miriam Ott, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
Oliver Rapf, Executive Director, Building Performance Institute Europe (BPIE)
Petar Karaboev, Deputy Editor in Chief, Capital Daily
Zdravko Genchev, Executive Director, EnEffect

Panels:

Panel 1
Energy Efficiency in Bulgaria – Challenge and Opportunity

The panel has explored the current state of energy efficiency in Bulgaria and the key policies that have been currently implemented on national level. The draft briefing "Funding Energy Efficiency in Bulgaria" has been also announced.

Panel 2
International Policy Practices for Energy Efficiency

The panel has presented selected energy efficiency policies in Germany and other European countries, their success in attracting wide range of investments and their applicability to the Bulgarian economic and social context.

Panel 3
Financing High Energy Efficiency Standards Buildings

This panel has presented the European building energy efficiency standards of the future and has discussed the best ways they could be financed. The panel has also launched the report "Implementing nearly Zero-Energy Buildings (nZEB) in Bulgaria – towards a definition and roadmap" prepared by BPIE.

Expert Meetings

Expert meetings after the conference have allowed the participants to discuss the outcomes of the conference in a more informal atmosphere. That has provided them with the opportunity to be sincere in sharing personal opinions that could not be done during the conference due to the official positions of the institutions they have represented. Moreover, the expert meetings have allowed the audience to get in touch with each other and with panelists and discuss possible future cooperation. Our expertise in the field shows that expert meetings are very useful for the achievement of the objectives of such projects.

Results

The conference "Energy Efficiency Investment Mechanisms" has been held at the premises of the German Embassy in Sofia on 14th November 2012. It has received huge attention from all interested sides. Participants have been politicians, businessmen, investors, scientists, representatives of non-governmental organisations (NGOs) and media.

The conference:

- Has explored the energy efficiency situation in Bulgaria. As one of the EU members on the Balkans with ambitions in the sector declared in the positions both of the Prime Minister and the President, Bulgaria has the potential to be a catalyst for improving the energy efficiency in the whole region. The conference has discussed the advantages and challenges for the country of such an ambition.

- Has discussed German and other foreign experience in the field and has provided concrete examples to be implemented in Bulgaria.

- Has identified energy efficiency investment opportunities. The conference has explored different national, EU and global investment sources which potentially could be used for improving the energy efficiency in Bulgaria. The discussion has looked into potential streams from EU and national government funds, private funds, catalysing the investment potential of personal savings and others.

- Has provided a clear view on problematic areas which prevent the successful implementation of energy efficiency mechanisms. The discussion has focused on the institutions that are responsible for the implementation of energy efficiency measures and the difficulties they face in the process.

The most interesting points of the panelists:

Bulgarian municipalities will receive another 51 million euros interest-free loans for energy efficiency measures, has said the Minister of Economy, Energy and Tourism Delian Dobrev during the conference. According to Minister Dobrev the most important resource for financing energy efficiency measures in Bulgaria is the

operational program "Competitiveness" of the scheme "Energy Efficiency and Green Economy." Under it 150 million euros are allocated as grants and 150 million euros as loans from EBRD for financing of projects. Alternative option is the international fund "Kozloduy" under which agreements for 47 million euros are signed. The funds will be distributed among 243 public buildings most of which are schools, kindergartens and hospitals buildings, has said Minister Dobrev.
Energy efficiency is a priority of the Bulgarian President, has said the President's economic adviser Evgeni Angelov. Our goal is the energy intensity of the economy in 2020 to be only 2 times larger than the average in the EU27. For comparison, in 2010 it has been 4.8 times larger.
Energy efficiency is one of the most important parts of energy policy in Germany, has said the Ambassador of Germany H.E. Matthias Hoepfner. He has mentioned that politicians must now create a framework to support energy efficiency and renewable energy sources. He has added that this was the way to counteract climate change.
CO_2 emissions will be reduced by nearly 5 million tons if Bulgaria starts to build houses with almost zero energy consumption. Energy savings will be approximately 17 TWh. Such are the conclusions of a special analysis on Bulgaria conducted by the Building Performance Institute Europe (BPIE). It has been presented by Oliver Rapf who is its Executive Director. According to another study of BPIE, conducted for the entire European Union, if after 2020 all Member States start to build only buildings with almost zero energy consumption, 345,000 new jobs will be created in construction related industries and innovations sector. The necessary investments are about 62 billion euros per year.
For the first time, experts have had the opportunity to get acquainted with the report on buildings with almost zero energy consumption for Bulgaria and to discuss its meaning for the construction industry, labor market and the energy needs of buildings.
Forum participants have discussed the potential role of Bulgaria as a regional center of development and financing of energy efficiency within the EU and the latest economic research on how the EU's energy efficiency targets will affect national economies.
After the panels the participants have had the possibility to meet and discuss the ideas that had been mentioned. That has contributed to the successful outcome of the conference that will lead to the achievement of future cooperation.

All relevant information and all presentations are uploaded on the website of the conference. It has been developed especially for the event and will continue to be improved with additional information. The site has both Bulgarian and English versions.

Link: http://energy-conference.schoolofpolitics.org/

During the conference several new reports have been presented and distributed. They have received huge attention from the audience and the media.

1. Bulgarian School of Politics: Policy brief "Energy Efficiency Programs. Funding Mechanisms. A Brief Overview of Programs in Bulgaria" - it provides an overview of existing tools and mechanisms for funding and raises issues that need to be taken into account in the development of future energy efficiency measures in Bulgaria

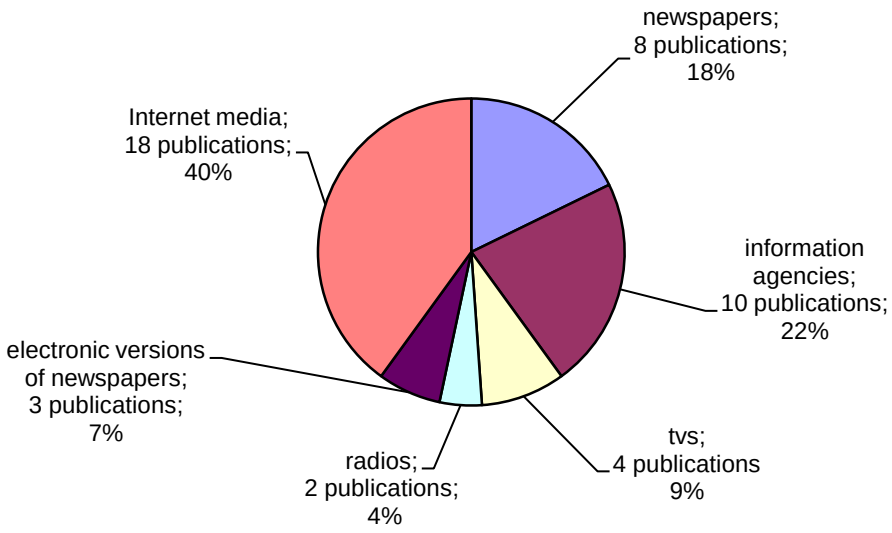
2. Building Performance Institute Europe: Implementing nearly Zero-Energy Buildings (nZEB) in Bulgaria – towards a definition and roadmap

3. German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, German Federal Environment Agency: Report on the Environmental Economy 2011. Facts & Figures for Germany

4. German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety: GreenTech made in Germany 3.0. Environmental Technology Atlas for Germany

The conference has received huge media attention. It has been attended by representatives of 18 national media (tvs, radios, newspapers, electronic media). It has been covered through 45 publications.

Publications by source:



Evaluation of the Project's Goals

All of the project goals have been achieved. The opening and the first panel have described the current energy efficiency situation by representing the opinion of the Bulgarian Government, Presidency and one of the major financing institutions – EBRD. The economic advisor of the President Evgeni Angelov for a first time has presented the strategy on energy efficiency of the President.
The second panel has presented the foreign experience in the area of energy efficiency investments. It has been added by Mrs. Dessislava Yordanova (Ministry of Regional Development and Public Works of Bulgaria). The idea behind that has been to compare the current environment in Bulgaria and abroad. That has contributed to the establishment of a clear view on the position of Bulgaria.
The third panel has shown the European building energy efficiency standards of the future and has discussed the best ways they could be financed. The panel has also launched the "Implementing nearly Zero-Energy Buildings (nZEB) in Bulgaria – towards a definition and roadmap" report. The standard has been greatly appreciated by all stakeholders. The opinion of all participants has shown that there is a big potential in it. As far as there is a huge potential for an increase in energy efficiency in buildings the standard is considered as very prospective.

All of the panels together with the discussions after them and the policy brief "Financing Energy Efficiency in Bulgaria" have contributed to the identification of suitable energy efficiency policy mechanisms. The conference has explored different national, EU and global investment sources which potentially could be used for improving the energy efficiency in Bulgaria. The discussion has looked into potential streams from EU and national government funds, private funds, catalysing the investment potential of personal savings and others.
The participation of representatives of institution directly responsible for the implementation of energy efficiency measures in the country has contributed to the establishment of a clear view on problematic areas which prevent the successful implementation of energy efficiency mechanisms. The discussion has focused on the institutions that are responsible for the implementation of energy efficiency measures and the difficulties they face in the process.

Evaluation of the Project's Impact

The project has had a great impact on the development of the energy efficiency sector in Bulgaria. It has been one of the few events that has let to clear and visible outcomes and not to simply talking. The policy brief "Energy Efficiency Programs. Funding Mechanisms" provides real and concrete solutions for improving the energy efficiency in the country. It is open for comments and improvements which will further develop it. The briefing has provoked huge interest in the panelists and the audience because it is the only document in the country that summarizes all sources and funds for energy efficiency.

The conference has included all stakeholders as speakers and audience. That has allowed each side to state its views, ideas and problems in implementing energy efficiency measures. However, we have planned a lot of time for discussions because they are the basis for real solutions. It is very important to have the opinion of all stakeholders before considering the implementation of certain measure. Therefore, we have differentiated from other conferences where 90% of the time is for panels and tried to shift it to 50:50. The feedback from participants on that is 100% positive.

There is a huge possibility that the standard for nearly zero energy buildings will be implemented on a national level. If that happens it will be one of the biggest outcomes as a result of such events in Bulgaria and will prove the fact that the conference has not been only talking but has contributed to the implementation of real measures.

Evaluation of the Project by the Bulgarian School of Politics "Dimitry Panitza"

The Bulgarian School of Politics "Dimitry Panitza" considers the project to be a very successful one. It has provoked huge attention from all stakeholders. We have received feedback from many participants stating that the conference has been very successful. They have stressed on the fact that it has been different from other conferences they have attended. The difference has been in the provision of concrete and direct solutions. Hopefully, based on them concrete results will be achieved.

Energy Efficiency Investment Mechanisms

14th November 2012

Embassy of the Federal Republic of Germany
Frederic-Joliot-Curie 25, Sofia

Bulgaria is often presented as the most energy inefficient country in the EU. Despite a significant progress in the last decade, energy efficiency remains an enormous challenge for the country. The low level of energy efficiency is a burden on the economic competitiveness, keeps the energy dependency at an unnecessarily high level and it also associated with significant social cost as a result of high energy bills and fuel poverty. At the same time high energy efficiency offers unique low cost opportunities for stimulating employment and economic growth, improving the standards of living and reducing greenhouse gas emissions. This conference will debate the policies and the financial mechanisms that could accelerate the improvement of the energy efficiency of the Bulgarian economy.

09:00 – 09:30	Registration and Coffee
09:30 – 09:45	Welcome and Opening of the Conference **Delyan Dobrev**, Minister of Economy, Energy and Tourism **H.E. Matthias Hoepfner**, Ambassador of Germany to Bulgaria **Julian Popov,** Chairman of the Board, Bulgarian School of Politics "Dimitry Panitza"
Panel 1	**<u>Energy Efficiency in Bulgaria – Challenge and Opportunity</u>** The panel will explore the current state of energy efficiency in Bulgaria and the key policies that are currently being implemented on national level. The draft briefing "Funding Energy Efficiency in Bulgaria" will be also announced. **Moderator: Julian Popov**, Chairman, Bulgarian School of Politics "Dimitry Panitza"
09:45 – 10:30	**Krasimir Naidenov,** Director, Sustainable Energy Development Agency **Evgeny Angelov,** Presidency of Bulgaria **Alexandar Hadzhiivanov**, Principal Manager, Energy Efficiency, EBRD
10:30 – 11:00	Panel Discussion
11:00 – 11:15	Coffee Break

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Panel 2 **<u>International Policy Practices for Energy Efficiency</u>**

The panel will present selected energy efficiency policies in Germany and other European countries, their success in attracting wide range of investment and their applicability to the Bulgarian economic and social context.

Moderator: Petar Karaboev, Deputy Editor in Chief, Capital Daily

11:15 – 12:00	**Diana Mangalagiu**, Smith School of Enterprise and the Environment, University of Oxford **Miriam Ott**, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety **Desislava Yordanova**, Director, Directorate "Housing Policy", Ministry of Regional Development and Public Works"
12:00 – 12:30	Panel Discussion
12:30 – 12:45	Coffee Break

Panel 3 **<u>Financing High Energy Efficiency Standards Buildings</u>**

This panel will present the European building energy efficiency standards of the future and will discuss the best ways they could be financed. The panel will also launch the Near Zero Energy Building report on Bulgaria.

Moderator: Bogdan Atanasiu, Senior Energy Efficiency Expert, Building Performance Institute Europe (BPIE)

12:45 – 13:30	**Oliver Rapf,** Executive Director, Building Performance Institute Europe (BPIE) **Zdravko Genchev,** Executive Director, EnEffect
13:30 – 14:00	Panel Discussion
14:00 – 14:15	Conclusions
14:15 – 15:15	Lunch
15:15 – 17:00	Expert Meetings

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Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Embassy of the Federal Republic of Germany Sofia

Bulgarian School of Politics "DIMITRY PANITZA" New Bulgarian University

ENERGY EFFICIENCY PROGRAMS

FUNDING MECHANISMS

A BRIEF OVERVIEW OF PROGRAMS IN BULGARIA

"This project has been financed by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety with means of the Advisory Assistance Programme for Environmental Protection in the Countries of Central and Eastern Europe, the Caucasus and Central Asia. It has been technically supervised by the German Federal Environment Agency (Umweltbundesamt, UBA). The content of this publication lies within the responsibility of the authors."

1. Summary

As the world's economies seek to decarbonize, energy efficiency efforts have gained broad acceptance as a crucial instrument to attain lower greenhouse gas emissions at least cost. Access to adequate financial resources is paramount in any effort to implement meaningful energy efficiency initiatives. This brief overview highlights the major funding instruments employed in Bulgaria, as well as others implemented elsewhere, with comments on their applicability in this country.

Broadly adopted energy efficiency funding mechanisms worldwide involve a significant public finance contribution. In Bulgaria, both national and EU-mandated instruments have been dependent upon government action to rally resources and provide predictable implementation guidance.

Energy efficiency funding programs are tailored to address the needs of businesses and residential users, as well as municipal entities and non-profit groups. Resources are provided for a number of energy efficiency measures, primarily focusing on new construction, equipment purchases and building retrofits.

The links to further information on the funding instruments can be found at the end of the document.

2. Funding Energy Efficiency in Businesses and Organizations

A number of mechanisms exist to ensure that businesses interested in making strategic energy efficiency investments can access resources. They address varying needs in terms of upfront cost mitigation, payback period, overall return on investment, etc.

2.1. *Energy Efficiency and Green Economy* Grants

These grants are made available to micro, small and medium-sized businesses under the Competitiveness Operational Program funded through the European Fund for Regional Development and the Bulgarian government[i]. A total of €150 million have been allocated with individual grants for large investment projects capped at €1 million, and at €200000 for small investment projects. Eligible investments include equipment and technology, as well as services. Project co-funding levels are between 30% to 50%, depending on a number of criteria. Information sessions presenting the specifics of this opportunity are currently under way in various cities throughout the country[ii].

2.2. Agricultural Energy Efficiency Grants

Various Rural Development Measures provide grant support for energy efficiency investment laterally. An example is the now oversubscribed Measure 123, Adding Value to Agricultural Products, which helps argo-processing enterprises recoup the cost of certain energy efficiency improvement investments.

2.3. Other Sources of Grant Support

Revenues from Bulgaria's excess Assigned Amount Units (AAUs) are administered by the National Trust EcoFund to provide grant support to businesses, non-profit entities, residents' associations, municipal and national authorities as they implement building energy efficiency projects under the Green Investment Scheme[iii]. A recent agreement for the purchase of AAUs by Austria has prompted an extraordinary call for projects[iv].

2.4. Loans and Loan-related Instruments

Loans are made available for energy efficiency investments through several facilities. They are typically packaged with consulting services and may involve additional investment incentives, such as subsidies, preferential terms, etc.

2.4.1. Bulgarian Energy Efficiency and Renewable Energy Credit Line (BEERECL)

BEERECL[v] is a credit facility made possible by the European Bank for Reconstruction and Development (EBRD), in partnership with the European Union and the Bulgarian government. Six commercial banks[vi] act as on-lending entities to provide industrial energy efficiency loans of up to €2.5 million. I addition, eligible projects receive consultation assistance and, upon successful completion, a grant of up to 15% of the disbursed loan amount. The grant is made through the Kozloduy International Decommissioning and Support Fund (KIDSF). A mirror program aimed specifically at residential energy efficiency improvements is structured similarly. It is outlined in 3.3 below.

2.4.2. Bulgaria Energy Efficiency Competitive Industry Financing Facility (BEECIFF)

BEECIFF[vii] is another EBRD-supported lending facility providing the loan counterpart to the grants outlined under 2.1 above. This facility operates through the lending capacity of six commercial banks[viii] to provide loan assistance to businesses applying for grants to ensure that applicants have secured at least 80% of the total project cost up-front, whether through their own funds or through a bank loan.

2.4.3. Completed EBRD Loan Programs

A third EBRD energy efficiency support program, the Energy Efficiency Finance Facility[ix], was just completed, having disbursed €20 million to over 40 industrial projects in Bulgaria.

2.4.4. Loans under the Bulgarian Energy Efficiency Fund (BEEF)

BEEF[x] provides several products to businesses, municipal authorities and individuals aimed at facilitating investment in energy efficiency improvements. Loans are made available to businesses at interest rates between 5% and 10% for a period of up to 5 years and require borrower contribution that varies depending on the specific terms of financing, e.g. if a commercial bank is involved in the transaction.

2.4.5. Partial Credit Guarantees

BEEF provides PCGs of up to €410000 to support borrowing entities for a period of up to 5 years. Depending on BEEF's creditor priority relative to the borrower's commercial bank lenders, its PCGs are capped at 50% to 80% of the total project loan.

2.4.6. Portfolio Guarantees

To facilitate the process of project risk assumption by Energy Service Company (ESCO) Contracts, BEEF provides portfolio guarantees, up to a negotiated limit, with 5% of the total portfolio amount being a realistic range. A similar instrument is available to residential retrofit projects to mitigate the risk assumed by the lending commercial bank.

2.5. ESCO Contracts

ESCO contracts are an instrument which allows entities to significantly mitigate the up-front cost of energy efficiency projects. ESCOs are commercial entities which assume the design and implementation of the entire energy efficiency project for a client. ESCOs are responsible for securing financing, by accessing their own resources or, more frequently, raising funds externally. Project costs, including the ESCO's fees, are paid out over time, as the resulting energy savings are realized. This mechanism targets primarily municipal and state-owned entities, and has been gaining increasing popularity due to its potential to mobilize third-party financing, as well as its flexibility and specific project risk allocation.

2.6 Newly-Launched Programs

Targeting small and medium-sized enterprises, the Green Industry Innovation Program is a new business development program launched by the European Economic Area[xi]. Worth €13.7 million, this program aims to encourage 'eco-innovation' in business and support the greening of local industries. The program is run by Innovation Norway and will promote business-to-business cooperation between the two countries. Improvements of technology and processes, waste and waste water management, energy efficiency, certification and verifications, strengthening of competences and capacity building are among the activities which will be eligible to receive support.

3. Funding Residential Energy Efficiency Efforts

Buildings can represent nearly 40% of energy requirements in an economy and are therefore a pivotal area to target to attain meaningful efficiency gains. They provide significant opportunities for cost-effective investments in efficiency. Retrofitting and efficiency investments in existing buildings represent nearly 50% of the efficiency/carbon reduction potential of buildings in the average European economy[xii]. In addition, deep retrofits, which address a building's overall and long-term energy efficiency performance, deliver the most cost-effective results over time. Since cost is the single most prohibitive barrier to optimal investment in this area, sufficient and stable capital is understandably a priority.

3.1. Grants

Grants of up to 50% of project cost are made available through the Ministry or Regional Development and Public Works (Housing Policy), which recently launched its Energy Renovation of Bulgarian Homes program[xiii]. The funds under this program total €26 million and are provided by the EU's Regional Development Fund, through the Regional Development 2007-2013 Operational Program. The program operates in 36 urban areas throughout the country. Eligible recipients include owners' associations in multifamily buildings whose purpose is primarily residential. Eligible investments include a diverse group of building retrofit measures. Grant support is packaged with a technical and energy efficiency audit, which is fully funded by the program. The program will run until 2015.

3.2. Loans and Bank Guarantees through the Building Renovation Fund

A Building Renovation Fund (BRF) of €5.3 million is made available though a commercial partner bank to facilitate the implementation of projects funded under 3.1 above. BRF will be tapped to provide escrow accounts, low-interest preferential loans and bank guarantees to grant recipients seeking to raise funds to cover the balance of their project's cost.

3.3. Loans and Grants through the Residential Energy Efficiency Credit Line

REECL[xiv] is a €40 million facility made possible through the European Commission, EBRD, and the Bulgarian Energy Efficiency Agency. The facility works with 4 partnering commercial banks[xv] to provide loans to homeowners' associations seeking to finance eligible energy efficiency projects. Incentive grants are provided upon successful project completion and may cover up to 35% of total project cost. The grant component is made available through KIDSF. These funds will be available through mid-2014.

3.4. Residential Portfolio Guarantees through BEEF

As discussed in 2.4.6 above, BEEF offers this instrument to mitigate the commercial lender's risk in residential efficiency improvement projects with the purpose of facilitating the flow of external financing.

3.5. Energy Performance Contracting with ESCOs

Another mechanism, already in place for businesses, whose principal purpose is to bring together financial resources, energy efficiency project expertise and the residential customer, is the use of energy performance contracts (EPCs). EPCs involve a broader use of ESCOs to attain energy savings for residential buildings as well. An example involves pilot projects under the FRESH[xvi] Initiative, involving Bulgarian, as well as other European social housing operators.

3.6. Tax Incentives

A fiscal mechanism which is probably somewhat underused entails incentives through tax exemptions and fee waivers at the national and local level. Currently, property tax exemptions for retrofitted buildings, if successfully certified, may last up to 10 years. Additionally, some municipalities have opted to waive building permit fees and sidewalk usage fees for the duration of building retrofit projects.

No significant tax credits or reduced VAT rates have been legislated in support of energy efficiency initiatives.

3.7. European Investment Bank Energy Efficiency Support Program

To assist urban areas with technical expertise and organizational capacity to implement large energy efficiency projects, the EIB has launched ELENA, the European Local Energy Assistance facility. Funding for this initiative comes from the Intelligent Energy Europe II program and covers up to 90% of the technical support cost local and regional authorities incur to prepare energy efficiency or renewable energy projects[xvii].

3.8. Private Sources of Financing

Commercial lenders have been hesitant to develop innovative stand-alone instruments targeting energy efficiency projects, other than those which involve at least some public funds. Currently, no retail bank offers energy-efficiency specific financing instruments.

4. Looking Outward

As the table below demonstrates, energy efficiency measures in Bulgaria can benefit from most of the financial instruments currently deployed in the European Union[xviii]. Nearly all conventional and some innovative mechanisms are available to businesses, public entities and/or residential projects in this country.

Financial instruments in Europe	Financial instruments in Bulgaria
Grants/subsidies/funds	V
Loans	V
Tax/VAT incentives	V
Energy Supplier/ Efficiency Obligations	X
Third-party financing/EPC	V
Levies	X

Source: BPIE, research (V – yes, X – no)

Although there appears to be a variety of mechanisms in place in Bulgaria, the uptake has reportedly been modest so far. A general lack of awareness and perceptions of high up-front costs are the most significant impediments.

Among the mechanisms not in use in Bulgaria, one that stands out and merits significant consideration involves Energy Efficiency Obligations[xix]. Broadly in use in the United States and in some EU countries, EEOs are an instrument which engages distribution utilities, energy suppliers or independent entities in delivering performance-based energy savings to a broader market. This mechanism is attractive in that it does not rely on public funds. If designed well, it can contribute to the country's energy efficiency efforts.

5. Looking Forward

As with all efforts which require a significant up-front investment and lead to benefits that become obvious over time, energy efficiency efforts are heatedly debated, as is the optimal mix of public and private funds that must be dedicated to implementing them. Lack of project funding for energy efficiency initiatives is consistently identified as the top barrier, and it is ever more prevalent in an environment of global economic belt-tightening.

Financing options in Bulgaria rely heavily upon external public funds at this time. Moving away from government-provided or facilitated funds is pivotal to ensure the long-term viability of energy efficiency efforts. There is a clear need to continue to raise capital sustainably beyond the existing programs, some of which are fairly near sunset horizons. Energy Efficiency Obligations and Energy Performance Contracting are two innovative instruments that mobilize private funds and may thus contribute to meaningful energy efficiency measures, if used more broadly and in a manner adequately tailored to Bulgarian specifics.

Additionally, another major issue that must be addressed in any future policy design action with respect to energy efficiency is how to encourage changes in behavior to attain ongoing energy savings. It is widely known that, since the country's energy intensity is fairly high, simply focusing on the "low-hanging fruit" is likely to result in noticeable efficiency gains. Thus, large-scale residential retrofits are an obvious, and rewarding, first step. As both the circumstances and the policies evolve, however, the challenge is for

funding instruments to be so designed as to encourage not only broad, but also deep efficiency measures, as well as sustainable patterns of green behavior for corporations and citizens alike.

Related to these broad considerations, there is a diverse group of specific policy questions that loom large and must, at the very least, inform the next wave of energy efficiency measures in Bulgaria:

- Do the existing mechanisms offer sufficient incentive for attracting domestic and foreign investment?
- Are there reliable ways to attract the substantial Bulgarian personal savings into the residential retrofit effort?
- How to secure the optimal technical standard of building retrofits so that buildings are locked in, at a minimum, medium-level energy saving mode?
- Are there financial provisions for the implementation of the near-zero energy standard for buildings which comes into effect in the EU in 2020?
- What is the most effective institutional management of the energy efficiency policies?
- Do energy efficiency policies have to be highly centralised, based on inter-institutional coordination or mainly dependent on local authorities?
- How can the financial savings from energy efficiency measures be directed into further energy efficiency measures or used to repay energy efficiency loans?
- Is there a role for the utilities companies to play in the residential retrofit efforts?

Obviously, the above is simply a sampling of the issues which must be given serious consideration.

Notes

[i] http://www.opcompetitiveness.bg/images/module3/430_igrp_2012_revised_11.09.2012.pdf
[ii] http://opcompetitiveness.bg/index.php
[iii] http://www.ecofund-bg.org/NDEF/upload/approved_projects_NTEF.pdf
[iv] To be submitted by October 30, 2012.
[v] http://beerecl.com/cms/?q=en/home
[vi] Allianz, DSK, Piraeus, PostBank, UniCredit, United Bulgarian Bank.
[vii] http://beeciff.org/cms/en
[viii] Allianz, DSK, MKB UnionBank, ProCredit Bank, Raiffeisen Bank, UniCredit Bulbank.
[ix] http://bulgaria-eueeff.com/pages/eueeff-bg_starter_en.htm
[x] http://www.bgeef.com/display.aspx
[xi] http://www.eeagrants.org/id/3193
[xii] *Residential Efficiency Retrofits*: *A Roadmap for the Future*, May 2011, Chris Neme, Meg Gottstein and Blair Hamilton
[xiii] http://mrrb.government.bg/?lang=bg&do=ispa
[xiv] http://www.reecl.org/about.php
[xv] CIBank, DSK, ProCredit Bank, Raiffeisen Bank.
[xvi] http://www.fresh-project.eu/project/
[xvii] http://www.eib.europa.eu/products/elena/index.htm
[xviii] http://www.bpie.eu/documents/BPIE/publications/BPIE_Financial_Instruments_08.2012.pdf
[xix] Also known as White Certificates.

Implementing nearly Zero-Energy Buildings (nZEB) in Bulgaria –
towards a definition and roadmap

Executive Summary

Project coordinator:
Bogdan Atanasiu (BPIE)

This study is elaborated in cooperation with:
Ecofys Germany GmbH:
Markus Offermann
Bernhard v. Manteuffel
Jan Grözinger
Thomas Boermans

And

EnEffect, Center for Energy Eficiency / EnEffect Design Bulgaria
Zdravko Genchev, Stanislav Andreev, Aleksandar Stankov, Anton Todorov, Dragomir Tsanev, Kamen Simeonov, Peter Kamburov, Snezhana Todorova

Editing team:
Ingeborg Nolte (BPIE)
Oliver Rapf (BPIE)
Nigel Griffiths (Griffiths & Company)
Alexandra Potcoava (BPIE)

Graphic Design
Lies Verheyen - Mazout.nu

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The Building Performance Institute Europe (BPIE) is an independent not-for-profit organisation dedicated to improving the energy performance of buildings across Europe, and thereby helping to reduce CO2 emissions from the energy used by European buildings. Our main focus lays on policy analysis, implementation and dissemination of knowledge through studies, policy briefs and best practices. BPIE acts both as European centre of expertise and as the European partner for a Global Buildings Performance Network.

1. Setting the Stage

The building stock is responsible for a large share of greenhouse gas emissions (GHG) in the European Union. Major emission reductions can be achieved through changes in this sector. With more than one quarter of the 2050s building stock still to be built, a large amount of GHG emissions are not yet accounted for. To meet the EU's ambitious reduction targets, the energy consumption of these future buildings needs to be close to zero, which makes finding and agreeing on an EU-wide definition or guidelines for "nearly Zero-Energy Buildings" (nZEB) essential in the effort to reduce domestic greenhouse gases to 80% of 1990 levels by 2050.

The recast of the Energy Performance of Buildings Directive (EPBD) introduced, in Article 9, "nearly Zero-Energy Buildings" (nZEB) as a future requirement to be implemented from 2019 onwards for public buildings and from 2021 onwards for all new buildings. The EPBD defines a nearly Zero-Energy Building as follows: "A nearly Zero-Energy Building is a [...] building that has a very high energy performance [...]".

The nearly zero or very low amount of energy required should to a very significant extent be covered by energy from renewable sources, including renewable energy produced on-site or nearby".

Acknowledging the variety in building culture, climate and methodological approaches throughout the EU, the EPBD does not prescribe a uniform approach for implementing nZEBs. Each EU Member State has to elaborate its own definition. The EPBD requires EU Member States to draw up specifically designed national plans for implementing nZEBs which reflect national, regional or local conditions. The national plans will have to translate the concept of nZEB into practical and applicable measures and definitions to steadily increase the number of these buildings. EU Member States are required to present their nZEB definition and roadmaps to the European Commission by 2013.

The nZEB criteria as defined in the EPBD are of a very qualitative nature with much room for interpretation and way of execution. Indeed, there is little guidance for Member States on how to concretely implement the Directive and on how to define and realise this type of building. Therefore a clear definition needs to be formulated that can be taken into account by EU Member States for elaborating effective, practical and well thought-out nZEBs.

The aim of this study is to actively support this process in Bulgaria by providing a technical and economic analysis for developing an ambitious yet affordable nZEB definition and implementation plan. Starting from country data reflecting current construction practices, economic conditions and existing policies, different technological options are simulated for improving the energy performance of offices and single- and multi-family buildings. We have evaluated the economic implications of the various options in view of an implementation plan.

2. Aim and methodology

The current study builds on the previous report “Principles for nearly Zero-Energy Buildings” and evaluates through indicative simulations whether these principles hold true for the situation in Bulgaria.
The objective is to offer an independent and research-based opinion proactively supporting national efforts to draw up an affordable yet ambitious definition and an implementation roadmap for nearly Zero-Energy Buildings (nZEBs) in Bulgaria.

The project started with an in-depth survey of the Bulgarian building stock, construction practices, market prices for materials and equipment, existing legislation and support measures. We defined and evaluated new reference buildings (current practice) for the following building types:
Detached single family houses (SFH)
Multi-family houses (MFH)
Office buildings (OFFICE)

Detached single family houses and multi-family blocks of flats represent almost 90% of the residential building stock in Bulgaria and around 97% of the net floor area in residential sector. Office buildings represent around 27% of the non-residential building stock and almost 39% of the non-residential floor area.
Altogether, these three building types account for around 89% of the Bulgarian building stock and around 85% of the overall net floor area of the Bulgarian buildings. Therefore, we consider single-, multi-family and office buildings types as being representative for the building stock and consequently we selected them for the nZEB analysis.

With these three reference buildings we undertook several simulations using variants of improved thermal insulation and equipment for heating, cooling, ventilation and hot water. To improve the CO_2 balance and the renewable energy share of the building, we considered photovoltaic compensation. These simulations were evaluated for compliance with the nZEB principles as elaborated in the BPIE study. Moreover, the economic and financial implications of each variant were analysed in order to determine the most suitable and affordable solutions under the country’s specific circumstances. Finally, the selected optimal solutions were extrapolated at national level to determine the direct and indirect benefits and impacts. Besides the CO_2 saving potential, impacts on job creation and industry/technology development were also considered.
The last chapter presents key policy recommendations and an indicative roadmap for the implementation of nZEBs in Bulgaria.

This report was conceptualized, coordinated and finalised by BPIE. The overall data aggregation and selection, simulations and analysis were executed by Ecofys Germany as a lead consultant. The provision of data concerning Bulgarian buildings, policies and market prices, the definition and selection of reference buildings and the revision of the final study were made by EnEffect as national consultant.

The building simulations were undertaken with the TRNSYS software tool. The economic analysis was performed by using the Ecofys analytical tool Built Environment Analysis Model (BEAM2).

3. Definition of nZEB options and solutions

Based on the research results and information about the local building stock, the simulations highlight the specific national situation in Bulgaria, which differs in many respects from the overall EU situation as presented in the general European study "Principles for nearly Zero-Energy Buildings".

To analyse the impact of different nZEB options, three reference buildings have been defined, based on current construction practices in Bulgaria:

1. Detached single family houses (SFH)
2. Multi-family houses (MFH)
3. Office buildings

The reference buildings selected should match the range of building types found in Bulgaria (taking into account typical shapes, sizes, characteristics and usage of new buildings). The aim of the simulation is to analyse the technical and economic impact of moving towards nZEB starting from the current situation in an effective and realistic manner and by minimizing transition costs.

The SFH is by far the dominant building type in Bulgaria and within this category the detached SFH has the highest share in the residential sector (55% of net floor area). The second largest amount of floor space was indicated for urban MFH, i.e. 42% of the net floor area in residential sector. In the non-residential buildings sector, office buildings are by far the dominant building type, followed by educational, retail and healthcare buildings.

However, the retail buildings sector is characterised by a high diversity of subtypes and the definition of many reference buildings would be necessary to produce an accurate picture. In addition, there is a very low dynamic of constructing new educational and healthcare buildings.

Public administration buildings, included in the office buildings category, receive a particular attention from the EPBD which indicates that public administration buildings should play a leading role and adopt more timely and ambitious nZEB requirements. Based on this, we chose office buildings to be the third relevant reference building category for this study.

The identified reference buildings for each category are presented in Table 1 on the next page.

Table 1: Identified reference buildings for new construction in Bulgaria

Parameter	Reference SFH	Reference MFH	Reference Office
Number of conditioned floors	2	6	3
Net floor area	127 m²	2870 m²	886 m²
Room height	2.65 m	2.73 m	3.00 m
U-walls	0.34 W/(m²K)	0.64 W/(m²K)	0.46 W/(m²K)
U-roof	0.27 W/(m²K)	0.30 W/(m²K)	0.32 W/(m²K)
U-floor	0.55 W/(m²K)	0.55 W/(m²K)	0.46 W/(m²K)
U-windows, frame	1.70 W/(m²K); 21%	1.70 W/(m²K),	1.70 W/(m²K), 15%

Window fraction (window/wall-ratio)	13% (only 5% on North and West facades)	23%	50%
Shading	None	None	Internal blinds, manual control
Air tightness	Moderate	Moderate	Moderate
Thermal bridges	Yes	Yes, significant thermal bridges considered	Yes
Heating system	Wood boiler (set point: 20°C) Heating efficiency: 0.82	District Heating (set point: 20°C) Heating efficiency: 0.99	Heat pump, fan coils (set point: 20°C) Heating efficiency: 3.3
DHW system	Combination of wood boiler and electric heater DHW efficiency: 0.93	Same as for heating DHW efficiency: 0.99	Decentralised direct electric
Specific DHW demand	15.8 kWh/(m²a)	20.4 kWh/(m²a)	0.8 kWh/m²a
Ventilation system	Natural/window ventilation (0.35 1/h)	Natural/window ventilation (0.5 1/h)	Mechanical ventilation 70% heat recovery Ventilation rates (6:00-18:00): Office spaces: 1.36 1/h Conference rooms: 2.72 1/h Other rooms: 0.46 1/h
Cooling system	Split system (set point: 26°C) SEER: 3.2	None	Compression chillers, fan coils (set point: 24°C) SEER: 3.3
Internal gains[1]	13.5 W/m²	20 W/m²	30 W/m²
Installed lighting power[2]	11.7 W/m²	10 W/m²	25 W/m²
Automatic lighting control	No	No	Only in service area
Person density in office areas (considered as an additional internal load)	-	-	0 am – 8 am and 6 pm - 0 am: no persons 8 am – 12 am and 2 pm – 6 pm: 1 person/15 m² 12 am – 2 pm: 1 person/30 m²

3.1. Definition of nZEB options, basic assumptions and simulation approach

[1] This value is to be understood as a maximum value. For persons, lighting and other internal gains schedules exist taking into consideration e.g. the number of persons, which are at a certain moment in the respective zone.

[2] This value is to be understood as a maximum value. For the hourly demand individual schedules for every zone have been considered.

3.1.1. nZEB solutions for single-family house (SFH)

For all variants – for comparison reasons – the geometry of the reference buildings has not been changed, even though it is far from optimum for an nZEB. Table 2 shows the solutions, which have been examined by dynamic thermal simulations.

TABLE 2: BULGARIAN SFH, NZEB VARIANTS

Variants	U-value Opaque Shell[3]	U-Value Window	Heat Recovery Rate	Solar Collector for DHW	Brief Description
V0	U-Wall: 0.34 W/m².K U-Roof: 0.27 W/m².K U-Floor: 0.55 W/m².K	U-Window: 1.7 W/m².K	0%	No	Reference
V1	U-Wall: 0.12 W/m².K U-Roof: 0.10 W/m².K U-Floor: 0.20 W/m².K	U-Window: 1.0 W/m².K	0%	No	improved building shell
V2	U-Wall: 0.12 W/m².K U-Roof: 0.10 W/m².K U-Floor: 0.20 W/m².K	U-Window: 1.0 W/m².K	0%	Yes	improved building shell + solar collectors
V3	U-Wall: 0.12 W/m².K U-Roof: 0.10 W/m².K U-Floor: 0.20 W/m².K	U-Window: 1.0 W/m².K	80%	No	improved building shell + mech. ventilation with heat recovery
V4	U-Wall: 0.10 W/m².K U-Roof: 0.09 W/m².K U-Floor: 0.20 W/m².K	U-Window: 0.80 W/m².K	92%	No	Nearly passive house standard[4]
V5	U-Wall: 0.10 W/m².K U-Roof: 0.09 W/m².K U-Floor: 0.20 W/m².K	U-Window: 0.80 W/m².K	92%	Yes	Nearly passive house standard + solar collectors

The comparison between variants V1, V2 and V3 will show the individual impacts of a shell improvement, solar thermal collectors and mechanical ventilation with heat recovery. It should be mentioned that an airtight construction without controlled ventilation increases the risk for mould foundation. It is therefore strongly recommended to develop an adequate ventilation concept.

For each of the five base variants, the following four heating supply options will be considered:

A. Air source heat pump[5]
B. Ground collector brine heat pump[6]
C. Wood pellet boiler
D. Gas condensing boiler

[3] Heat bridges have been included in the calculation of the U-values.

[4] Passive house standard: major shell improvements, no heat bridges, airtight construction, highly efficient mechanical ventilation (> 90%), useful heating and cooling demand < 15 kWh/m²yr

[5] Solutions will be considered to have a low temperature floor heating system to get a better system efficiency

[6] cf. previous footnote

3.1.2. nZEB solutions for multi-family house (MFH)

As for the SFH, the geometry of the reference buildings has not been changed, even though it is not optimum for an nZEB. Table 3 shows the variants simulated with TRNSYS.

TABLE 3: BULGARIAN MFH, NZEB VARIANTS

Variants	U-value Opaque Shell[7]	U-Value Window	Heat Recovery Rate	Solar Collector for DHW	Brief Description
V0	U-Wall: 0.64 W/m².K U-Roof: 0.30 W/m².K U-Floor: 0.55 W/m².K	U-Window: 1.7 W/m².K	0%	No	Reference
V1	U-Wall: 0.45 W/m².K U-Roof: 0.15 W/m².K U-Floor: 0.32 W/m².K	U-Window: 1.0 W/m².K	0%	No	Improved building shell
V2	U-Wall: 0.64 W/m².K U-Roof: 0.30 W/m².K U-Floor: 0.55 W/m².K	U-Window: 1.7 W/m².K	85%	No	Mech. ventilation with heat recovery
V3	U-Wall: 0.45 W/m².K U-Roof: 0.15 W/m².K U-Floor: 0.32 W/m².K	U-Window: 1.0 W/m².K	85%	No	Improved building shell + mech. ventilation with heat recovery
V4	U-Wall: 0.45 W/m².K U-Roof: 0.15 W/m².K U-Floor: 0.32 W/m².K	U-Window: 1.0 W/m².K	85%	Yes	Improved building shell + mech. ventilation with heat recovery + solar collectors

Variant V1 was created to examine the individual impact of a shell improvement. It should be mentioned that an airtight construction without controlled ventilation increases the risk of mould foundation. It is therefore strongly recommended to develop an adequate ventilation concept.

For each of the four base variants, the following five heating source options have been considered:

A. Air source heat pump
B. Ground collector brine heat pump
C. Wood pellet boiler
D. Gas condensing boiler
E. District heating

[7] Heat bridges have been included in the calculation of the U-values.

3.1.3. nZEB solutions for Office Building

As for the the other reference buildings, the geometry of the reference buildings has not been changed, even though it is not optimum for an nZEB. Table 4 shows the variants simulated with TRNSYS.

TABLE 4: BULGARIAN OFFICE BUILDING, NZEB VARIANTS

Variants	U-value Opaque Shell[8]	U-Value Window/ windows	Heat Recovery Rate	External shading	Lighting system	Solar Collector for DHW	Brief Description
V0	U-Wall: 0.46 W/m².K U-Roof: 0.32 W/m².K U-Floor: 0.46 W/m².K	1.7 W/m².K, 50% windows share	70%	None	Manual control	No	Reference
V1	U-Wall: 0.30 W/m².K U-Roof: 0.25 W/m².K U-Floor: 0.40 W/m².K	1.7 W/m².K, 50% windows share	70%	Automatic	Manual control	No	Improved building shell + external shading
V2	U-Wall: 0.30 W/m².K U-Roof: 0.25 W/m².K U-Floor: 0.40 W/m².K	1.7 W/m².K, 50% windows share	70%	Automatic	Automatic controlled lighting +LEDs	No	Improved building shell + external shading + improved lighting
V3	U-Wall: 0.30 W/m².K U-Roof: 0.25 W/m².K U-Floor: 0.40 W/m².K	1.0 W/m².K, 50% windows share	85%	Automatic	Automatic controlled lighting +LEDs	No	Improved building shell + external shading + improved lighting + improved windows + improved heat recovery

For each of the three base variants, the following five heating options have been considered:

A. Central air/water heat pump
B. Central brine/water heat pump
C. Central wood pellet boiler
D. Central gas condensing boiler
E. District heating

[8] Heat bridges have been included in the calculation of the U-values.

4. Indicative nZEB definition based on (cost–) optimal variants

The results of the simulation for each solution in terms of primary energy consumption, renewable share, associated CO2 emissions and total annualised additional costs (investment, energy cost savings and other running costs such as maintenance) are shown in tables 5-7. Total final and primary energy demand for residential buildings includes the energy consumption within the EPBD scope: heating, cooling, ventilation, domestic hot water. For office buildings, this also includes lighting energy consumption. The colour code used for highlighting the results of the different nZEB options considered in this study is in line with the nZEB principles as they were defined in the previous BPIE study[9].

TABLE 5: OVERVIEW OF RESULTS FOR THE SFH

	final specific demand [kWh/m2/yr]	without CO2 compensation				with CO2 compensation (by additional PV)			
		primary energy demand [kWh/m2/yr]	CO2 emissions [kgCO2/m2/yr]	Renewable share [%]	total additional annualised costs [Euro/m2/yr]	primary energy demand [kWh/m2/yr]	CO2 emissions [kgCO2/m2/yr]	Renewable share [%]	total additional annualised costs [Euro/m2/yr]
V0-Reference	169,9	86.4	45.1	90%	0	n.a	n.a.	n.a.	0
V1-Air Heatpump	25,5	51,1	6,4	35%	-11,23	0	0	135%	-7,73
V1-Brine Heatpump	21,2	42,5	5,4	35%	-6,37	0	0	135%	-3,46
V1-Bioboiler	91	21,9	0,5	99%	-4,28	11,6	0	104%	-3,57
V1-Gasboiler	91	102	18,5	1%	-5,58	36,4	10,2	37%	-1,07
V2-Air Heatpump	19,4	39	4,9	35%	-9,78	0	0	135%	-7,11
V2-Brine Heatpump	15	29,9	3,8	35%	-4,95	0	0	135%	-2,9
V2-Bioboiler	71	16,6	0,3	99%	-3,93	6,3	0	106%	-3,22
V2-Gasboiler	71	79,4	14,4	1%	-5,23	26,1	7,7	38%	-1,57
V3-Air Heatpump	20,8	41,8	5,3	35%	-8,78	0	0	135%	-5,92
V3-Brine Heatpump	18,1	36,4	4,6	35%	-5,69	0	0	135%	-3,2
V3-Bioboiler	72,1	18,8	0,6	98%	-2,96	8,5	0	105%	-2,26

[9] BPIE (2011). Principles for nearly Zero-Energy Buildings - Paving the way for effective implementation of policy requirements. Available at www.bpie.eu

V3-Gasboiler	72,1	81,6	14,7	1%	-4,27	15,9	6,4	47%	0,23
V4-Air Heatpump	15,6	31	3,9	35%	-7,12	0	0	135%	-4,99
V4-Brine Heatpump	13,5	27,1	3,4	35%	-4,85	0	0	135%	-2,99
V4-Bioboiler	49,4	13,2	0,5	98%	-2,75	2,9	0	108%	-2,04
V4-Gasboiler	49,4	55,9	10,1	1%	-3,51	-9,7	1,8	68%	1
	<40	<40	<4	>50	<5	<40	<4	>50	<5
	40< x<60	40< x<70	4<>7	30>x<50	10<>5	40< x<70	4<>7	30>x<50	10<>5
	>60	>70	>7	<30	>10	>70	>7	<30	>10

TABLE 6: OVERVIEW OF RESULTS FOR THE MFH

	final specific demand [kWh/m2/yr]	without CO2 compensation				with CO2 compensation (by additional PV)			
		primary energy demand [kWh/m2/yr]	CO2 emissions [kgCO2/m2/yr]	Renewable share [%]	total additional annualised costs [Euro/m2/yr]	primary energy demand [kWh/m2/yr]	CO2 emissions [kgCO2/m2/yr]	Renewable share [%]	total additional annualised costs [Euro/m2/yr]
V0-Reference	87,1	115,9	59,5	0%	0%	n.a	n.a.	n.a.	0
V1-Air Heatpump	22,5	45,1	5,7	35%	-3,45	13	1,6	106%	-2,49
V1-Brine Heatpump	19,1	38,4	4,8	35%	0,1	6,3	0,8	119%	1,06
V1-Bioboiler	78,5	18,1	0,3	99%	0,48	15,5	0	101%	0,53
V1-Gasboiler	80,6	89,9	16,4	1%	-0,16	57,8	12,3	20%	0,8
V1-District Heating	71,5	45,5	7,8	54%	-0,63	13,4	3,8	76%	0,33
V2-Air Heatpump	21,4	43	5,4	35%	-1,09	10,9	1,4	110%	-0,14
V2-Brine Heatpump	18,9	37,8	4,8	35%	1,99	5,8	0,7	120%	2,95
V2-Bioboiler	66,6	19,9	0,9	96%	1,9	12,6	0	102%	2,06
V2-Gasboiler	60,9	70,3	12,5	2%	0,72	38,3	8,5	28%	1,68
V2-District Heating	60,9	42,2	7	53%	0,69	10,2	3	79%	1,64
V3-Air Heatpump	18,9	37,9	4,8	35%	-0,72	5,8	0,7	120%	0,24
V3-Brine Heatpump	16,8	33,7	4,2	35%	1,25	1,7	0,2	130%	2,21
V3-Bioboiler	56	17,4	0,9	96%	1,83	10,5	0	102%	1,98

V3-Gasboiler	51,2	59,5	10,5	2%	0,77	27,5	6,5	34%	1,73
V3-District Heating	51,2	36,1	6	53%	0,96	4	2	84%	1,91
V4-Air Heatpump	16,8	33,5	4,2	35%	-0,07	5,1	0,6	120%	0,78
V4-Brine Heatpump	14,1	28,3	3,6	35%	1,83	0	0	135%	2,67
V4-Bioboiler	46,3	15,8	0,9	95%	1,86	8,5	0	103%	2,01
V4-Gasboiler	42,4	49,9	8,8	3%	0,79	21,5	5,2	36%	1,64
V4-District Heating	42,4	30,9	5,1	52%	0,93	2,5	1,5	86%	1,78

	<40	<40	<4	>50	<5	<40	<4	>50	<5
	40< x <60	40< x<70	4<>7	30>x<50	10<>5	40< x<70	4<>7	30>x<50	10<>5
	>60	>70	>7	<30	>10	>70	>7	<30	>10

TABLE 7: OVERVIEW OF RESULTS FOR THE OFFICE BUILDING

	final specific demand [kWh/m2/yr]	without CO2 compensation				with CO2 compensation (by additional PV)			
		primary energy demand [kWh/m2/yr]	CO2 emissions [kgCO2/m2/yr]	Renewable share [%]	total additional annualised costs [Euro/m2/yr]	primary energy demand [kWh/m2/yr]	CO2 emissions [kgCO2/m2/yr]	Renewable share [%]	total additional annualised costs [Euro/m2/yr]
V0-Reference	68,7	209.2	55.3	13%	0	n.a	n.a.	n.a.	0
V1-Air Heatpump	63,9	127,8	16,1	35%	4,91	70,5	8,9	80%	6,16
V1-Brine Heatpump	58,2	116,4	14,7	35%	10,58	59,1	7,4	84%	11,83
V1-Bioboiler	88,3	116,5	13,8	60%	9,98	59,2	6,6	92%	11,24
V1-Gasboiler	88,3	146,6	20,6	22%	7,28	89,3	13,4	54%	8,53
V1-District Heating	86,6	129,2	17,2	42%	5,98	71,8	10	75%	7,23
V2-Air Heatpump	39,7	79,3	10	35%	2,99	22	2,8	107%	4,24
V2-Brine Heatpump	34,9	69,7	8,8	35%	8,8	12,4	1,6	117%	10,05
V2-Bioboiler	67,8	68,3	7,7	71%	8,22	11	0,4	113%	9,47
V2-Gasboiler	67,8	101,9	15,2	16%	5,51	44,6	8	58%	6,77
V2-District Heating	65,8	82,5	11,5	45%	4,26	25,1	4,2	89%	5,51
V3-Air Heatpump	38,5	77,1	9,7	35%	4,42	19,7	2,5	109%	5,68
V3-Brine Heatpump	32,8	65,6	8,3	35%	7,97	8,3	1	122%	9,22

V3-Bioboiler	54,5	69,9	8,2	61%	9,27	12,5	1	114%	10,52
V3-Gasboiler	54,5	89,5	12,6	21%	6,78	32,1	5,4	74%	8,04
V3-District Heating	53,4	78,1	10,5	42%	5,55	20,8	3,2	75%	6,81
V4-Air Heatpump	41,7	83,5	10,5	35%	10,56	26,2	3,3	104%	11,81
V4-Brine Heatpump	40,6	81,3	10,2	35%	14,37	24	3	105%	15,62
V4-Bioboiler	53,8	77,9	9,4	55%	13,69	20,6	2,2	108%	14,94
V4-Gasboiler	53,8	92,8	12,7	24%	12,07	35,5	5,5	77%	13,32
V4-District Heating	43,2	78,2	10	38%	10,06	20,9	2,8	104%	11,31

	<40	<40	<4	>50	<5	<40	<4	>50	<5
	40< x <60	40< x<70	4<>7	30>x<50	10<>5	40< x<70	4<>7	30>x<50	10<>5
	>60	>70	>7	<30	>10	>70	>7	<30	>10

**Important note: compensating the building's CO2 emissions by introducing an additional onsite PV system improves significantly the primary energy demand of the building. However, the PV compensation doesn't necessarily supply the energy demand of the building within the EPBD scope (i.e. energy for heating, cooling, ventilation, domestic hot water and, in case of commercial buildings, for lighting), but the overall energy demand of the building (including the electricity for household appliances). In this case, the PV compensation helps reduce the primary energy demand and associated CO2 emissions towards or below zero in the overall trade-off with the energy grids. Hence, the PV compensation may have a significant contribution to a nearly zero whole energy demand. For simplifying the evaluation methodology in this study only a PV compensation is considered. The PV compensation may be replaced in practice by any other renewable energy system. The amount of the compensation can be reduced by e.g. improved building insulation by improved building geometries or higher system efficiencies. However, PV compensation has a significant direct impact in the case of office buildings where lighting electricity consumption is within the EPBD scope and represents a significant share of the overall energy demand of the buildings.*

On the basis of the economic analysis the three most appropriated solutions for each building type were selected which fulfill entirely the nZEB principles (as defined in the 2011 BPIE study). All solutions are with PV compensation and the variations of the most suitable technologies and facade qualities are considered. Table 8 presents these suggestions.

Table 8: Overview of the (cost-) optimal variants and the additional costs

Building type	Variant	Brief Description	Heating system	Additional annualized costs (Base year 2010) [€/m²yr]	Additional annualized costs comparing with average reference actual price[10] [%]
SFH	V1A	Improved building shell	Air heat pump	-7.73	-14.7%
	V3B	Improved building shell + mech. ventilation with heat recovery	Brine heat pump	-3.20	-6.1%
	V3C		Bio Pellet	-2.26	-4.4%
MFH	V1C	Improved building shell	Bio Pellet	0.53	1.15%
	V3B	Improved building shell + mech. ventilation with heat recovery	Brine heat pump	2.21	4.8%
	V4C	Improved building shell + mech. ventilation with heat recovery + solar collectors	Bio Pellet	2.01	4.4%
Office	V2A	Improved building shell + external shading + improved lighting	Air heat pump	4.24	12.15%
	V2C		Bio Pellet	9.47	27%
	V3B	Improved building shell + external shading + improved lighting + improved windows + improved heat recovery	Brine heat pump	9.22	26.3%

[10] The percentage of the additional annualized costs was based on the following assumptions: turnkey costs for SFH: 450 Euro/m², MFH: 363 Euro/m² and office: 275 Euro/m² (Andreev, Bulgarian Expert, 2012). The lifetime of residential buildings were assumed to be 50 years for residential building and 30 years for offices.

In the residential sector in Bulgaria, the selected cost-optimal nZEB solutions have additional annualized costs of new buildings by between -14.7% and 26.2% higher than actual market prices for a new building in this category. The most cost-effective solutions are for SFH where all optimal nZEB solutions are very effective with additional costs between -14.7% and -4.4% as comparing with the reference building according to actual practice. For MFH, the nZEB cost-optimal solutions indicate additional costs between 1.1% and 4.8% as comparing to the cost of the reference building.
For offices, the additional annualized costs are by 12.0% and 26.2% higher than actual market prices for a new building in this category. This is also due to a shorter lifetime assumed for the office building in the calculation.

District heating in Bulgaria with a high share of renewable energy may be an important point for the heating strategy in Bulgaria and work well in the context of increasing the energy performance of buildings and the nZEB implementation. District heating may provide cheap nZEB solutions especially for multi-family and office buildings.
However, In Bulgaria currently nearly all district heating plants are still operating with natural gas or coal. There is only one very small plant operating with wood chips in the town of Bansko and one experimentally reconstructed boiler in Veliko Tarnovo Plant. According to our estimations, the actual share of renewable energy for district heating is about 1%. Overall the DH systems built before 1990 are developed at a very large scale covering big parts of city areas and due to this uncontrolled extension are inefficient and have a bad public perception. Consequently, if it is intended to transform DH into an effective solution for the future it is therefore necessary a radical rethinking of the actual systems.
In this study the district heat solutions for multi-family buildings without CO2-compensation turned out to be above the CO2 emission target of 3 kg/m² per year, although the district heat was calculated with a share of about 54% renewable energies. For the examined solutions this share of renewable energies is still not sufficient to bring down the CO2 emissions to or below the required 3 kg/m² per year.

As suggested in the BPIE study defining principles for nZEB[11], the strategy for district heating (DH) systems should be developed in strong relationship with buildings policies, in order to better identify future needs and to shape the economic instruments for reaching an overall sustainable buildings sector. District heating systems may offer a higher flexibility than other alternatives in changing the energy carriers and may be an important nZEB solution.

[11] BPIE (2011). Principles for nearly Zero-Energy Buildings - Paving the way for effective implementation of policy requirements. Available at www.bpie.eu

Based on the above analysis, on the simulation results shown in tables 5-7 and taking mainly into consideration the additional costs and results for basic variants without PV compensation, the following levels are proposed for consideration as nZEB definitions for Bulgaria (Table 9).

Table 9: Proposed nZEB definitions for Bulgaria

Building type	Minimum requirements	Year		
		2015/2016	2019	2020
Single family buildings	Primary energy [kWh/m²/yr]	60-70		30-50
	Renewable share [%]	>20		>40
	CO_2 emissions [kgCO_2/m2/yr]	<8		<3-5
Multi-family buildings	Primary energy [kWh/m²/yr]	60-70		30-50
	Renewable share [%]	>20		>40
	CO_2 emissions [kgCO_2/m2/yr]	<8		<3-5
Office buildings	Primary energy [kWh/m2/yr]	100		60-80
	Renewable share [%]	>20		>40
	CO_2 emissions [kgCO_2/m2/yr]	<15		<8-10
Public office buildings (exemplary role)	Primary energy [kWh/m2/yr]	100	40-60	
	Renewable share [%]	>20	>50	
	CO_2 emissions [kgCO_2/m2/yr]	<12	<5-8	

The thresholds suggested above for an nZEB definition in Bulgaria are fairly ambitious yet affordable as comparing to the actual practice. However, these thresholds are significantly less ambitious than in other Western Europe countries which aim to reach climate neutral, fossil fuel free or even energy positive new buildings[12] by 2020. Thinking long-term, it should be ensured that the building concept can be improved towards specific CO2 emissions below 3 kgCO2/m²yr (and aiming at: 0 kg/m²yr), which is the identified EU average minimum requirement for achieving the EU 2050 decarbonisation goals.

[12] For more details on other EU countries strategies for implementing nZEB by 2020, please see table 3 from BPIE (2011). Principles for nearly zero-energy buildings - Paving the way for effective implementation of policy requirements. Available at www.bpie.eu

Therefore, the nZEB definition should still be gradually improved after 2020 and it is likely to lead by 2030 to energy and climate neutral levels. Beyond implementing an EU Directive requirement, the significant reduction in energy consumption and related CO2 emissions of the building sector will have a major impact on the country's energy supply security, by creating new activities and jobs and by contributing to a better quality of life for Bulgarian citizens.

It is important to highlight the fact that the financial and energy analysis are based on very conservative assumptions, using the actual interest rates and technology prices and according to the actual practices in construction. For instance, it is a significant optimization potential of the buildings' geometries towards those recommended by passive houses design which will lead to additional costs reductions. Moreover, by implementing ambitious nZEB requirements in the Bulgarian building codes will generate a wider market deployment of the energy efficient and renewable technology which will consequently reduce their prices and will overall generate lower costs for nZEB.

In addition, the financial evaluation of the nZEB solutions considered the actual interest rate on Bulgarian market, i.e. 7.5%/yr. However, according to the estimated economic evolution, the interest rates are likely to decrease consistently by 2020 when the nZEB requirement has to become legally binding. Additional support policies may also consider a potential subsidy of the interest rate in order to ease the transition to nZEB and to make them competitive with buildings at today's standards. Overall, a reduction of the interest rate may impact positively in the financial analysis and may even make nZEB investments profitable over a given period of time, as is the case in other EU countries already having better conditions.

5. Direct and indirect benefits of identified nZEB solutions

This chapter presents the direct and indirect benefits of implementing nZEBs.

Overall, the payback from investing in better buildings occurs over time. It contributes substantially to energy security, environmental protection, the social inclusion of people by creating or preserving jobs and offering a better quality of life, as well as supporting the sustainable development of the construction sector and supply chain industry.

While the upfront investment is relatively high and the return on investment is usually longer than for other economic activities, there are multiple benefits for building users and owners, the construction industry, public budget and society as a whole.

The benefits of the implementation of nZEBs are much wider than simply leading to energy and CO2 savings . They can be summarised as follows:

- The quality of life in a nearly Zero-Energy Building is better than in a building constructed according to the current practice. Cost-saving possibilities arising from the appropriate design of the building and high quality construction almost entirely cover the additional costs of the energy-efficient building envelope. The quality of life is greater through better (thermal) comfort. The nearly Zero-Energy Building provides good indoor air quality. Fresh filtered air is continuously delivered by the ventilation system. It is more independent of outdoor conditions (climate, air pollution etc.). The thick and well insulated structures provide effective sound insulation and noise protection.
- Ambient benefits arise through reduced energy demand that reduces wider environmental impacts of energy extraction, production and supply.
- There are environmental benefits from improved local air quality.
- Social benefits arise through the alleviation of fuel poverty.
- Health benefits are possible through improved indoor air quality and reduced risks of cold homes, particularly for those on low-incomes or for elderly householders.
- Macro-economic benefits arise through the promotion of innovative technologies and creating market opportunities for new or more efficient technologies and through the provision of certain incentives for pilot projects and market transformation.
- Private economic benefits: higher investment costs may be outweighed by the energy savings over the lifetime of the building (the building offers less sensitivity to energy prices and to political disturbances). When a building is sold, the high standard can be rewarded through a re-sale price up to 30% higher in comparison with standard buildings.
- Job creation can arise through the manufacturing and installation of energy efficiency measures and of renewable energy technologies.
- There will be decreased energy dependence on fossil fuels and therefore on the future energy prices[13]

In this study, the approach to quantifying some of the benefits is done in an approximate way by extrapolating results from the reference buildings to the national level, e.g. (average energy and CO2 savings per m²) x (m² built new per year) x 30 years (2020-2050). Therefore, in Table 10 we present the estimated macro-economic impact by 2050 in terms of additional investments, additional new jobs, CO2 and energy savings.

However, this is a conservative approach without considering additional important factors that may positively influence the macro-economic benefits. As an example, the job creation impact is based on the job intensity of construction industry and reflects only the additional work places that may be created at the execution level and doesn't include the jobs in the supply chain industry induced by up-scaling the market and the indirect jobs in the administration of the processes (e.g. additional auditors and control bodies for new tech). Moreover, by moving towards very efficient buildings and increasing the need for new

[13] Paroc (2012). Web page: Benefits of passive house. Available at: http://www.energiaviisastalo.fi/energywise/en/index.php?cat=Benefits+of+Passive+House

technology will impact mainly on new job profiles such as renewable systems and heat pumps installers. Therefore, it will be an increase need for these new activities all over the country and driven not only by additional invested volumes as we considered in this study but also by the local needs for such new job profiles[14]. Consequently, it is very likely to have a much higher job creation potential than estimated in this study.

TABLE 10: EFFECT OF THE IMPLEMENTATION OF NZEB AFTER 2020 IN 2050

Indicator	Effect
CO2 emissions savings in 2050	4.7-5.3 Mio t CO2
Cumulative energy savings in 2050	15.3 -17 TWh
Additional annual investments	38 - 69 Mio Euro
Additional new jobs[15]	649 - 1180 Full time employees

Table 11 shows a detailed overview of the possible contribution of each variant in the residential and the non-residential sector.

TABLE 11: EFFECT OF THE IMPLEMENTATION OF NZEB AFTER 2020 IN 2050ERROR! REFERENCE SOURCE NOT FOUND.

6. 2020 roadmap for implementing nZEBs in Bulgaria and policy recommendations

Based on the analysis of the country situation as well as on the results of the previous study for defining the nZEB principles and on related studies, some key recommendations merge that should be considered when designing an nZEB implementation roadmap:

1. Different instruments should be part of a wider holistic policy package which should comprise regulatory, facilitation and communication aspects. The German investment bank KfW is a good example of a strong communication policy that managed to raise awareness among the building owners to such an extent that the financial products and mechanisms for buildings are well known terms and are used by the commercial banks and construction companies to advertise their offers. Therefore implementing targeted communication campaigns is recommended because it is seen as key to a scheme's success.
2. Clear communication is indispensable since it provides information to consumers and market players about incentives and energy efficiency measures available to them. In

[14] As an example, additional investments in a very well established construction sector already having all necessary job profiles and spread all over the considered country or region, then the job impact is determined with a fair approximation by using the job intensity of the sector. However, if the additional invested capital supposed to expand new qualifications as is the case for nZEB, it is necessary to create all over the given country or region a critical mass of specialists for these new qualifications able to provide the requested services. In this case, the job creation potential is much higher than in the first case (even few times higher).

[15] This is the estimated job effect in construction sector only and without considering the additional impact in the supply chain industry and other related sectors. It was considered that any 1 Mio euro invested will generate around 17 new jobs, as identified in several previous studies such as BPIE (2011) Europe's buildings under the microscope.

addition, wide public consultation with relevant stakeholders is necessary at all implementation stages of buildings policy.

3. Impact assessment (ex-ante, interim and ex-post) of the planned policies together with a simple but effective monitoring and control mechanism are important in order to have a clear image of the necessary measures to be implemented, risks, challenges and benefits.
4. Higher energy performance of buildings should be rewarded by better financial support, i.e. higher grants or lower interest for dedicated loans. This is again another best practice from other countries, including the above mentioned KfW example.
5. Policy-makers should concentrate long-term programmes so as to provide stable frameworks and facilitate the long-term planning of all stakeholders.
6. The buildings strategies should be in line with the complementary energy and climate strategies at national and EU level to ensure that other important policy objectives are not harmed.
7. Within individual Member States, different instruments need to be coordinated with each other to ensure success. One example is the Carbon Emissions Reduction Target (CERT) in the UK which is closely coordinated with other instruments[16]. The overlapping of financial support instruments should be avoided so as to offer clear, simple and coherent market instruments.

6.1. Proposal for an nZEB Roadmap for Bulgaria

We demonstrate in this report that the additional financial efforts involved in moving towards nearly Zero-Energy Buildings are manageable with appropriate policy measures. By improving the thermal insulation of new buildings and by increasing the share of renewable energy use in a building's energy consumption, the implementation of nearly Zero-Energy Buildings in Bulgaria can generate macroeconomic and social benefits.

There are multiple benefits for both society and the business environment. But to ensure a cost-effective and sustainable market transformation, to develop appropriate policies and to increase institutional capacities, concerted action is needed. It is vitally important to start preparing today an implementation roadmap based on a major public consultation of all relevant stakeholders and linked to a continuous information campaign. Elaborating a policy roadmap and announcing the future measures in a timely way will provide the business sector and the market with the necessary predictability to adapt their practices to the upcoming requirements.

To support these national efforts, this study proposes a 2020 roadmap for nZEB implementation (see the nZEB Roadmap attached at the end of the study) which takes into account the required improvements at the level of policy, building codes, capacity building, energy certification, workforce skills, public information and research.

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[16] EuroACE (2010). Making money work for buildings: Financial and fiscal instruments for energy efficiency in buildings. Available at: http://www.euroace.org/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=133&PortalId=0&TabId=84

To have a coherent and sustainable transition, all proposed measures are to be implemented in parallel.
They are interlinked and ensure an overall consistency in the proposed implementation package, while trying to preserve a balance between increase requirements and support policies. Half measures make any market transformation process longer and ineffective, putting at the same time additional burdens on society and economy.

TABLE 12: ROADMAP 2020 FOR MOVING TOWARDS NZEB IN BULGARIA

	Status 2012	2013	2014	2015	2016	2017	2018	2019	2020-2021
Process for the elaboration of building policies.	Start planning the process introduction of future measures.	Preparatory studies, discussion of benchmarks and of future measures with main stakeholders and by public consultation. Elaboration of a long term (2050) buildings' strategy and goals.		Evaluate results; announce the implementation on of new steps by 2020 and beyond.		Preparatory studies, discussion of benchmarks and of future measures with main stakeholders and by public consultation.			Evaluate results; announce the implementation of new steps by 2025 and beyond. Consider introducing life-cycle requirements for energy and CO2.
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-21**
Building codes	Actual practice: SFH Primary cons: 87kWh/m2/yr CO2 emissions: 45.1kgCO2/m2/yr RES share: 90% MFH Primary cons: 116kWh/m2/yr CO2 emissions: 59.5kgCO2/m2/yr RES share: 0% OFFICE Primary cons: 209 kWh/m2/yr CO2 emissions:	Tighten energy performance requirements according to actual practice. Proposal primary cons: 100 kWh/m2/yr for MFH and SFH and 180kWh/m2/yr for offices. Introduce indicative evaluation of related CO2 emissions in primary energy. Introduce compulsory consideration of renewables.			Tighten requirements for specific building components and equipment. Make stricter energy performance requirements. Proposal primary cons: 70kWh/m2/yr for MFH and SFH and 100kWh/m2/yr for offices. Introduce minimum requirements for the related CO2 emissions in primary energy. Proposal: <8kgCO2/m2/yr for		Introduce minimum requirement for public buildings. Proposal: 40-60 kWh/m2/yr primary cons. <5-8 $kgCO_2/m^2/yr$ and >50% renewable share.		Tighten requirements for specific building components and equipment. Make stricter energy performance requirements slightly better than actual practice. Proposal primary cons: 30-50kWh/m2/yr for MFH and SFH. 60-80kWh/m2/yr for offices. Tighten minimum requirements for

	55kgCO2/m2/yr RES share: 13%				SFH and MFH. <15kgCO2/m2/yr for offices and <12kgCO2/m2/yr for public buildings. Introduce compulsory consideration of renewables. Proposal: >20% renewable share or at least one renewable measure to be used. The renewable energy share may be different at local levels, according to the renewable energy potential in the area.			the related CO2 emissions in primary energy. Proposal: <3-7kgCO2/m2/yr for SFH and MFH. <3-5 kgCO2/m2/yr for offices. Tighten the renewables requirements. Proposal: >40% renewable share or at least one renewable measure to be used.
	Note: It has to be ensured that the building concept can be improved in the future to move towards net zero energy buildings and specific CO2 emissions below 3 kg/m²yr (aimed: 0 kg/m²yr), which is the maximum EU average value derived from the long term decarbonisation goals by 2050.							
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019** **2020-2021**
Energy certification	According to the certification scheme, all new buildings are within energy classes A and B, i.e. energy class A is EP<0.5 EPmax,r and energy class B is EP < EPmax,r, where EPmax,r is Energy	Diversify energy classification for each relevant building category. Adjust the energy classes A and B for better reflecting the future buildings' performance, e.g. consider the introduction of fix threshold for energy	National database for energy performance certificates (EPC), improve the control and evaluation procedures of certificates and certifiers. Use Energy certificates for promoting low-energy buildings. Make compulsory the existence of basic information from energy performance certificate, in a clearly defined way, on real-estate announcements.					

	performance requirement (kWh/m2/yr) of the building calculated based on the last issued U-values norms.	class A (e.g. EP<50kWh/m2/yr) or/and more energy subclasses within the actual A and B labels.							
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-2021**
Enforcement and compliance	Not clear enforcement and compliance based on energy performance indicators at building level.	Introduce stricter enforcement criteria on energy performance of buildings and components, penalties and fines. Increase the compliance check at the design and construction phase of the building.		Adapt and revise periodical enforcement and compliance.					
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-2021**
Policies		Gradually move actual subsidies on fossil energies and on energy prices to support energy efficiency measures and renewable energies in buildings. This should be compensated by support measures (see below) and social subsidy schemes for poor households.					Preserve only social subsidy schemes for poor households.		
	‘Casa Verde’ program and other national schemes for building rehabilitation	Introduce appropriate and predictable long-term support measures, tailored-made for consumers’ categories and building types: Preferential loans. Grants. Fiscal incentives, feed-in-tariffs for renewables in buildings. Use of national. EU and IFI financing, build on the existing support programmes.							
		Integrate buildings policies with other related policies and strategies for maximizing the effectiveness and coherence, i.e. with district heating policies, sustainable communities, and energy and environment policies. Particular attention given to integrate buildings and renewable district heating policies as well as to decarbonisation of energy supply.							
		Support local industry and technology: schemes for developing local supply chain industry. A strong local industry for energy efficient materials and renewables will multiply the macro-economic benefits of the support measures (increase job creation effect. more revenues from taxes to the public budget etc) and for minimizing the life cycle energy and CO2 emissions.							
		Public procurement: all new building purchased/built by the public sector should be very low energy buildings. Proposal: at least below 40-60 kWh/m2/yr from 2018/2019 onwards and moving towards 15kWh/m2/yr.					Adapt and revise periodically public procurement rules.		

		Remove market barriers for energy efficiency and renewable energy in buildings.							
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-2021**
Capacity building	Evaluate responsibilities for building policies.	Reinforce or nominate clear responsible bodies (agencies. ministry's departments) for elaboration strategies and policies, for monitoring and control of implementation, for cooperation with other delegated bodies responsible with the implementation of other related policies. Ensure the effective running of the EPC national database.		Periodical evaluation and reinforcement of responsibilities. Improve data collection concerning existing and new buildings: collect building data for non-residential sector (building stock inventory), provide necessary statistical data collection tools for RES systems in buildings. Integrate all related databases in an electronic national database for buildings (e.g. cadastral data).					
		Create information points (one-stop-shop) at city halls and at other relevant bodies (i.e. Chambers of Commerce, Energy Agencies) where citizens and companies may find appropriate information and advice concerning existing support schemes, procedures and benefits.		Permanent support to the info-points (incl. materials. guidelines etc.)					
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-2021**
Workforce skills	Build-Up Skills Bulgaria IEE Project for development of a National roadmap for trainings on energy solutions in buildings	Elaborate basic and long-life educational and training programs for workforce in construction, for architects and other related jobs, with embedded energy efficiency and renewable energy solutions for buildings in the mainstream curricula and practice.							
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-2021**
Information and awareness	Punctual info on specific measures, but not very visible.	Continuous and visible information campaign for promoting better, energy efficient buildings. Provide short guidelines and hints for building low-energy homes for supporting people constructing on their own (especially in rural areas). Awareness of construction and design companies on new techniques and technologies. Support market champions in integrating low-energy buildings (awards. high public exposure).							
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-2021**

Demo projects	Few dispersed demo-projects.	Support the implementation of demo projects (covering all building types) proving the cost-effectiveness and feasibility of nZEBs.							
	Status 2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020-2021**
Research	Varied RTD activities	Support RTD for buildings related activities, including new energy efficient and renewable technologies, better integration of existing technologies, active control systems, design and evaluation software tools for low-energy buildings.							

November 14th 2012

Financing Sustainability in Buildings

Alexandar Hadzhiivanov
Energy Efficiency and Climate Change Team
European Bank for Reconstruction and Development

EBRD mandate and policies in the context of building sector

- **EBRD mandate:**
  - To facilitate a market economy and sustainable economic development;
- **EBRD Country Strategy (Bulgaria):**
  - Sustainable Energy AP – 17 March 2009;
  - Developing Sustainable Energy Policies and Investments;
  - Supporting shift to more sustainable growth focused on competitiveness
- **Building sector:**
  - Promotion of best available technology
  - Introduction of new financing mechanisms
  - Development of a competitive market for energy efficiency technologies
  - Introduction and upgrading of the supportive regulatory framework
  - Expansion from energy efficiency to resource efficiency and building sustainability
  - Integrated approach of financing, technical assistance and policy dialogue

Sustainable Energy Investments in Bulgaria (2006-2012)

– Sustainable energy investments: €537 million of €2.7 billionOf

– 232 projects 52 have “sustainable energy” projects

1. Industrial Energy Efficiency

2. Sustainable Energy Financing Facilities

3. Power Sector Energy Efficiency

4. Renewable Energy Scale-up

5. Municipal Infrastructure Energy Efficiency

6. Carbon Markets Development

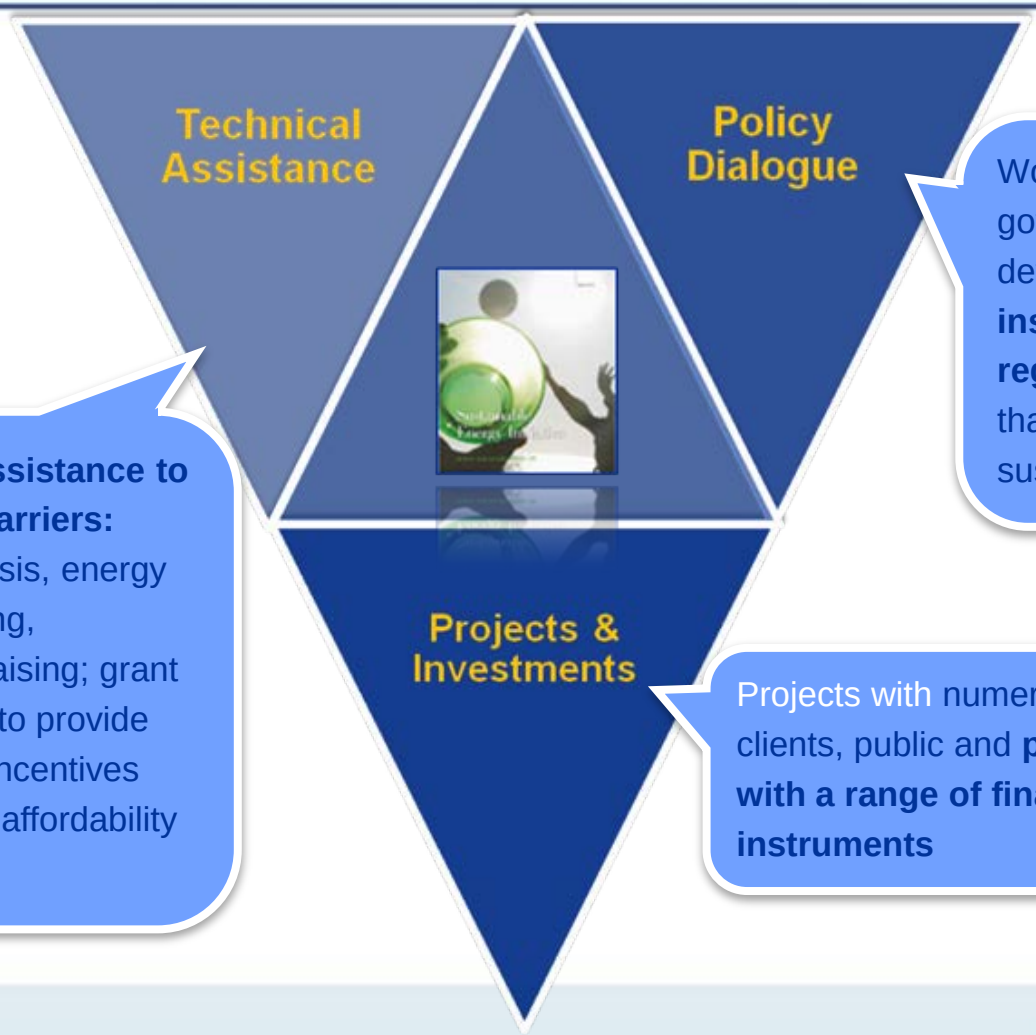
Barriers for financing building sustainability

Similar to barriers in all the countries in the region:

- High fragmentation of the sector **(large number of small-size property projects, different stakeholders – owners/tenants/management/authorities)**
- High transaction costs for relatively small-size projects
- Lack of technical expertise for assessment
- Information asymmetries and misconceptions about technical risks and financial benefits
- Lack of targeted or specific financing structures
- Limited marketing tools and budgets allocated for such activities
- Insufficient regulatory framework **(technical standards, regulations, e.g. the format and content of the energy performance certificate, etc)**

EBRD Sustainable Energy Operational Approach

A successful holistic strategy



Technical assistance to overcome barriers: market analysis, energy audits, training, awareness raising; grant co-financing to provide appropriate incentives and address affordability constraints

Working with governments to support development of **strong institutional and regulatory frameworks** that incentivise sustainable energy

Projects with numerous clients, public and **private, with a range of financing instruments**

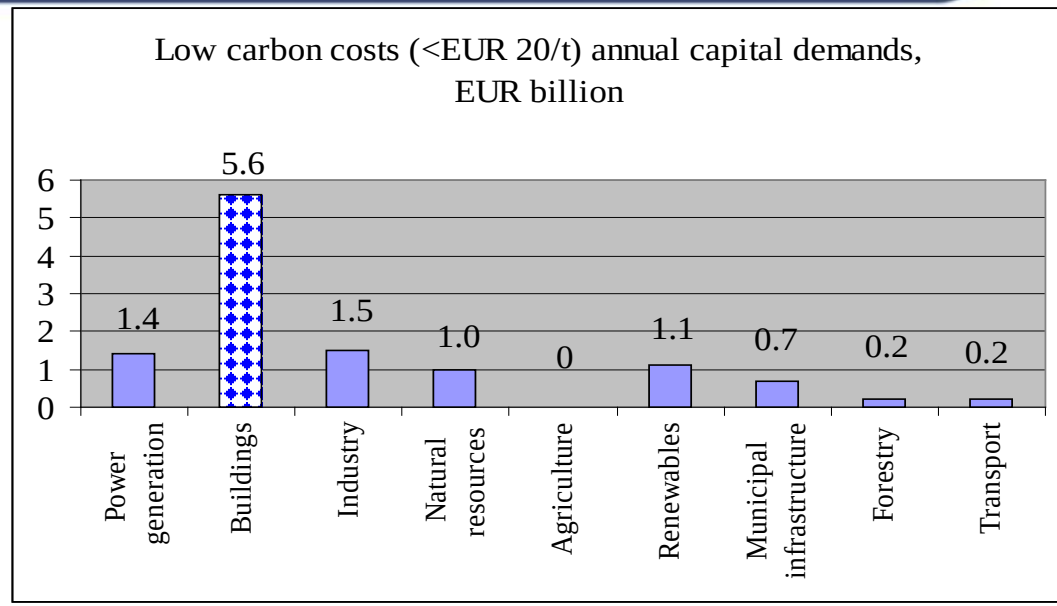
Buildings (commercial, public and residential) – the hidden culprit of Climate Change

- **Largest end consumer: 40% of overall energy use in EU**
  - **34% in Bulgaria and increasing**
- **Largest saving potential: 41% of potential in the EU;**
- **Buildings are major CO2 emitters globally: 20% of global emissions.**
  - **Without change, direct and up-stream carbon footprint of buildings will grow from 8.7 G t to 20.1 G t CO2 globally[1] , and**
- **Political commitments for reduced greenhouse gases will be difficult to meet without addressing building sector impacts;**

SOURCE: 1 - IEA, WEO 2007 & ETP 2008

Buildings – how the Bank responds?

- **Building are a priority within the Bank's Sustainable Energy Initiative**



- **Financing models available**
- **TC from donor funds**
- **Policy Dialogue engagement (policy&regulatory barriers)**

Financing building sustainability

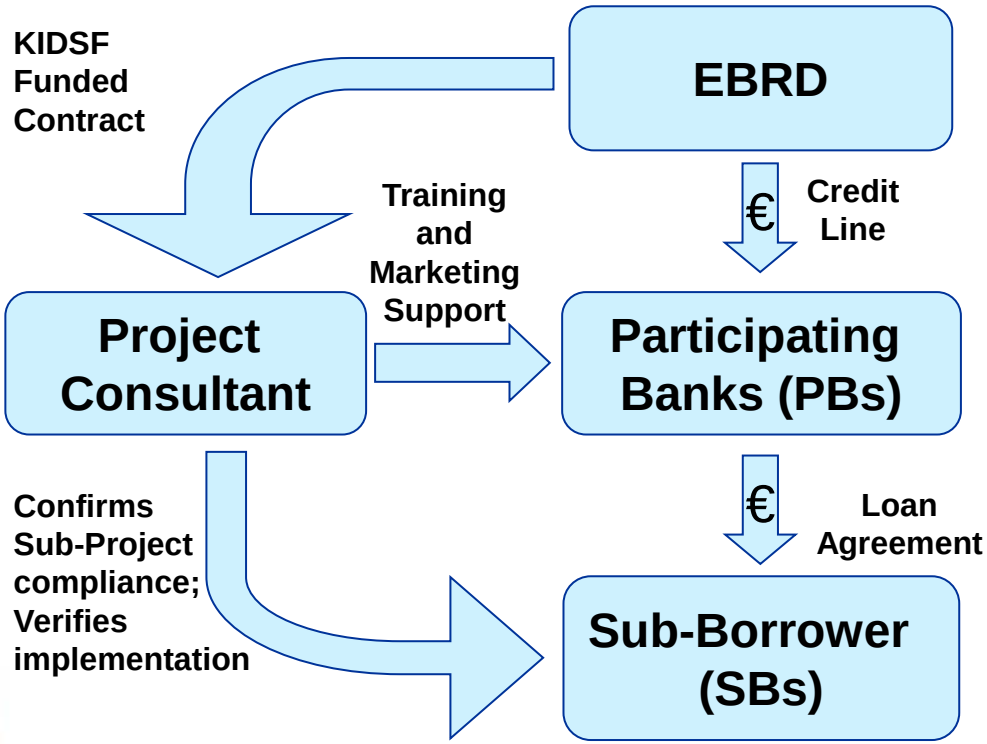
- Residential Energy efficiency Credit Line (REECL: www.reecl.org)
  - **REECL 1** (Oct 2005 – Jan. 2010): €50 million
  - €14.6 million from KIDSF for TC and incentives
  - 28,100 small-size residential projects financed with € 43 million

  - **REECl 2** (July 2011 – Dec. 2014): €40 million
  - Focus on high performing EE technologies and complex refurbishment
  - 8,200 projects financed with €13.6 million (by Oct. 2012)

- Utility Demand Side EE Programs (under development)

The Bank has suggested a Utility DS EE Program for gas distribution companies in Bulgaria and addressing the residential sector

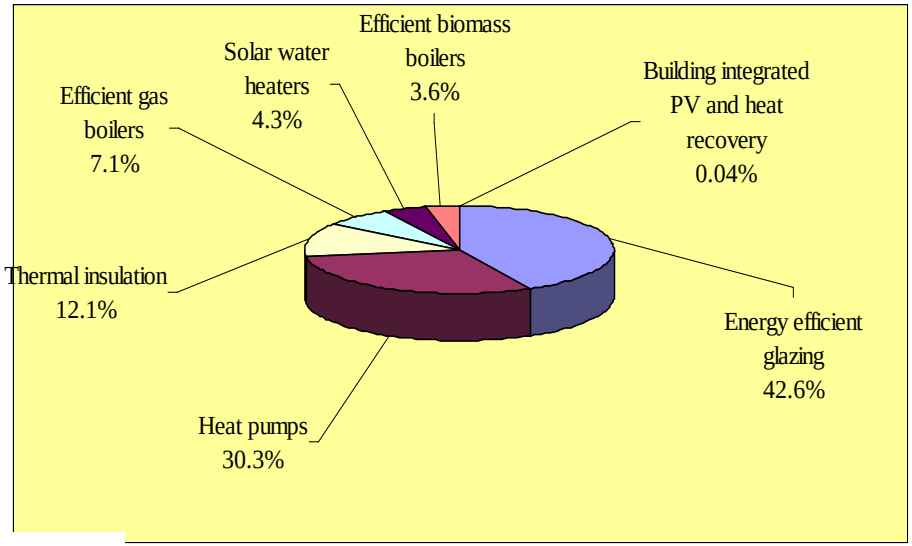
Bulgaria: REECL Structure



Bulgarian Residential Energy Efficiency Credit Line: REECL

- REECL finances top-performing technologies only
- Market penetration rates increased two to four times as compared with 2005

Split of projects



- REECL contribution of up to 30% from top-performing technologies sales (2005-2011)

Bulgarian Residential Energy Efficiency Credit Line: REECL

- **Continue providing all the services to PBs and interested residents**:
  - Compliance and verification checks,
  - Technical and legal advise
  - Advisory help line
  - Marketing EE through PBs and Eligible Installers
  - Maintenance and up-date of operation tools
  - Monitoring and verification

- **Work with the municipalities**: Sofia, Gabrovo, Plovdiv, Burgas, Varna
- **Work with utilities and technology suppliers**: Dalkia in Varna, Baumit, Marisann and Terraco, Knauf, Sisecam, Douglas
- **Work with professional associations**: Association of Professional Facility Managers, Home Owners Associations, Habitat for Humanity
- **Work with media: bTV,** TV7, 24 Hours, Duma, Standard, Capital, Pressa, Stroitelstvo, Monitor, all major info and news e-portals

EBRD Sustainable Energy Financing Facilities - overview

- REECL I+II, Bulgaria, www.reecl.org: € 90 million (2005-2014)
- SlovSEFF I+II, Slovakia, www.slovseff.eu: € 150 million (2007-2011)
- RuSEFF-Residential, Russia: $ 100 million (2012-2016)
- MoREEFF, Moldova, www.moreeff.info: € 35million (2012-2017)
- TurSEFF, Turkey, www.turseff.org: $ 200 million (2011-2013)

Under preparation

- SlovSEFF III, Slovakia: € 45 million (2013-)
- KoSEP, Kosovo: € 15 million (2013-)
- KyrSEFF, Kyrgyzstan: $ 20 million (2013-2017)
- ArmSEFF, Armenia: TBD
- SloREEFF, Slovenia: € 30-40 million

Other ways to improve EE in public and muni infrastructure

- **Bulgarian ESCO Fund**
  - Euro 17 million signed in 2007 and 2011.
  - ESCO which helps finance – via purchase of receivables – on savings in public buildings following retrofitting of the buildings.

- **FLAG** Infrastructure project: €18 million
- **District Heating** in Sofia: €14.3 million
- **Water supply and infrastructure** in Sofia, Varna, Plovdiv, Rouse, St Zagora: € 78.2 million
- **Improved power infrastructure**
- **Integrated urban transport projects**

Commercial buildings – best technology to reduce footprint

- **Sustainable energy investments**
  - Galeria Stara Zagora, Galeria Burgas, Europolis, Golden Yavor, etc
- **Overall investments in commercial properties:** € 150 million

- The Bank is interested to finance:
  - High profile building infrastructure projects in secondary cities
  - Strong demonstration of building sustainability (innovative technologies, best international standards, sustainability certification)
  - Commercially sound
  - Innovative financing models

EBRD financing building sustainability – next steps

- **Policy dialogue with the Bulgarian Government and the EC**
- **New sustainable financing models**
  - Off-balance financing through ESCOs and/or facility management companies
  - Green property funds
  - Utility demand side energy efficiency programs
- From energy to resource efficiency
  - Energy efficiency
  - Small-size building integrated renewables
  - Recyclable and reusable materials
  - Water efficiency

We are looking forward for good cooperation!

Thank you

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

ПРОЕКТ BG161PO001-1.2.01-0001 „ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ”

14 ноември 2012 г., гр. София

Обхват на проекта

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

- **Цел:** осигуряване на по-добри условия на живот за гражданите в многофамилни жилищни сгради и изпълнение на мерки за енергийна ефективност в многофамилни жилищни сгради
- **Обхват:** 36 градски центрове
- **Стойност на БФП:** 50 109 140,20 лв.
- **Продължителност:** 3 години (2012-2015)
- **Получатели на БФП:** Сдружение на собствениците

Основни участници

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

- Звено за изпълнение на проекта
- Проектни мениджъри
- Фонд за жилищно обновяване
- Външни изпълнители за изпълнение на дейностите по проекта:
  - Извършване на техническо обследване и изготвяне на технически паспорт;
  - Изготвяне на технически/работен проект и авторски надзор;
  - Строително-монтажни работи;
  - Строителен надзор и оценка на съответствието;
  - Информационна кампания.
- Органи на местната власт - общини

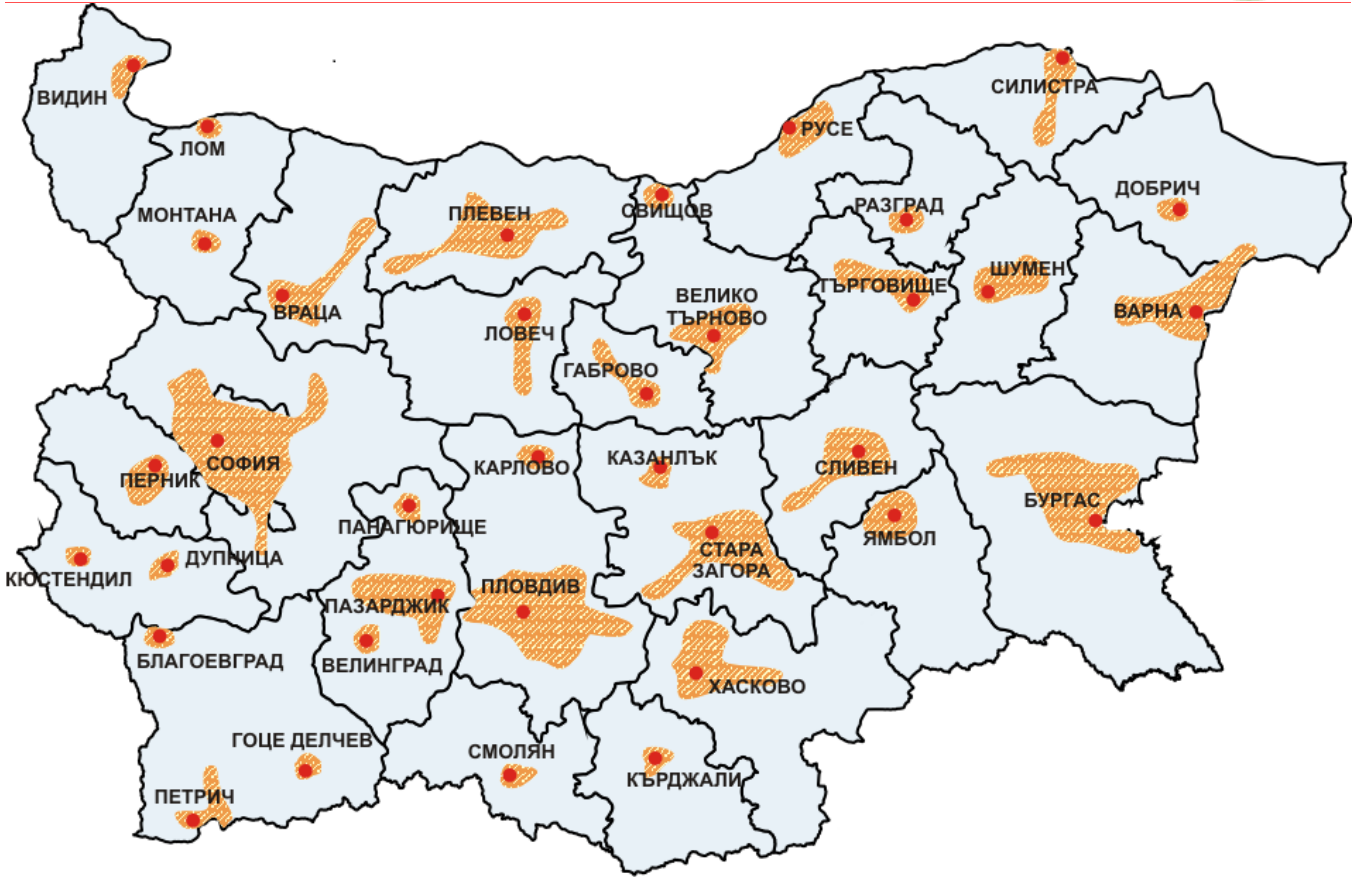
Допустими сгради

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

- **Многофамилна жилищна сграда - с 6 или повече обособени самостоятелни обекти с жилищно предназначение съответно на 3 и повече етажа.**
- **Сграда/блок-секция -** строителна единица със самостоятелно функционално предназначение, която притежава отделни ограждащи от външния въздух конструкции и елементи и има самостоятелно обособен генератор на топлина/студ или няма генератор на топлина/студ.
- **Проектирането на сградата да е започнало преди 26 април 1999 г.**
- **Сградата трябва да е конструктивно устойчива** - установява се след извършване на техническото обследване.

Допустими градове

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ



Разпределение на разходите

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

100%	50%
техническо обследване	технически проект
технически паспорт	оценката на съответствието на проекта
обследване за енергийна ефективност	строително-монтажни работи
заплащане на проектния мениджър	авторски и строителен надзор
цялостна организация на процеса	разходи по въвеждането на обекта в експлоатация
	разходи по набавяне на разрешителни документи
Реално държавата поема 70% от всички разходи!	

Мерки за енергийна ефективност

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

- подмяна на дограма (прозорци, врати и др.);
- топлинна изолация на външни ограждащи елементи (външни стени, покриви и др.);
- основен ремонт, модернизация или подмяна на локални източници на топлина/котелни стопанства или прилежащите им съоръжения, собственост на собствениците на самостоятелни обекти и смяна на горивната база при доказан енергоспестяващ и екологичен ефект;
- изграждане на инсталации за оползотворяване на възобновяеми енергийни източници – слънчеви системи за осигуряване на енергия за собствени (битови) нужди, които не генерират приходи в процеса на експлоатация на съоръженията;
- ремонт или подмяна на вътрешна отоплителна/охладителна/вентилационна инсталация, включително радиаторни термостатични вентили и разпределители в общите части на сградата/блок секцията;

Мерки за енергийна ефективност

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

- ремонт на електроинсталация в общите части и въвеждане на енергоспестяващо осветление в сградата/блок секцията;
- инсталиране на автоматизирани сградни системи за управление, в т.ч. балансиране, регулиране и др. на потреблението на топлинна и електрическа енергия към локалните източници, собственост на собствениците на самостоятелни обекти в общите части на сградата/блок секцията;
- газифициране на сгради (вътрешна сградна разпределителна мрежа и котел/котли), при наличие на изградена до сградата разпределителна газопроводна мрежа;
- съпътстващи строително-монтажни работи, свързани с изпълнението на мерките за енергийна ефективност и съответното възстановяване на общите части на сградата/блок секцията в резултат на изпълнените мерки с енергоспестяващ ефект.

Кандидатстване

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

ПОДАВАНЕ НА ЗАЯВЛЕНИЕ ЗА ИНТЕРЕС И ПОДКРЕПА

↓

ОДОБРЕНИЕ/НЕОДОБРЕНИЕ НА ЗАЯВЛЕНИЕТО

↓

ОГЛЕД НА СГРАДАТА

↓

ИЗГОТВЯНЕ НА ИНДИКАТИВЕН БЮДЖЕТ НА СГРАДАТА И РАЗПРЕДЕЛЕНИЕ НА РАЗХОДИТЕ НА ВСЕКИ СОБСТВЕНИК

↓

СЪЗДАВАНЕ НА СДРУЖЕНИЕ НА СОБСТВЕНИЦИТЕ*

↓

ОСИГУРЯВАНЕ НА СУМАТА ОТ 500 ЛВ. ЗА ВСЕКИ АПАРТАМЕНТ ПО СМЕТКА НА МРРБ**

↓

ПОДАВАНЕ НА ЗАЯВЛЕНИЕ ЗА ФИНАНСОВА ПОМОЩ И ИЗПЪЛНЕНИЕ НА ОБНОВЯВАНЕ ЗА ЕНЕРГИЙНА ЕФЕКТИВНОСТ

↓

ОДОБРЕНИЕ/НЕОДОБРЕНИЕ НА ЗАЯВЛЕНИЕТО

↓

ПРИ ОДОБРЕНИЕ СКЛЮЧВАНЕ НА СПОРАЗУМЕНИЕ МЕЖДУ СДРУЖЕНИЕТО НА СОБСТВЕНИЦИТЕ И МРРБ

* Сдружението на собствениците следва да бъде учредено и регистрирано в процеса на подготовка за кандидатстване за финансова помощ и преди подаване на Заявлението за финансова помощ.

** Сумата от 500 лв. на всеки апартамент се изразходва като част от дължимото от Сдружението на собствениците съфинансира-не, а в случай на неизпълнение на задълженията по Споразумението - се удържа за покриване на извър-шените разходи по сградата/блок-секцията.

Процесът по обновяване

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

ОСИГУРЯВАНЕ НА 30% ОТ ДЪЛЖИМАТА СУМА

ОБСЛЕДВАНЕ НА КОНСТРУКЦИЯТА И ТЕХНИЧЕСКИ ПАСПОРТ

ОБСЛЕДВАНЕ ЗА ЕНЕРГИЙНА ЕФЕКТИВНОСТ

СГРАДАТА СЕ НУЖДАЕ ОТ КОНСТРУКТИВНО УКРЕПВАНЕ
1. СОБСТВЕНИЦИТЕ МОГАТ ДА ПОЕМАТ РАЗХОДИТЕ ЗА КОНСТРУКТИВНИТЕ МЕРКИ, ИЗВЪРШВА СЕ ОБСЛЕДВАНЕ ЗА ЕНЕРГИЙНА ЕФЕКТИВНОСТ
2. СОБСТВЕНИЦИТЕ НЕ МОГАТ ДА ПОЕМАТ РАЗХОДИТЕ ЗА КОНСТРУКТИВНИТЕ МЕРКИ – ПОЛУЧАВАТ ОБСЛЕДВАНЕТО И ИЗГОТВЕНИЯ ТЕХНИЧЕСКИ ПАСПОРТ И ИМ СЕ ВЪЗСТАНОВЯВАТ 500 ЛВ.

СГРАДАТА НЕ СЕ НУЖДАЕ ОТ КОНСТРУКТИВНО УКРЕПВАНЕ

ИЗВЪРШВА СЕ ОБСЛЕДВАНЕ ЗА ЕНЕРГИЙНА ЕФЕКТИВНОСТ

ИЗГОТВЯНЕ НА ТЕХНИЧЕСКИ ПРОЕКТ,
ОДОБРЕНИЕ НА ПРОЕКТА И ИЗДАВАНЕ НА РАЗРЕШЕНИЕ ЗА СТРОЕЖ

ОСИГУРЯВАНЕ НА ОСТАТЪКА ОТ ДЪЛЖИМАТА СУМА,
ОТ КОЯТО СЕ ПРИСПАДАТ ВНЕСЕНИТЕ 500 ЛВ. НА АПАРТАМЕНТ

ИЗВЪРШВАНЕ НА СТРОИТЕЛНО-МОНТАЖНИ РАБОТИ, АВТОРСКИ И СТРОИТЕЛЕН НАДЗОР

Фонд за жилищно обновяване

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

- Ниска лихва за целия период на кредита от основен лихвен процент на БНБ + 6,5%, с възможност за намаляване на лихвата до основен лихвен процент на БНБ + 4,5% при определени условия
- Без допълнителни такси за кандидатстване и управление
- Гратисен период за главницата и лихвата от 6 месеца
- Срок на погасяване – март 2022 г.

ФОНД ЗА ЖИЛИЩНО ОБНОВЯВАНЕ

Корпоративна търговска банка АД – Фонд за жилищно обновяване
ул. Граф Игнатиев № 10, 1000 София
Тел.: 02 8015 404, факс: 02 9375 699
www.corpbank.bg

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

- **Резултати от 4-годишния опит на проекта (2007-2011):**
  - ✓ **50 обновени сгради** и прилежащи околоблокови пространства
  - ✓ **80 975 кв.м. РЗП** подобрена жилищна инфраструктура
  - ✓ **1093** обновени жилища
  - ✓ **2732** облагодетелствани жители
- **Очаквани резултати по настоящия проект (2012 - 2015):**
  - ✓ **180 обновени сгради**
  - ✓ **426 550 кв.м. РЗП** подобрена жилищна инфраструктура
  - ✓ **6100** обновени жилища
  - ✓ **13 500** облагодетелствани жители

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

БУРГАС, ул. „Съгласие” № 6, бл. „Пощенец 2”

Домакинства: **12**, Енергопотребление: **52% намаление**

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

ГАБРОВО, ул. „Осми март”, № 33

Домакинства: **8,** Енергопотребление: **55% намаление**

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

ГОЦЕ ДЕЛЧЕВ, ул. „Симеон Радев”, бл. 15

Домакинства: **38,** Енергопотребление: **64% намаление**

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

СВИЩОВ, ул. „Черни връх”, № 24, бл. 3

Домакинства: **16,** Енергопотребление: **68% намаление**

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

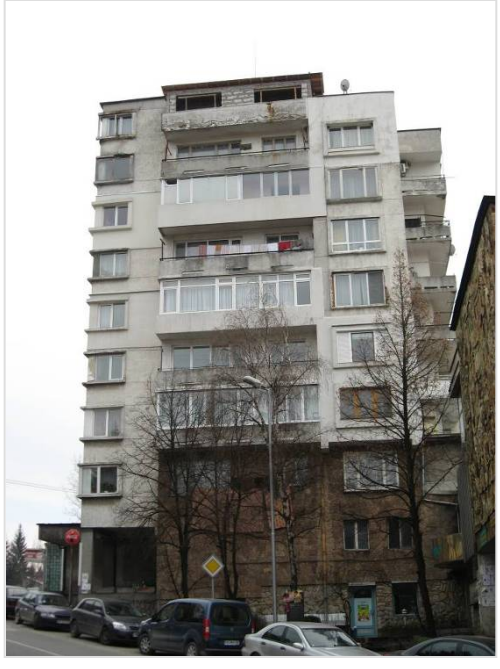
СЛИВЕН, ул. „Г. С. Раковски”, № 23

Домакинства: **28,** Енергопотребление: **63% намаление**

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

СМОЛЯН , ул. „Миньорска“ № 1, бл. „Строител“ 1



Домакинства: **30;** Енергопотребление: **58% намаление**

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

СОФИЯ , ул. „Асен Златаров“ № 11

Домакинства: **14;** Енергопотребление: **56% намаление**

Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

СОФИЯ , ул. „Чаталджа” № 54 (с ВЕИ)

Домакинства: **19;** Енергопотребление: **60% намаление**

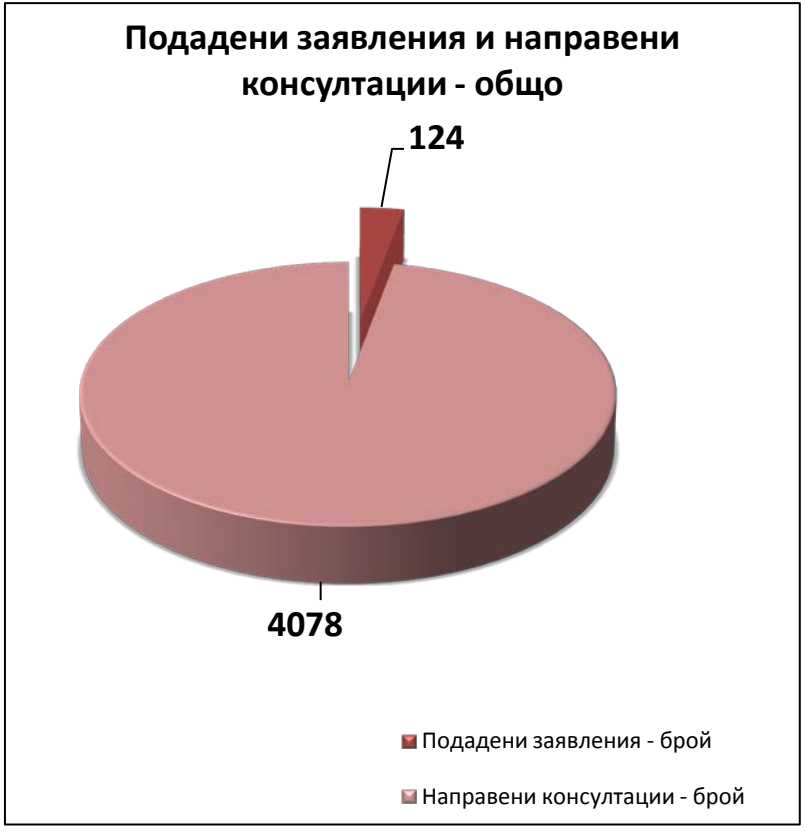
Проект “Демонстрационно обновяване на многофамилни жилищни сгради”

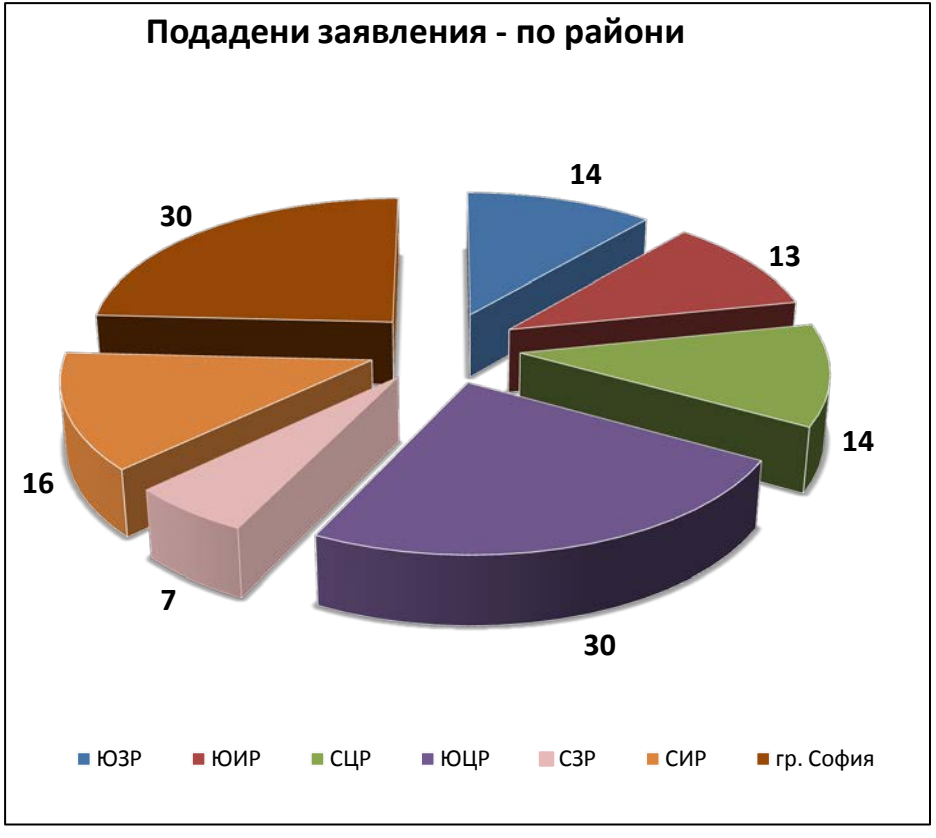
ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

ЯМБОЛ , ул. „Г.С. Раковски” бл. № 11

Настоящия момент ...

ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ





ЕНЕРГИЙНО ОБНОВЯВАНЕ НА БЪЛГАРСКИТЕ ДОМОВЕ

www.mrrb.government.bg, секция “Обновяване на жилища”

ЕВРОПЕЙСКИ СЪЮЗ
Европейски фонд за регионално развитие

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ОПРР

Проект BG161PO001-1.2.01-0001 „Енергийно обновяване на българските домове”
се осъществява с финансовата подкрепа на Оперативна програма „Регионално развитие“ 2007 – 2013 г.,
съфинансирана от Европейския съюз чрез Европейски фонд за регионално развитие.

Energy Efficiency: from Policy to Implementation

Prof. Diana Mangalagiu

Smith School of Enterprise and Environment, Oxford University

& Global Climate Forum

diana.mangalagiu@smithschool.ox.ac.uk

Investing in Energy Efficiency Conference

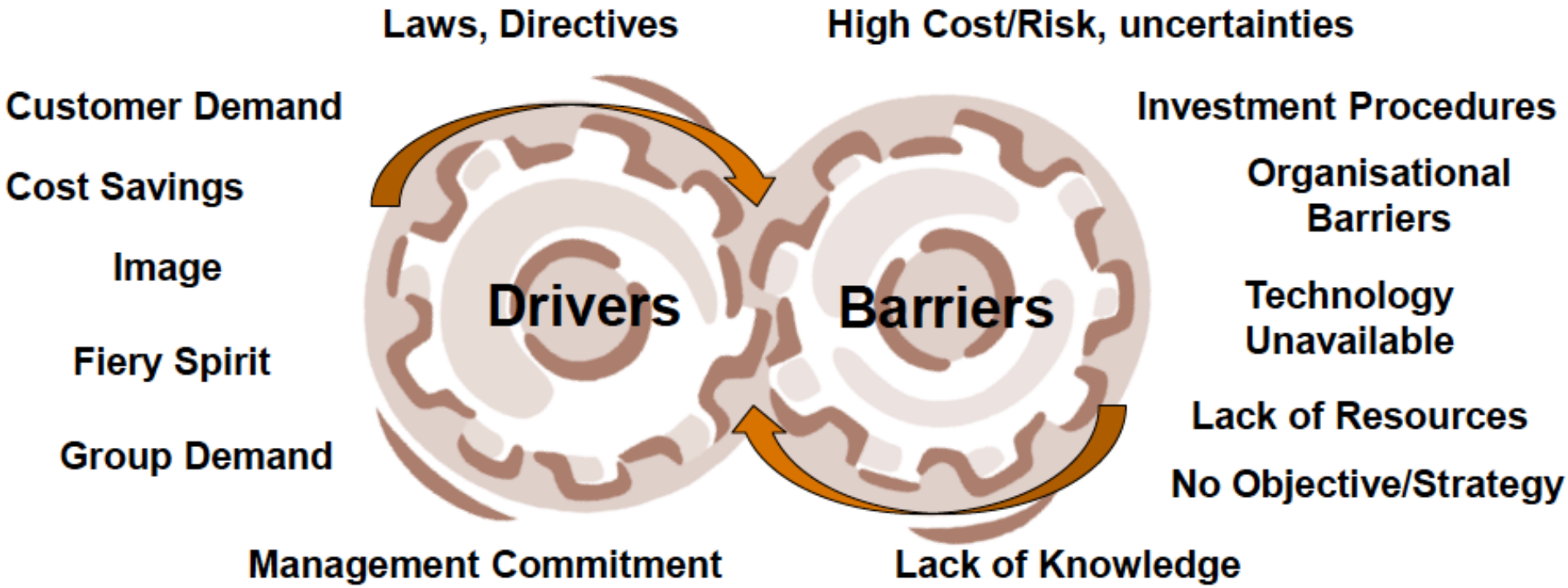
Sofia, 14th November 2012

Smith School of Enterprise and the Environment

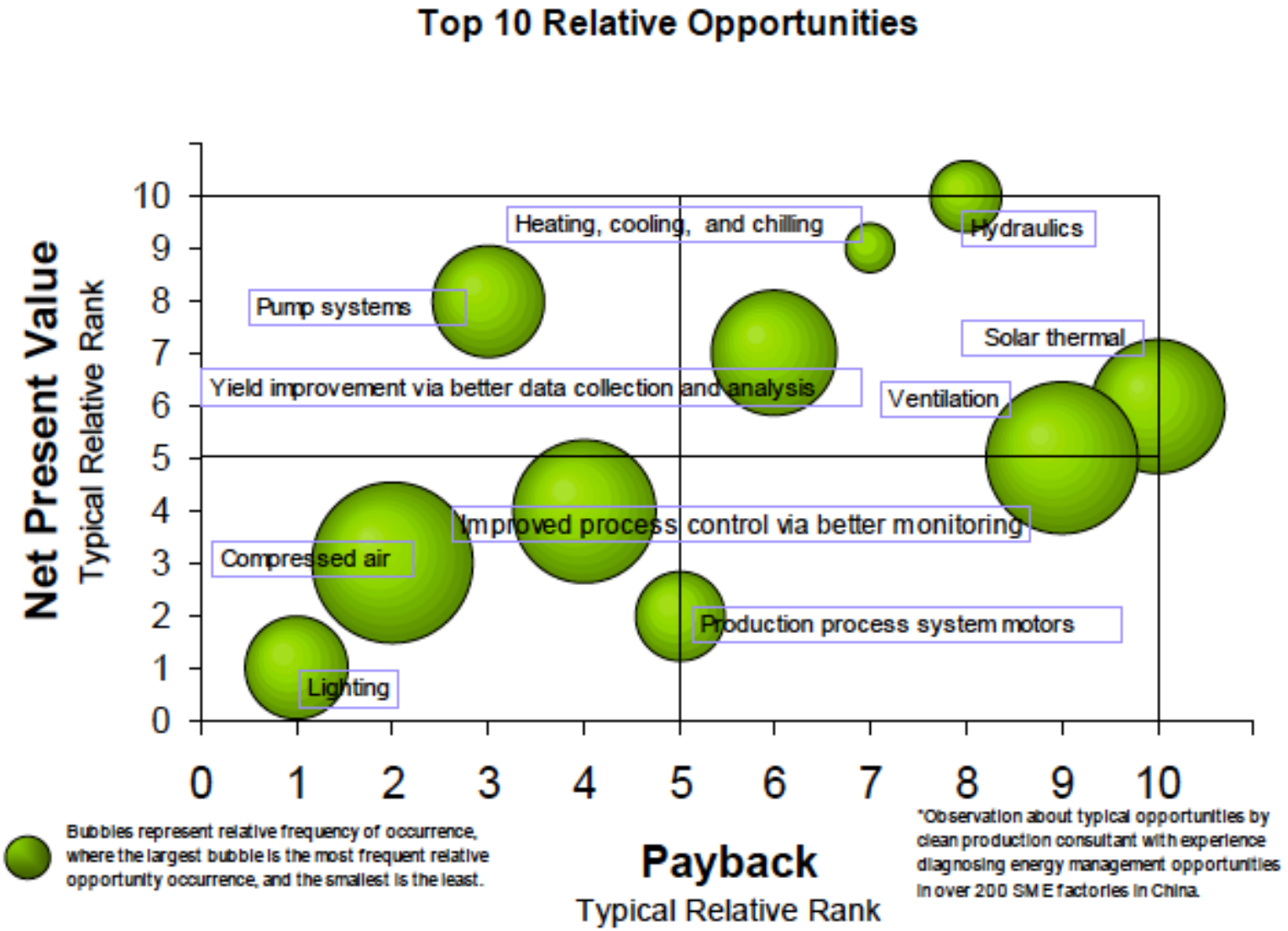
UNIVERSITY OF OXFORD

Global Climate Forum

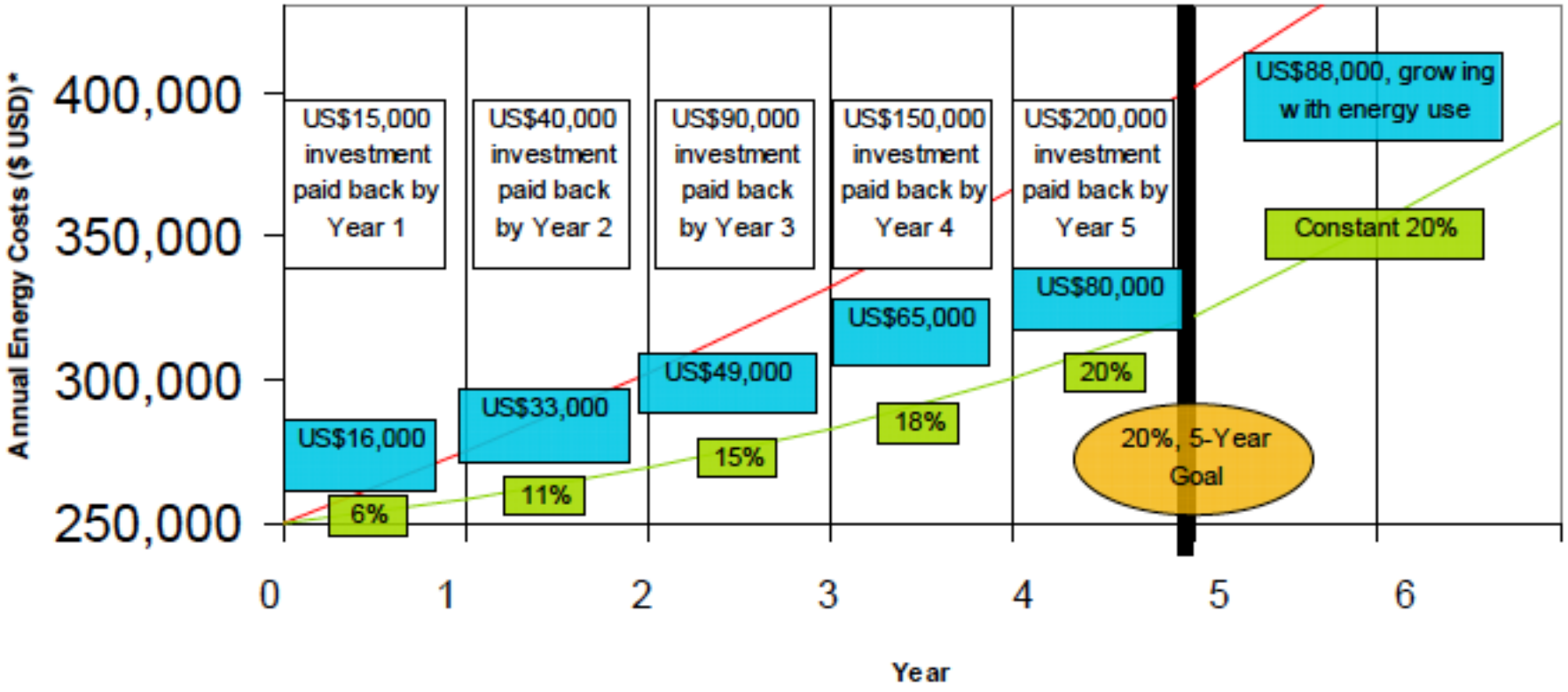
Drivers and barriers for energy efficiency implementation



Where should one start? Typical relative energy efficiency opportunities in industry



Cost savings potential from energy efficiency: example of 20% target in 5 years



Business-As-Usual Energy Use. 10,000 MWh Baseline with 10% Annual Growth.

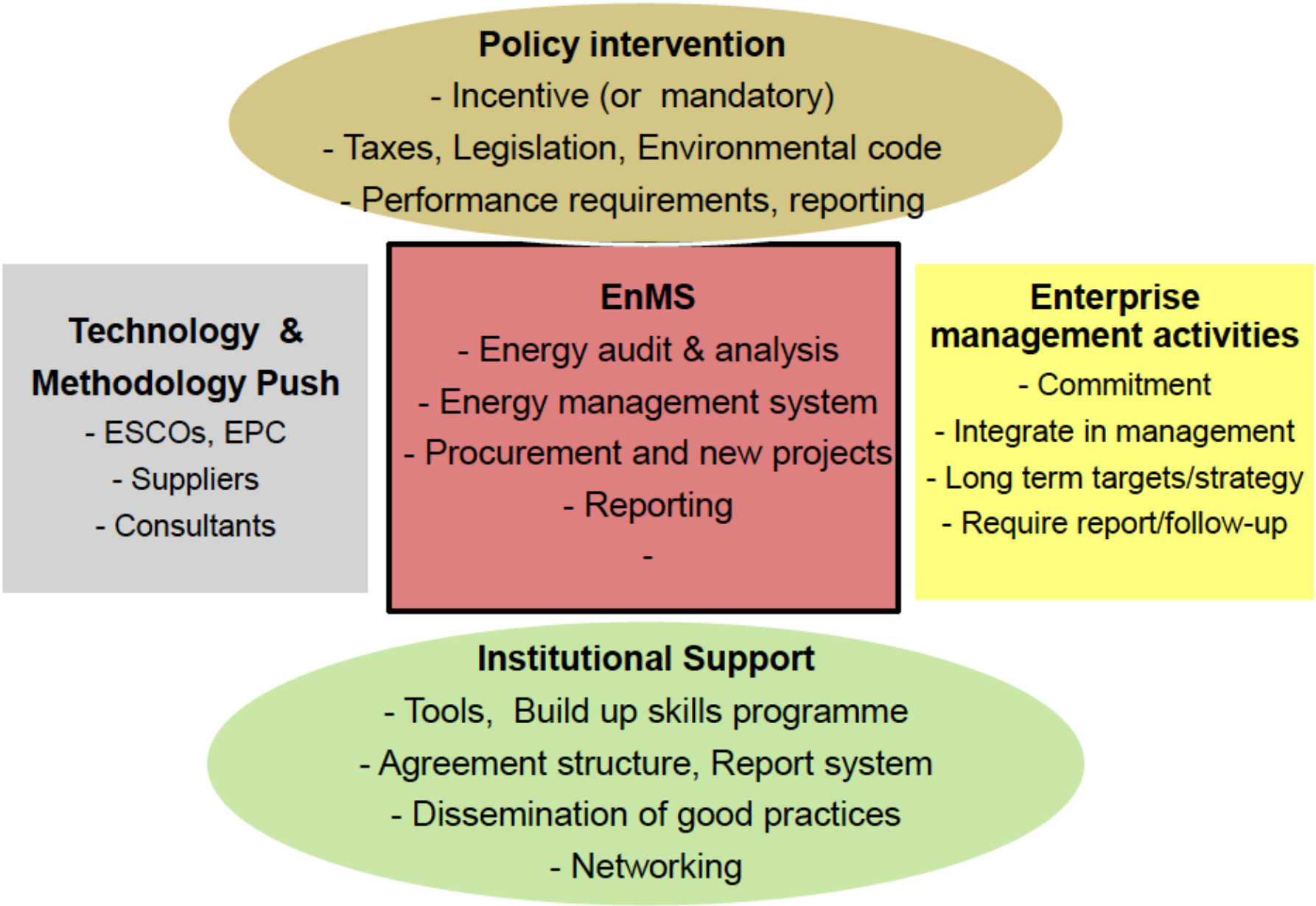
Efficient Energy Use. 20% Improvement on BAU over 5 Years.

Annual savings

Cumulative energy reduction

*Assumes starting annual energy use of 10,000 MWh with average cost of US$0.025/kWh, and energy use growing at 10 percent per year. Progress toward reduction goal of 20 percent over five years is somewhat front-weighted to reflect typical quick wins in lighting, compressed air, and heating/cooling systems

How to implement energy efficiency?



Overview of policies and measures in EU-27

Regulations	
Energy performance standards	Mandatory inspections and audits
Minimum efficiency standards	Mandatory planning and reporting
Economic and financial incentives	
Grants and subsidies for EE and CHP	Tax exemptions and reductions
Incentives for planners and architects	
Informative instruments	
Labelling (equipment and buildings)	Awards and competitions
Information campaigns	EE information centres
Co-operative measures	
Voluntary agreements	Technology procurement

Typical policies and measures

- Cross-cutting programmes
  - combine multiple measures and target multiple end-use sectors
- Procurement initiatives
  - Environmental criteria included in **public** purchasing processes
- Demonstration (e.g. building and lighting)
  - E.g. retrofits: existing building stock in **public** ownership; measures target primarily heating, cooling and lighting
- Labelling schemes
  - E.g. energy performance labels and voluntary building rating systems

Demonstration example: educational sector energy efficiency in Russia

- 50-70% energy savings technically possible
- 20-25% savings available using low cost measures
- On average 30% energy savings achieved in demonstration schools and universities
- Additional energy efficiency gains from educational programme aimed at secondary school students
  $\rightarrow$ increased long-term cost efficiency
- Lack of budgetary autonomy limits incentives for local authorities

Success factors

- Partnership / co-operation between industry and government / public administration
- Combining voluntary agreements with regulatory measures Win-win deal for the government and the participants
- Clear targets, rights and obligations
- Reliable monitoring and reporting
- Creation of relevant Funds by the government, subsidized interest rates for loans, budgetary support at the household level, tax exemptions, emission taxes
- Use low public investment to leverage private investment

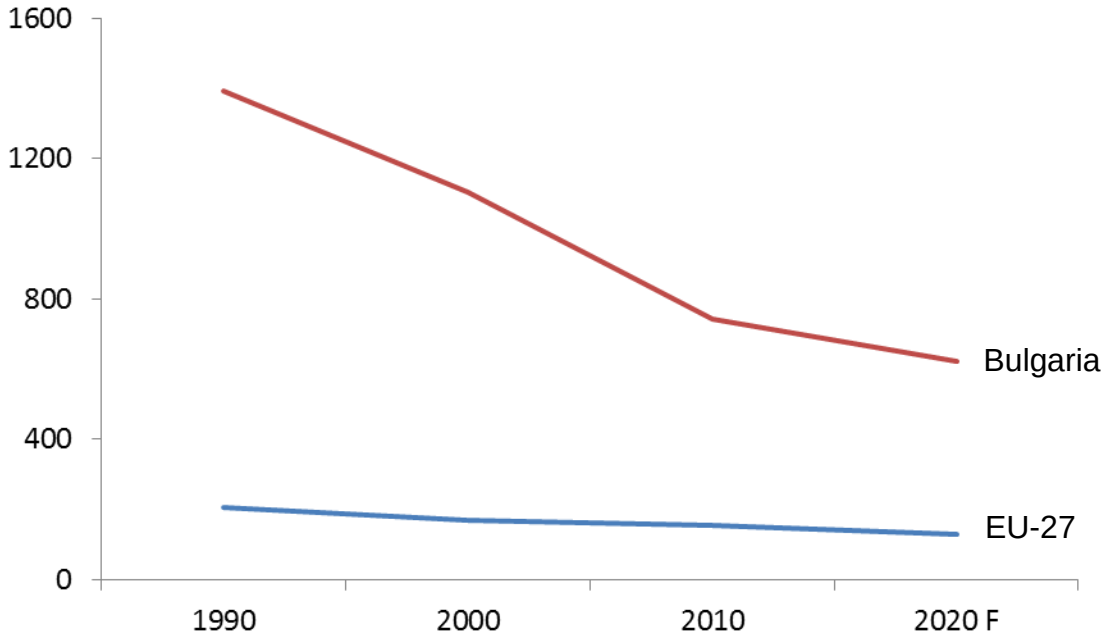
Comprehensive Approach to Energy Efficiency: strategy and instruments

November 14, 2012

Evgeny Angelov, Economic Advisor to the President of the Republic of Bulgaria

Although energy intensity in Bulgaria is decreasing, the country is still significantly behind EU average

Energy intensity
(Gross Inland Consumption, ktoe / GDP, 000 M€'05**)**



- In 2010, Bulgaria was 4.8 times more energy intensive than EU average
- Although decreasing, in 2020 Bulgaria is forecasted to **keep the same ratio to the EU average**, i.e. 4.9 times more energy intensive (*Source: PRIMES Baseline 2009 Scenario*)
- **Effective and aggressive approach to reducing energy intensity is needed to achieve substantial improvement**

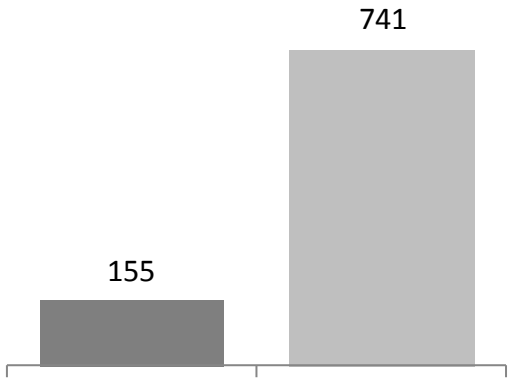
"Today, Bulgaria is five times more energy intensive than EU average.
By 2020 we should reduce this gap to two times…"

President Plevneliev, January 2012

Source: EU Energy trends to 2030, Update 2009; Directorate-General for Energy, European Commission

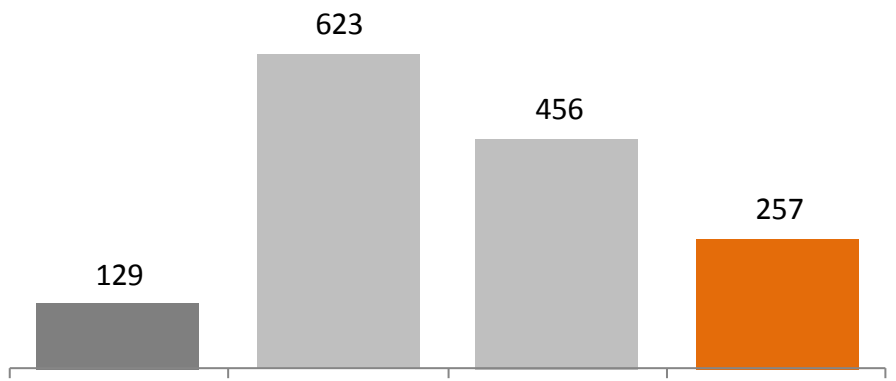
To achieve President's target by 2020 , Bulgaria needs to reduce energy intensity by 72% (2005 baseline)

Energy intensity, 2010
ktoe / 000 M€'05



Energy intensity BG / EU-27	**4.8 x**
Energy intensity reduction (2005 baseline)	**19%**

Energy intensity, 2020 F, three scenario
ktoe / 000 M€'05



Energy intensity BG / EU-27	**4.8 x**	**3.5 x**	**2 x**
Energy intensity reduction (2005 baseline)	**32%**	**50%**	**72%**

Notes: Bulgaria 2005 Baseline energy intensity: 913.3 ktoe / 000 M€'05
Source: EU Energy trends to 2030, Update 2009; Directorate-General for Energy, European Commission; Bulgarian Energy Strategy, June 2011; Second National Energy Efficiency Action Plan 2011-2013, MEET

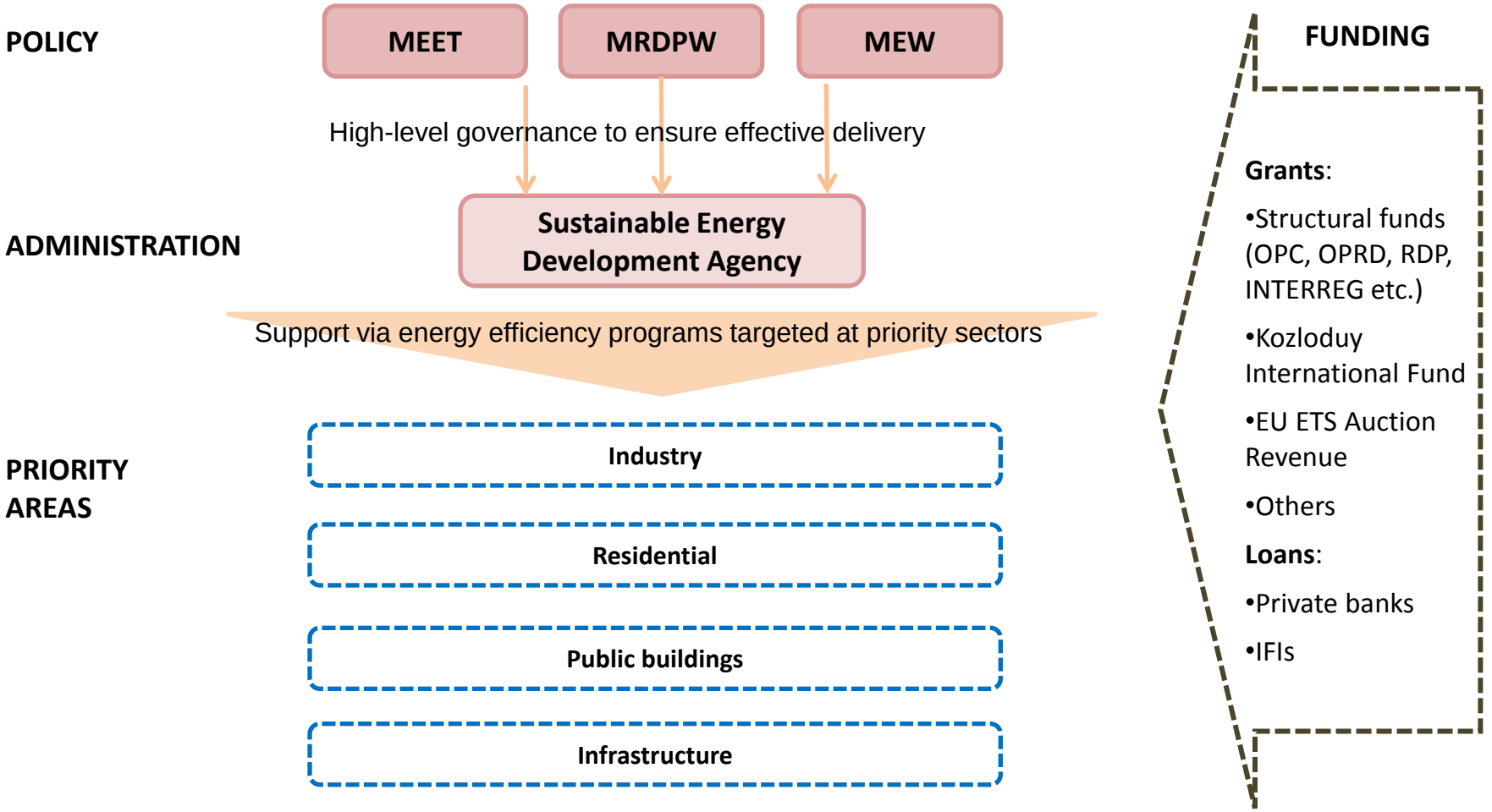
Current programmes overview

- Significant policy and program initiatives have been undertaken over the past several years
- By and large these initiatives are focused on public and residential buildings, and companies. They include loans, grants and guarantees as well as technical assistance in structuring and implementation
- Since 2004, programs aimed specifically at funding energy efficiency amount to over €1.5bn. Systematic evaluation of programs (efficiency, effectiveness, impact evaluation) is still to be performed
- Despite these efforts, energy inefficiency remains a critical impediment to competitiveness and a major contributor to CO^2 emissions

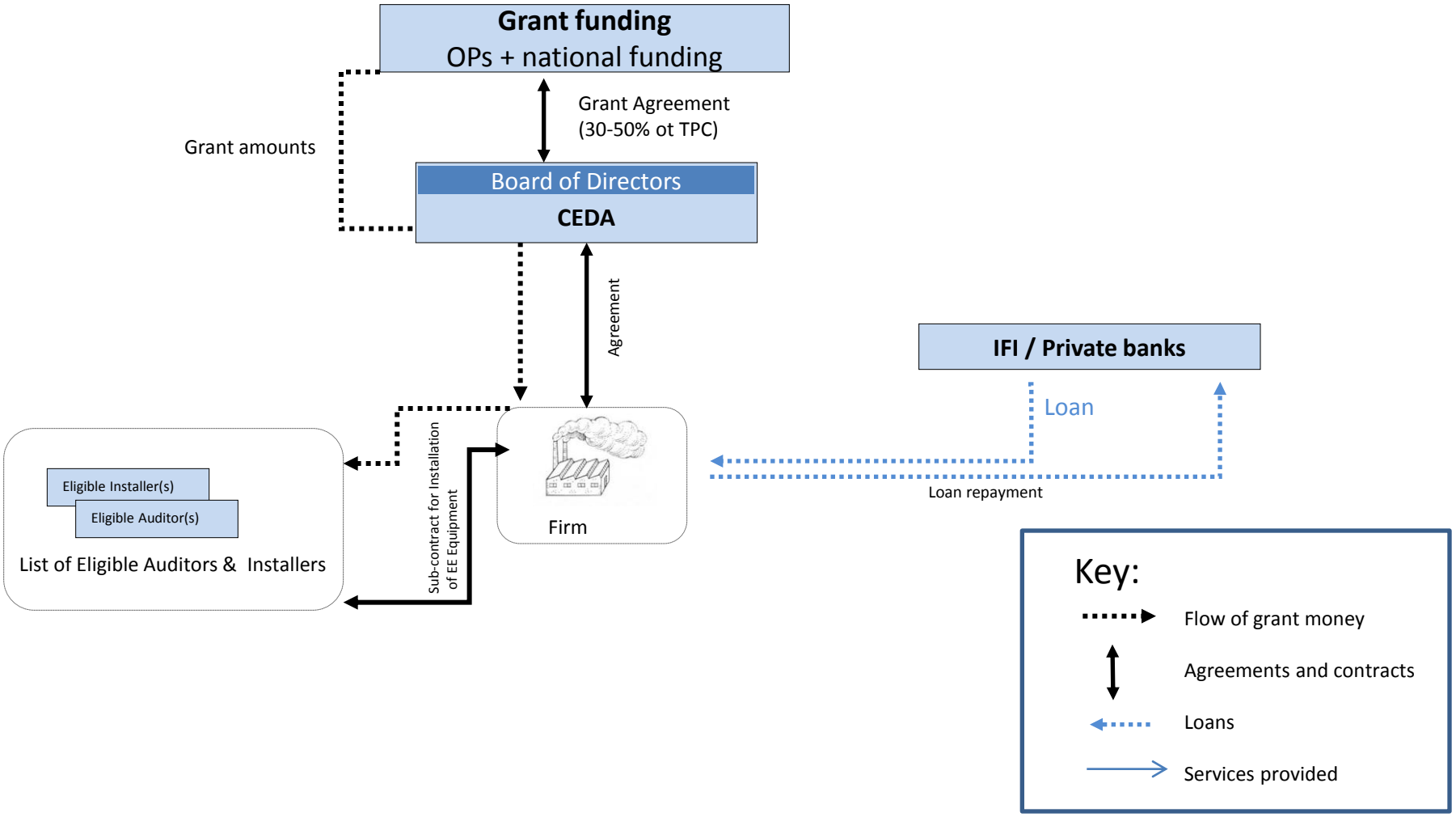
Major challenges for Energy Efficiency investments

- **Technical challenges**
  - Owners often lack the technical background and expertise to implement EE measures (in particular, owners of residential and public buildings). Significant resources need to be allocated to inform the public of the benefits of such measures and demonstration of proven technologies
  - Lack of project development capacity and creation of a robust project pipeline
- **Economic challenges**
  - Demonstration of cost effectiveness of EE projects is generally problematic, especially for residential and public buildings
  - Current energy prices do not provide incentives for investments in energy efficiency
- **Financial challenges**
  - Raising financing for EE projects is challenging for all priority sectors, and with limited resources prioritization of EE investments is often low
  - Access to long-term finance
  - Credit worthiness of home owner associations
  - Absence of consolidated policy counterpart with a holistic view of all initiatives
- **Institutional and regulatory challenges**
  - Insufficient incentives to promote savings; resource-consuming procedures for conducting energy audits etc.

Proposed Energy Efficiency framework

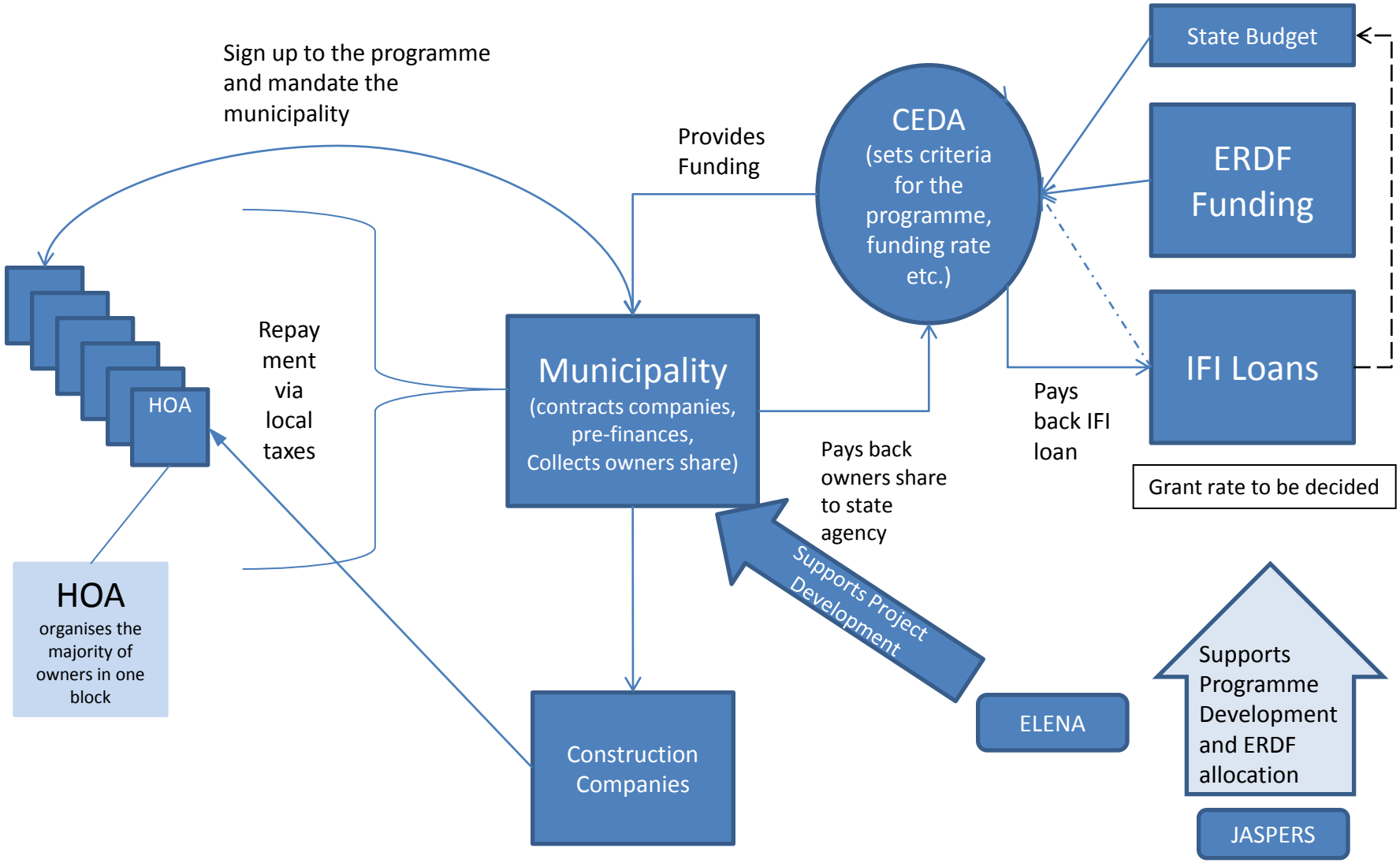


Energy Efficiency programs: Industry



Evaluation of results achieved and feedback received on the current MEET-EBRD program should be used to adapt where necessary the program and make it large-scale

Energy Efficiency programs: Residential



АГЕНЦИЯ ЗА УСТОЙЧИВО ЕНЕРГИЙНО РАЗВИТИЕ

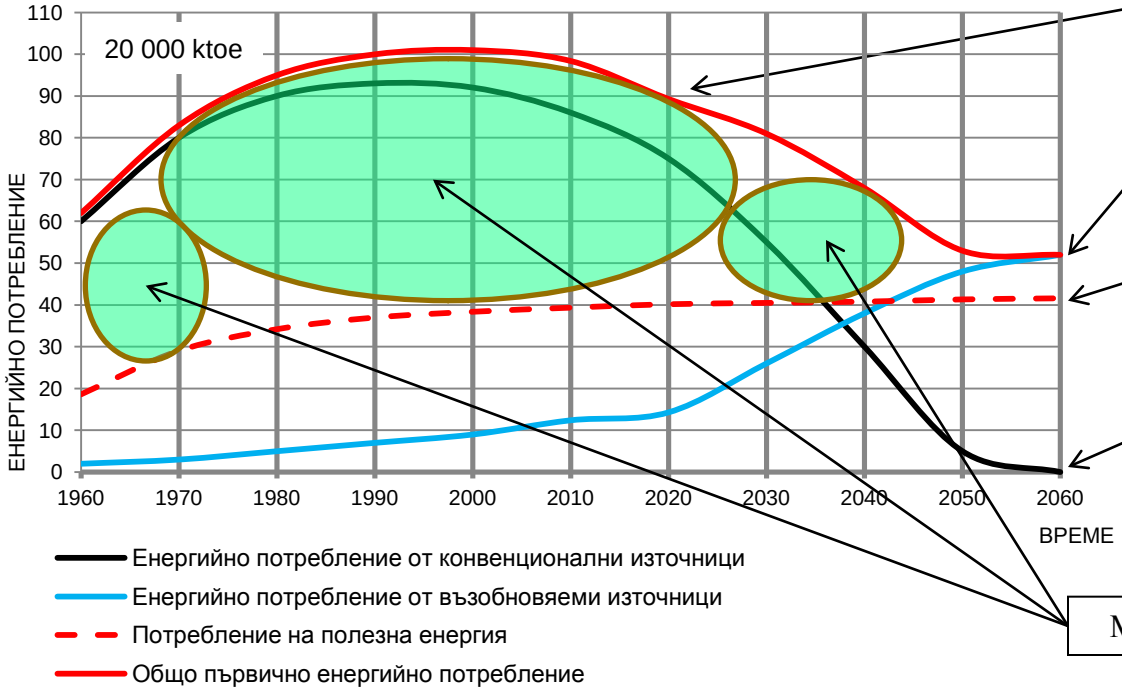
СЪСТОЯНИЕ НА ЕНЕРГИЙНАТА ЕФЕКТИВНОСТ В БЪЛГАРИЯ

Красимир Найденов

Директор “Информация и анализ”

Мястото и ролята на ЕЕ в енергийния баланс

Прогноза за енергийното потребление на България до 2050



Енергийното потребление ще намалява.

При устойчиво развитие енергийното потребление трябва да се осигурява само от възобновяеми източници.

При бързо въвеждане на възобновяеми източници полезно-използваната енергия ще нараства.

Изчерпване на конвенционалните енергийни източници (нефт, природен газ, въглища).

Мястото и ролята на енергийната ефективност.

- Изчерпването на конвенционалните ресурси до 2050 ще предизвика временно намаляване на енергийното потребление. То ще започне да нараства отново въз основа на нарастването на енергията от възобновяеми източници.
- Повишаването на енергийната ефективност трябва да запази полезно използваната енергия и да компенсира намаляването на конвенционалната енергия до заместването ѝ с енергия от възобновяеми източници.

Произведена електроенергия от ВИ от 01.01 до 30.09.2012

ВИД ВЪЗОБНОВЯЕМ ИЗТОЧНИК	ОБЕКТИ	ИНСТАЛИРАНА МОЩНОСТ	ПРОИЗВЕДЕНА ЕНЕРГИЯ	СРЕДНА ИНСТАЛИРАНА МОЩНОСТ	СРЕДНО ОТРАБОТЕНИ ЧАСОВЕ ПРИ НОМИНАЛНА МОЩНОСТ
НАИМЕНОВАНИЕ	**бр.**	**MW**	**MWh**	**MW**	**h**
ВЯТЪРНА ЕНЕРГИЯ	172	596,9	796 266	3,5	1 334
ВОДНА ЕНЕРГИЯ	216	2 303,9	2 399 115	10,7	1 041
СЛЪНЧЕВА ЕНЕРГИЯ	879	794,7	543 949	0,9	684
СМЕТИЩЕН ГАЗ	1	0,8	150	0,8	180
БИОМАСА	3	16,5	20 243	5,5	1 227
ГАЗ ОТ ОТПАДНИ ВОДИ	2	3,5	76	1,7	22
ОБЩО:	**1 273**	**3 716,3**	**3 759 800**	**2,9**	**1 012**

По пътя към УЕР

Намаляване на търсенето на енергия за вътрешния пазар

- Намаляване на продадените количества и увеличаване на цената на енергията от конвенционални източници.
  Нарастване на цените на енергията до достигане на цените от ВИ.
- Излишък от генериращи мощности и нарастване на възможностите за износ на енергия.

Нарастване на произведената енергия при крайния потребител

- Намаляване на разликата между производители и потребители на енергия и зависимостта на потребителя от доставчика .
- Увеличаване броя на автономните, индивидуални енергийни системи.
  Нужда от “интелигентни” системи за управление.
  Разширяване на пазара за монтаж и поддръжка на индивидуални системи.

Децентрализация и преструктуриране на енергийния пазар

- Прехвърляне на капитали от конвенционална енергетика към ВИ и ЕЕ - от големи инфраструктурни енергийни обекти към малки обекти, използващи местния потенциал на ВИ .
  Стремеж за трансформиране на собственост от обществени към индивидуални системи.
- Възможен конфликт между собствениците на обществени мрежи и собственици на малки обекти.
  Търговците на енергия – движещи сили на прехода.
  Сградите - ключови обекти и решаваща роля на собствеността.

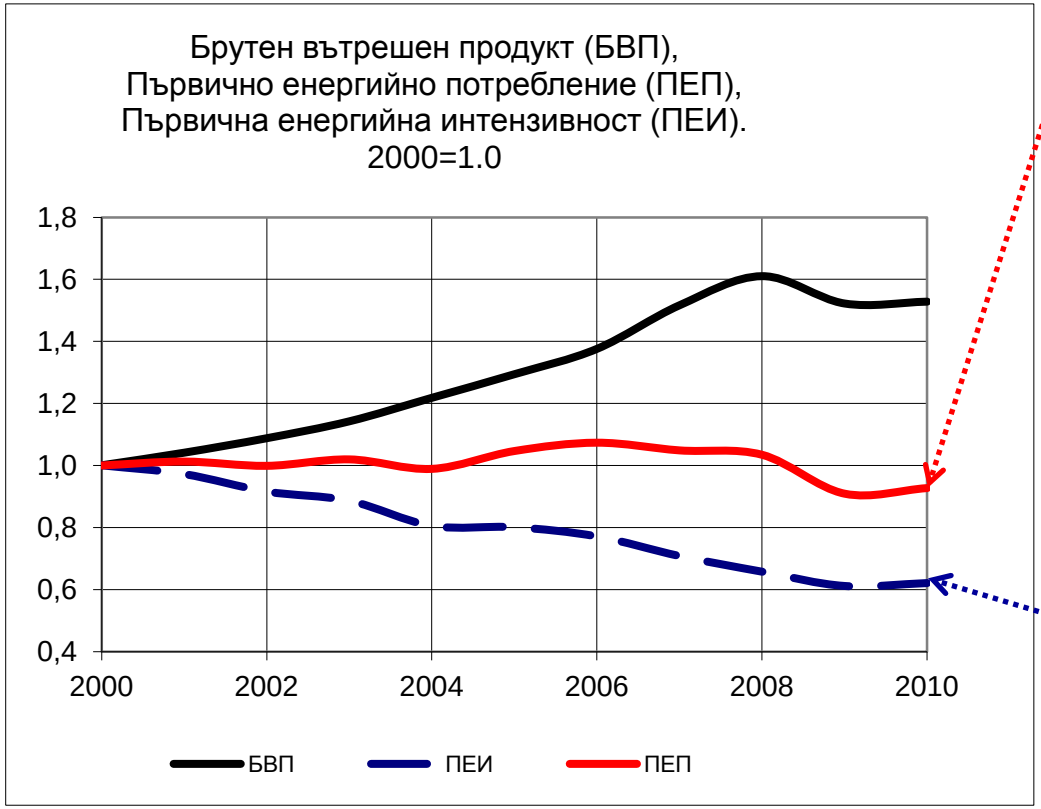
Оценка на енергийната ефективност на крайните потребители: крайна енергийна интензивност

До 2008 Крайното енергийно потребление нараства, под влиянието на бързото нарастване на БВП. След 2008 намалява рязко и през 2009 - 2010 е почти равно на това през 2000.

Крайната енергийна интензивност показва трайна тенденция към намаление с изключение на 2010, когато започва да нараства с 3,3 % годишно.

- Започва понижаване на енергийната ефективност на българската икономика, предизвикано от влошаване на показателите на индустрията, вследствие икономическата криза.
- Не се очаква значително нарастване на крайното енергийно потребление в близко бъдеще.

Обща оценка на енергийната ефективност



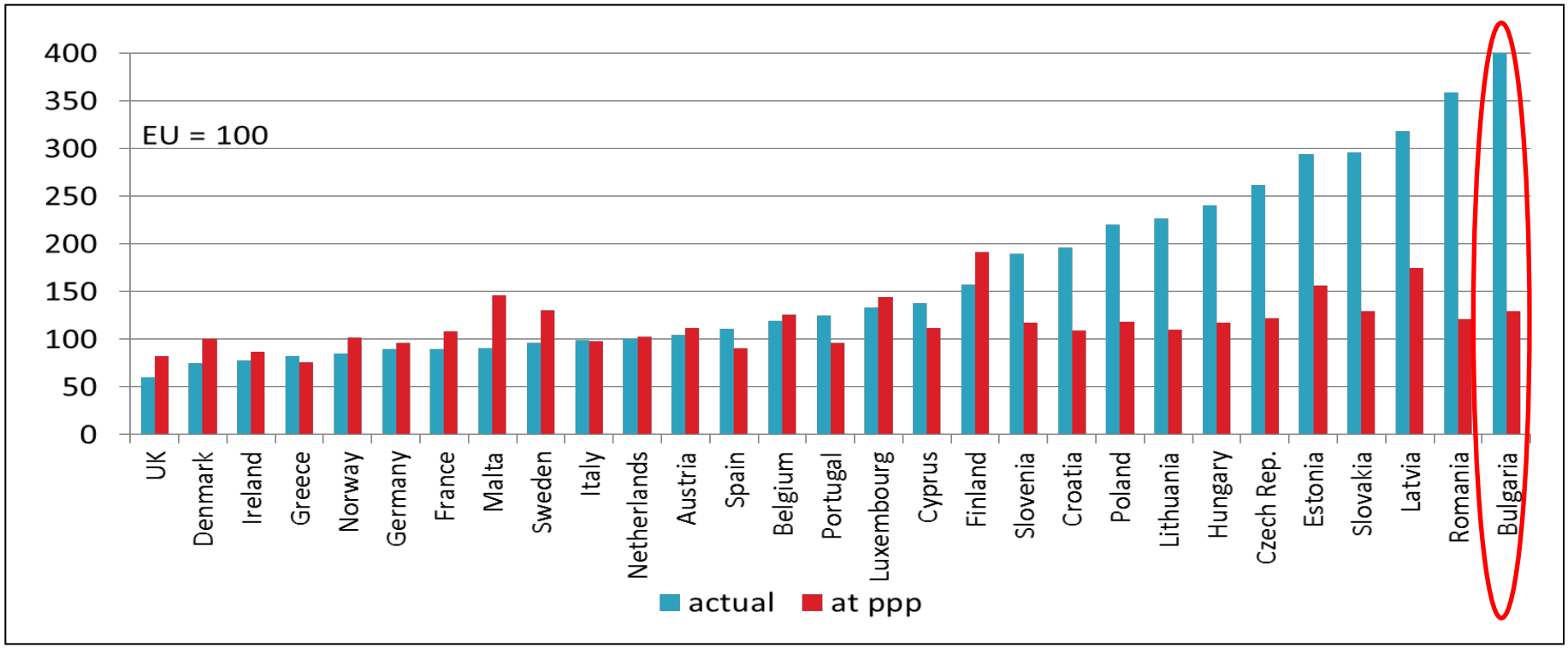
Независимо от бързото нарастване на БВП, **първичното енергийно потребление е почти постоянно**.

Първичната енергийна интензивност показва трайна тенденция към намаление.

Нарастването през 2010 (2,2 %.) е предизвикано от икономическата криза и от съпътстващите я структурни промени в икономиката

- **Стабилизиране и намаляване на енергийното потребление.**
- Промените в енергийното потребление **съответстват на тенденциите в ЕС.**

Крайна енергийна интензивност – сравнение с ЕС



- След корекция на БВП с "паричния покупателен паритет (ppp)" **енергийната интензивност на българската икономика е съизмерима с по-голямата част от държавите от ЕС27.**
- Сравнението на енергийната интензивност на различни държави би било по-точно, ако се вземе под внимание **влиянието на „сивите" икономики.**

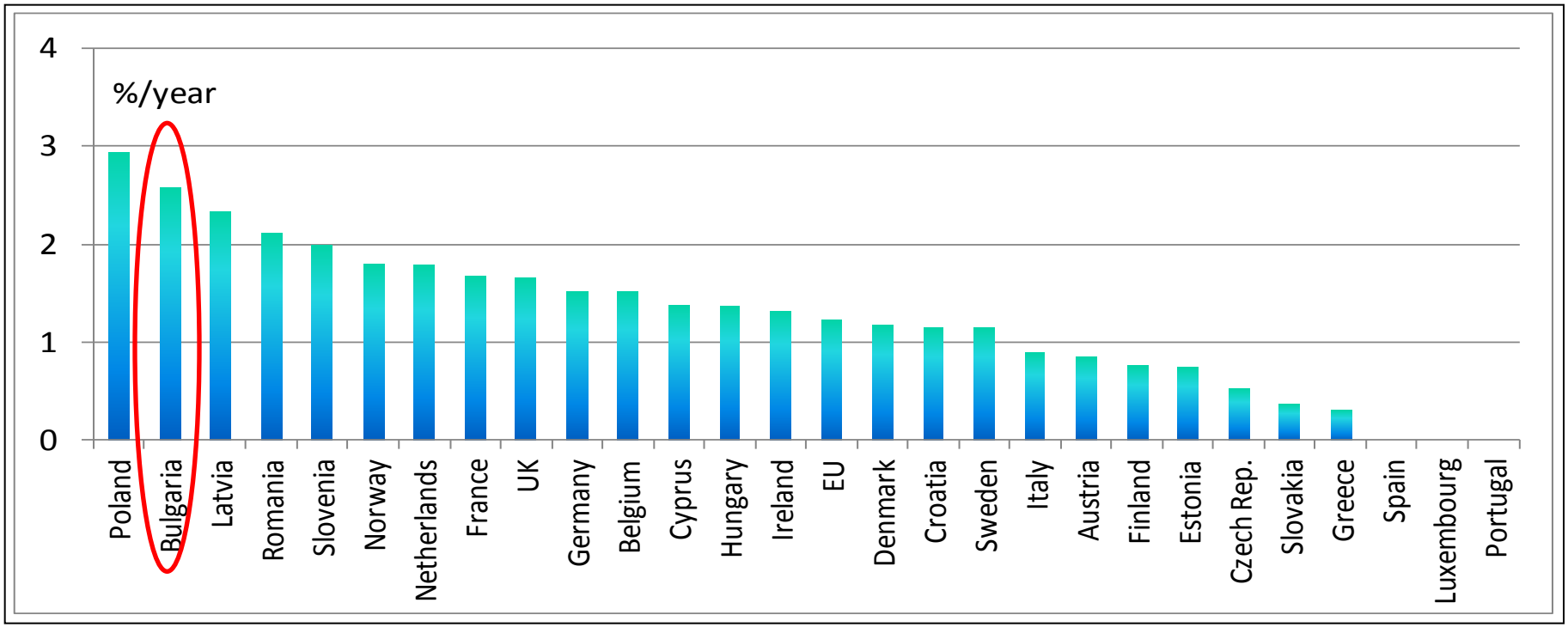
Действителна оценка на ЕЕ на Българската икономика

ЕНЕРГИЙНА ЕФЕКТИВНОСТ (2010)

- Първична енергийна интензивност: **65 %** по-висока от ЕС 27
- Крайна енергийна интензивност: **35 %** по-висока от ЕС 27.

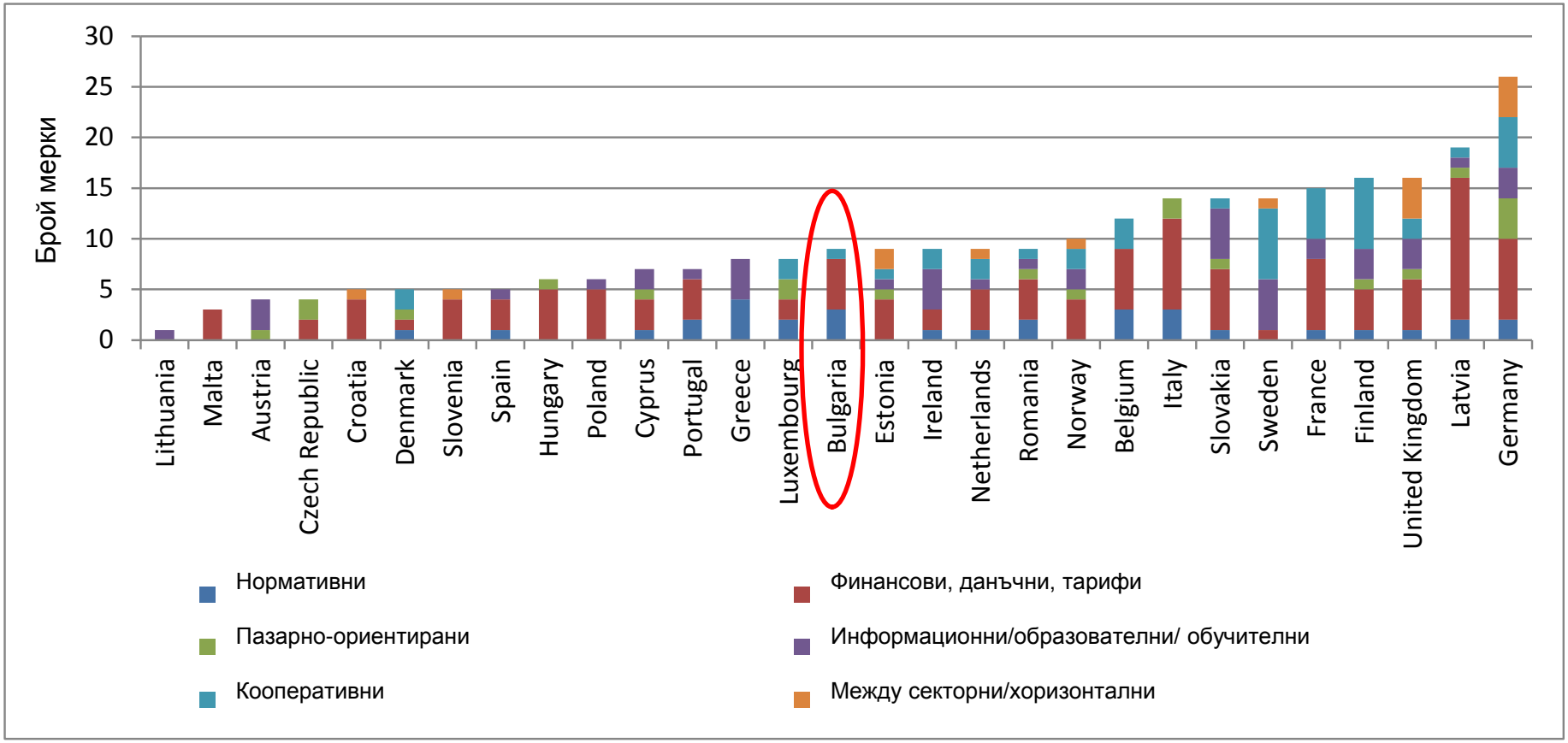
- Независимо, че нашата икономка е енергийно интензивна, **потенциалът за енергийни спестявания е по-малък от общоприетия**.
- По-лошият индикатор за първичната енергийна интензивност е следствие от голям дял на електроенергията в крайното потребление.
- Конкурентоспособността на нашата икономика силно зависи от цените на енергията. Ако цените на енергията се повишават по-бързо от подобряването на ЕЕ, **конкурентоспособността ще се влоши.**

Подобряване на енергийната ефективност при крайните енергийни потребители (2000-2010)



- България е **сред държавите с най-бързо подобряване** на ЕЕ (около 2.5 %/год.)
- При приетата национална цел около 1 %/годишно ,
  съществува значителен допълнителен резерв .

Действащи мерки по ЕЕ по видове и по държави



България има сравнително добре развита нормативна база в областта на енергийната ефективност, но
изостава във въвеждането на пазарно ориентирани мерки.

Нормативна база по ЕЕ на ЕС

ЕВРОПЕЙСКО ЗАКОНОДАТЕЛСТВО

- Директива 92/75/ЕС за енергийно етикетиране на домакинските електроуреди
- Директива 2004/91/ЕС за стимулиране на комбинираното производство
- Директива 2005/32/ЕС за еко-дизайн
- Директива 2006/32/ЕС за ЕЕ при КЕП и ЕУ
  Въведена в ЗЕЕ през 2008 година. Очаква се нова директива до края на 2012.
  Акцент върху търговците на енергия: 1,5 % годишно енергийни спестявания
  Акцент върху санирането на обществените сгради: 3 % годишно
- Директива 2002/91/ЕС за енергийните характеристики на сградите
  Въведена в ЗЕЕ от 2005 година.
- Директива 2010/31/ЕС за енергийните характеристики на сградите
  Подсилена версия на 2002/91. Въвежда се в момента чрез ЗИД ЗЕЕ.

Нормативната среда е много динамична и изисква
ускорени процедури за въвеждане.

Енергийната ефективност по сектори: 1-ви пример
Услугите: “малкият” потребител с растящите разходи

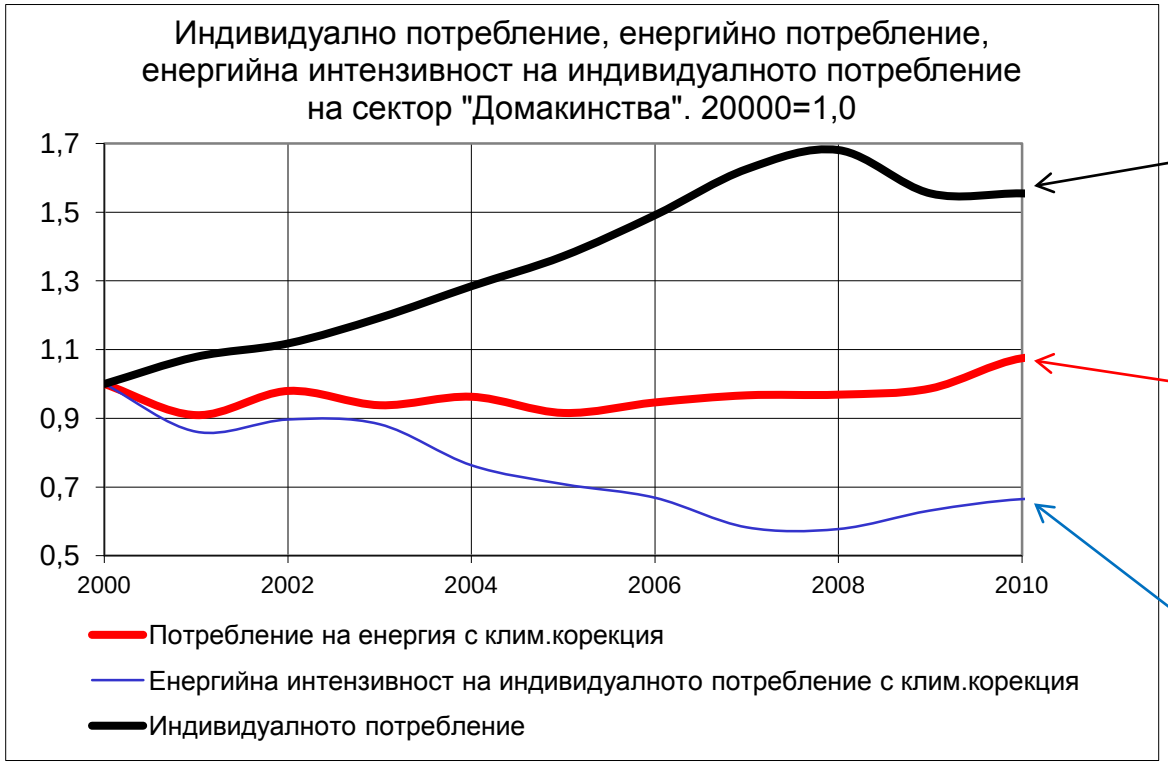
Потреблението на енергия в услугите нараства

Добавената стойност на услугите остава постоянна.

Енергийната интензивност нараства, предизвикана от нарастващото потребление на електроенергия.

- Независимо от подобряването на енергийните характеристики на обществените сгради, **очакванията за намаляване на енергийното потребление не се сбъдват.**
- Голяма част от изпълнените мерки не водят до действително спестяване на енергия, а само до **увеличаване на енергийния комфорт** на обитателите им.

Енергийната ефективност по сектори: 2-ри пример
Домакинствата: "големият" потребител в сянка



След 2008, в условията икономическа криза, индивидуалното потребление намалява.

Енергийното потребление на домакинствата е почти постоянно, но през 2010 започва да нараства.

Независимо, че след 2008 индивидуалното потребление не се увеличава, енергийната интензивност на домакинствата започва да нараства.

- Ефектите от санирането на жилищата и модернизирането на домакинските уреди се използват за **запазване на постигнатия енергиен комфорт.**
- За да не намалят енергийното си потребление, **домакинствата ограничават други си разходи.**
- Българските домакинства консумират около два пъти по-малко енергия от средното за ЕС. Ако цените на енергията се повишават по-бързо от подобряването на ЕЕ, **жизнения стандарт на домакинствата ще се влоши.**

ОБОБЩЕНИЕ: близки предизвикателства

- **Потенциалът за спестяване на енергия в България не е толкова голям,** колкото са популярните оценки.

- Изпълнението на политиката по ЕЕ е ключов елемент за социално (устойчиво) развитие. В условията на изоставане на доходите **подобряването на ЕЕ на домакинствата е единствения начин да се запази достигнатия енергиен комфорт.**

- Ускореното изпълнение на мерки по ЕЕ в сгради е **тест за способността на обществото да върви към устойчиво развитие.**

- Нараства **ролята на информираността и мотивацията.**

- Привличането на допълнителни инвестиции в ЕЕ изисква **въвеждане на пазарни стимули и нови участници** на пазара за ЕЕ – услуги.

БЛАГОДАРЯ ЗА ВНИМАНИЕТО !

Красимир Найденов
Телефон: +359 2 915 40 25
Факс: +359 2 915 40 19
E-mail: KNaydenov@seea.government.bg
Web: www.seea.government.bg

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Energy Efficiency and its role in the German „Energiewende“

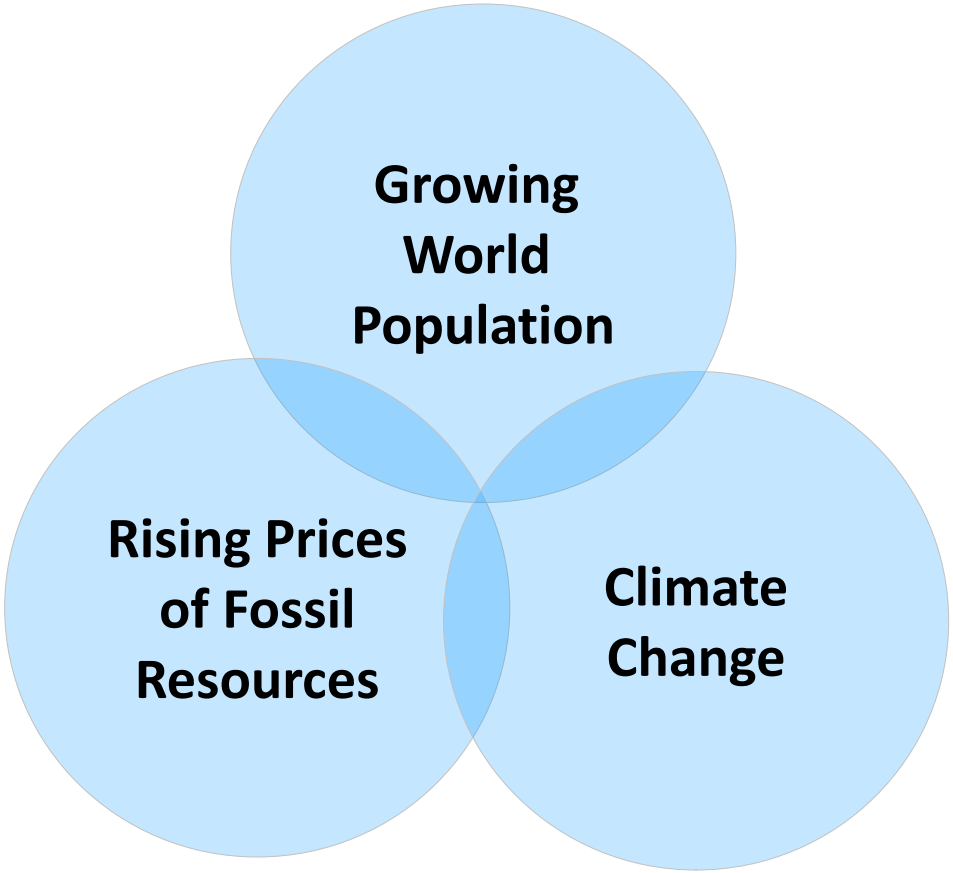
Miriam Ott
Federal Ministry for the Environment, Nature Conservation and Nuclear Security

Division E III 5
Cooperation with Central and Eastern European Countries and New Independent States

Investing in Energy Efficiency – 14 November 2012

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Energy Policy Challenges: Global Megatrends



- **Challenge:**
  securing a sustainable, i.e. secure, affordable and environmentally friendly energy supply for a growing population

- **Solutions:**
  energy efficiency, renewable energy sources, green economy

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Rationale of German Climate and Energy Policy

- **Energy Concept** of 28 September 2010:
  Defining our Climate and Energy policy for beyond 2020
  - fundamental transformation of German energy supply
  - nuclear power as bridging technology

- **After Fukushima** – re-evaluation of the role of nuclear power, accelerated decommissioning of nuclear power plants

- **Decisions of 6 June 2011:**
  - **Phasing-out** of nuclear energy by 2022
  - **Accelerating** transformation of energy system, comprehensive legislative package

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German Climate and Energy Policy
Targets and Timetables

		2020	2030	2040	2050
Climate	Greenhouse gases (vs. 1990)	- 40%	- 55%	- 70%	- 80 to - 95%
Renewable energies	Share of electricity	35%	50%	65%	80%
	Overall share (Gross final energy consumption)	18%	30%	45%	60%
Efficiency	Primary energy consumption	- 20%	● ● ● ● ● ● ● ● ● ● ● ● ● ▶		- 50%
	Electricity consumption	- 10%			- 25%
	Energy consumption in buildings	20% heat demand			80% primary energy

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German Climate and Energy Policy
German Energy Concept

100 specific measures in three areas

1. Renewable energies:

- swift and continuous expansion
- cost-effective and market integration

2. Energy efficiency:

- reducing energy consumption
- ensure efficiency

3. Grid infrastructure:

- expansion and modernisation
- integration of RE

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At the EU level …

Europe 2020 strategy:

- effiency is one of the core targets
- but: currently EU will miss energy efficiency target by half

→ EU Energy Efficiency Directive

- approved by Council on 4th October 2012
- Still only expected to yield energy efficiency improvements of 15 – 17% compared to the baseline

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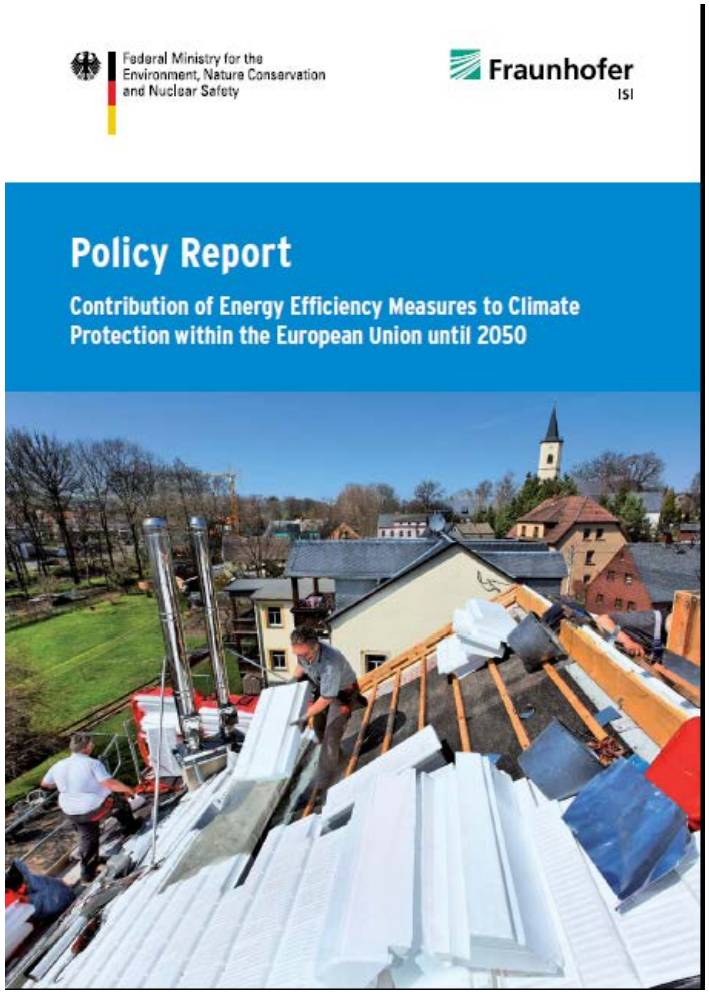
At the EU level:

tapping all economically viable energy efficiency measures until 2050 could …



- Save the equivalent of 11 x Poland‘s final energy demand from the year 2008
- Decrease the annual energy costs for each European citizen in 2050 by 1,000 €
- Reduce the EU‘s energy imports by 118 percent
- Decrease GHG emissions by 79 percent below the level of 1990

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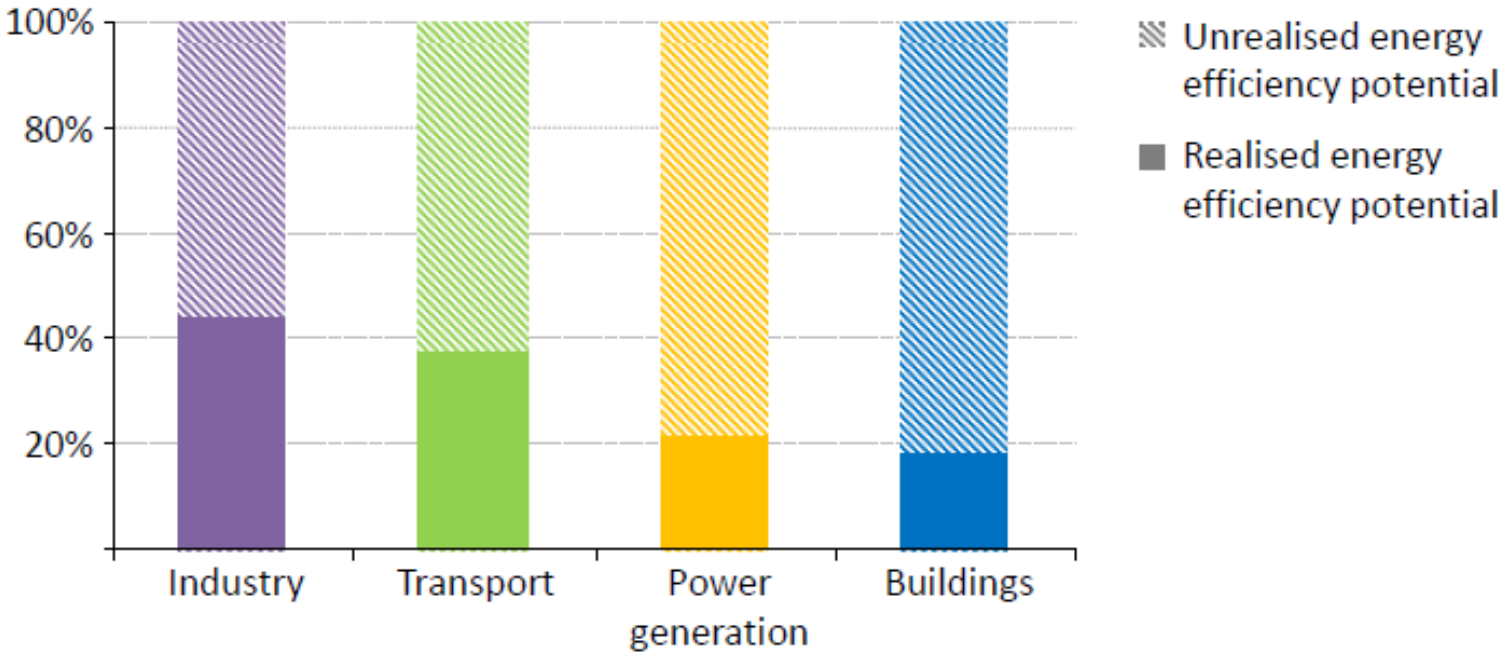
At the global level: A huge opportunity going unrealized

Energy efficiency potential used by sector in the New Policies Scenario



Two-thirds of the economic potential to improve energy efficiency remains untapped in the period to 2035

WORLD ENERGY OUTLOOK 2012

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The role of the state

Implementing a balanced an efficient mix of instruments

- **Legislation, regulations and ordinances … to establish the regulatory framework**
  - Energy Savings Ordinance, Energy Consumption Labelling Ordinance, Energy certificates for buildings, …
- **Economic instruments … to create financial incentives**
  - Emission Trading, …
- **Funding Programmes … to facilitate upfront investment**
  - Energy Efficiency Fund, KfW Efficient Renovation Programme, Law on Cogeneration, …
- **Information and advice … to lower information costs**
  - Information, Consultation, Labeling, Energy Efficiency Campaign, ECO Management and Audit Scheme (EMAS), …

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National funding programms

National funding programme	Eligibility	Funding volume 2012***
CO_2 Building Modernisation Programme	Energy upgrading of buildings; construction of energy-efficient buildings.	€1.5 billion*
Market Incentive Programme for Renewable Energies (MAP)	Investments in heat generation from renewable energies for homeowners and businesses.	€350 million
National Climate Initiative	Municipal climate projects; projects for industry, consumers and the education sector.	€168 million
Energy efficiency funding measures, Energy Efficiency Fund	Energy advice for consumers and businesses; investments in electricity saving.	€180 million
Research funding: renewable energies and energy efficiency	Research and development in the renewable energies and energy efficiency sectors.	€528 million**
Research funding and market introduction of renewable resources	Research, development and market introduction in the bioenergy and renewable resources sector.	€65 million
Electromobility	Research, development and demonstration of electromobility.	€323 million
Total		€3.114 billion

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Contributions of sectors

- efficient power generation→ primary energy
- efficient consumption → final energy
  - Buildings, Households
  - Industry
  - SMEs
  - Cities/Communities
  - etc.

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Efficient Buildings

- 40% of end-energy demand comes from the building sector.
- Targets (Energy Concept)
  - **-20% in 2020**
  - **-80% in 2050**

Source: BMU

→ refurbishment rate must rise from 1% to 2% per year

→ very low energy standard (“Climate neutral”) for new houses from 2020 (latest) (EPBD)

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Efficient Buildings

Standards for new buildings

→ Energy Saving Ordinance "EnEV"

Subsidies

- (1.5 bn €/a 2012 - 2014) for refurbishing buildings (better insulation, more efficient heating) → Program: Energy Efficient Renovation (KfW)
- low interest rates and grants for energy efficient new buildings above standard (Program KfW 40, 55, 70)

Energy "passport" for buildings provides information on energy demand for prospective buyer or tenant.

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Efficient Power Consumption in Households

- Information / Labeling (EU)
- Audits and consultation on energy saving in low income households (Climate Initiative):
  - Training for unemployed people, who then provide basic on the spot advice to low income households.
  - 2008 – 2012: installation of ca. 800.000 energy efficiency appliances in 70.000 households
  - average savings of 395 kWh electricity r energy and water costs per year

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„Mindful also of its responsibility towards future generations, the state shall protect the natural foundations of life …“

Basic Law for the Federal Republic of Germany, Article 20a

Further information: www.bmu.de

Miriam.Ott@bmu.bund.de

Sofia, November 2012

Moving towards nearly Zero-Energy Buildings in Bulgaria

Oliver Rapf
Buildings Performance Institute Europe
Oliver.Rapf@bpie.eu

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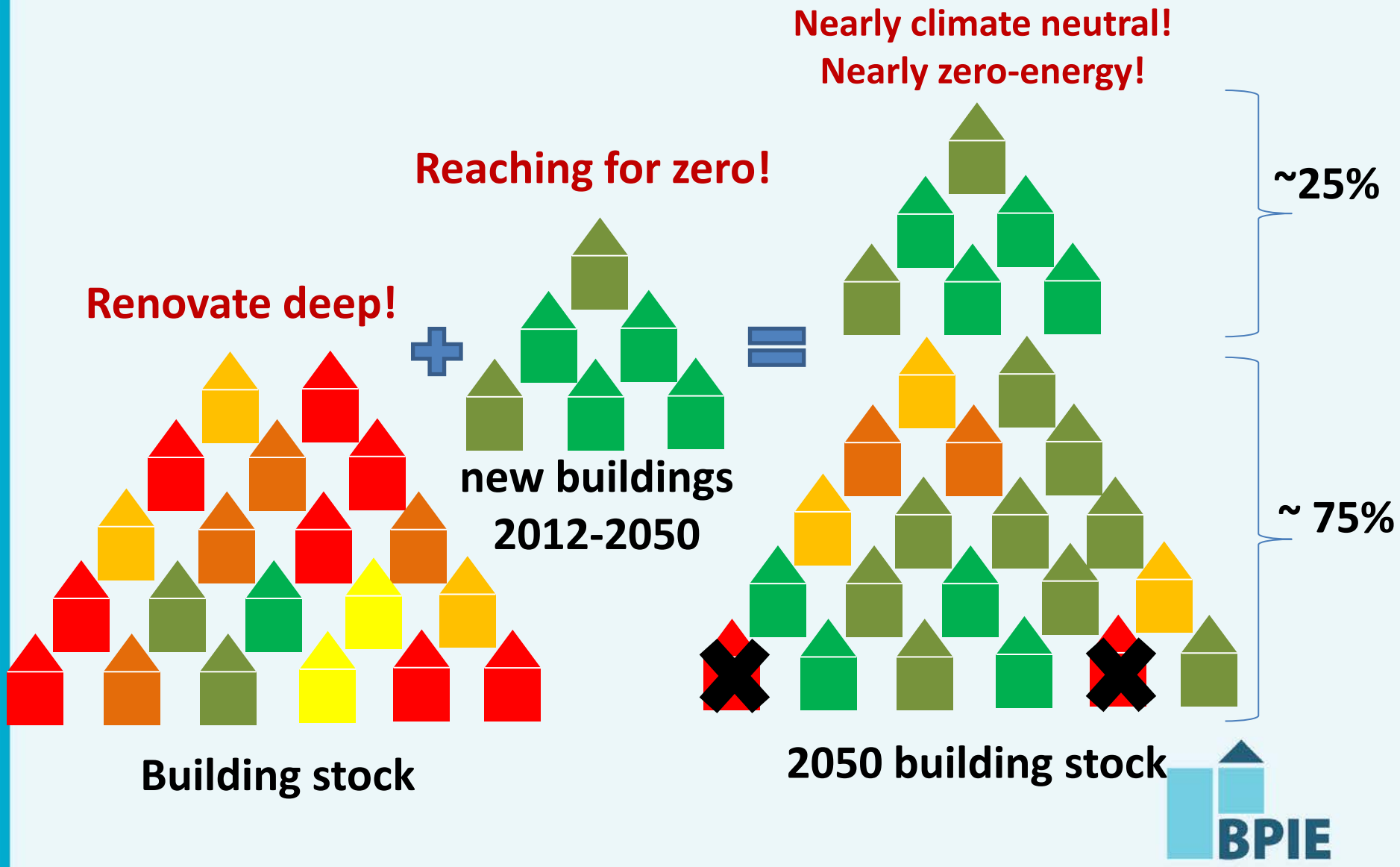
EU buildings by 2050: one aim, two big challenges!



nZEB: One EU requirement, 27 (28) national implementation rules

'nearly zero-energy building' […] has a **very high energy performance**. The **nearly zero or very low amount of energy required (for HVAC, DHW, aux. equip. and lighting)** should be covered to **a very significant extent by energy from renewable sources, including on-site or nearby RES.** (EPBD)

recast EPBD: Nearly Zero-Energy Buildings

- by 31 December 2020, all new buildings
- after 31 December 2018, new buildings occupied and owned by public authorities

- National definition for nZEB
- National plans for nZEB (including public buildings retrofit towards nZEB levels)
- Support measures & overcoming barriers

RES Directive Article 13.4: By 31 December 2014 the EU MSs have to introduce in building codes minimum requirements for RES for new buildings and renovation

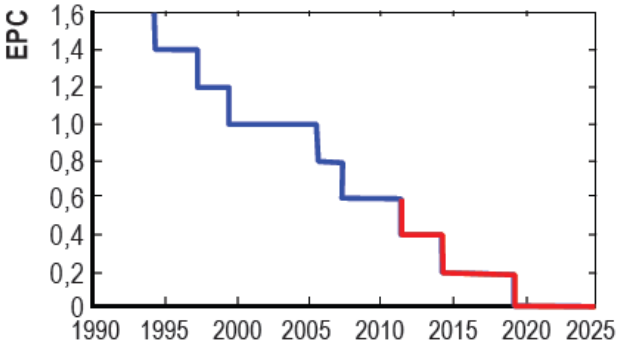
Recommendation for nZEB ‘golden’ principles

From BPIE (2011) study on ‘Principles for nearly Zero-Energy Buildings’ (www.bpie.eu)

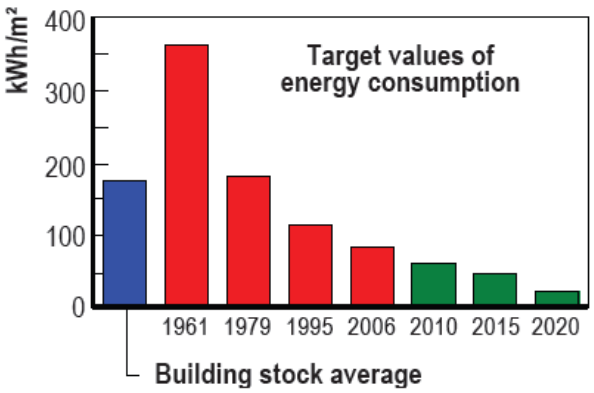
Set clear boundaries in the building’s operational energy flow	Set thresholds:
Energy need	
…that defines the energy quality of the energy need	**…for the maximum allowable energy need** (*proposal: fix threshold in a corridor between C-O and BAT*)
Renewable energy share	
…where the share of renewable energy is calculated or measured	**… for the minimum share of renewables demand** *(proposal: 50%<>90%)*
Primary energy & CO2 emissions	
… where the overarching primary energy need and CO2 emissions are calculated	**… for the overarching primary energy demand and CO2 emissions** *(proposal: <3kgCO2/m2/yr)*

Some guys already started: Roadmap towards nZEB

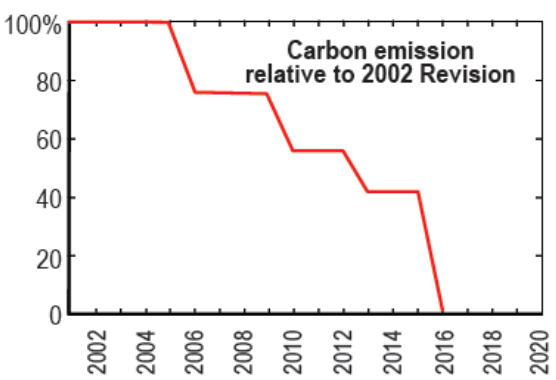
The Netherlands



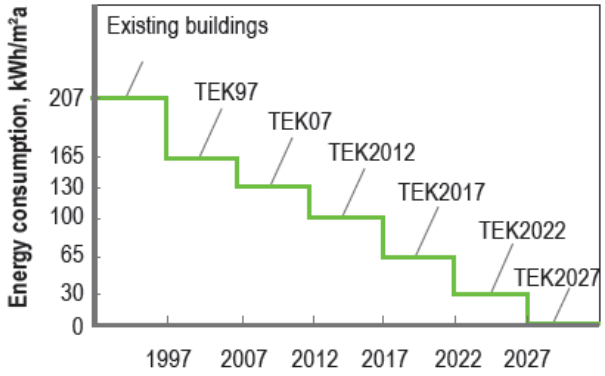
Denmark



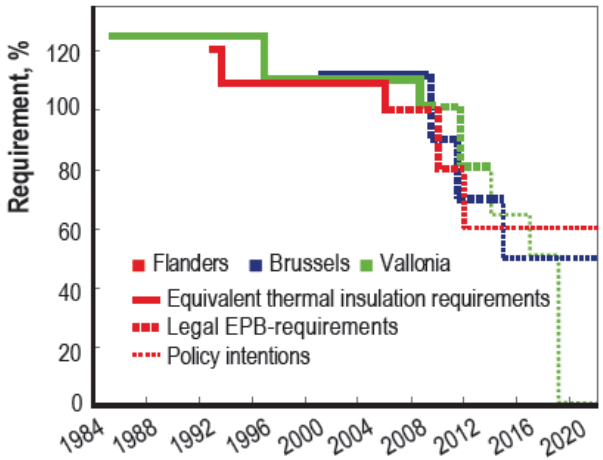
United Kingdom



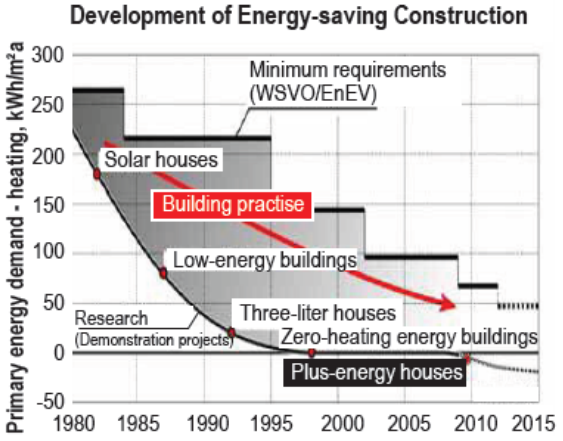
Norway



Belgium



Germany



Source: REHVA

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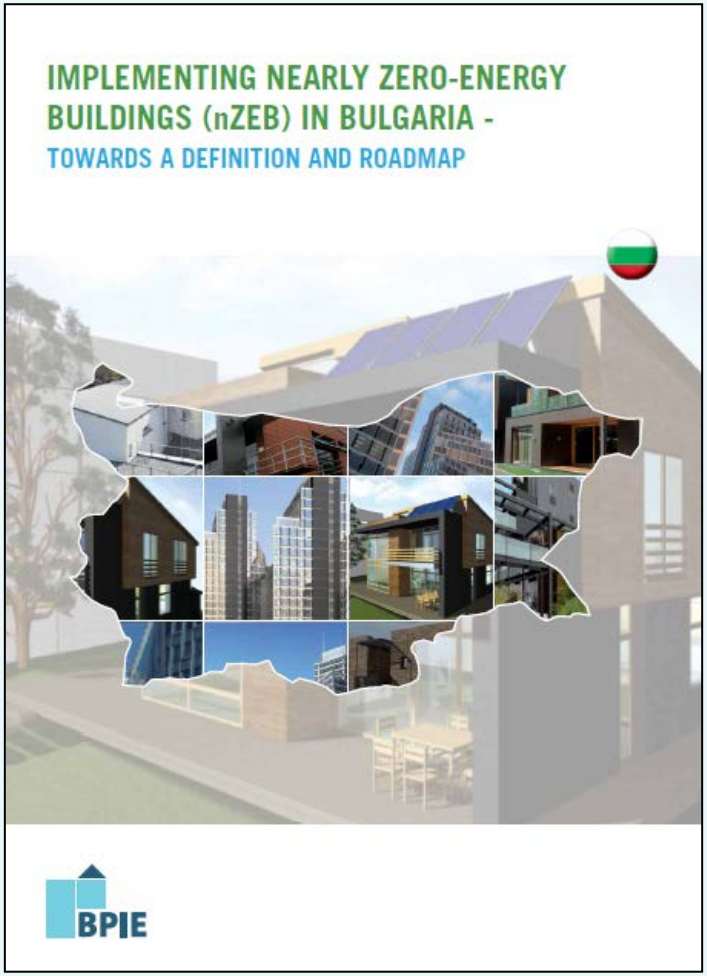
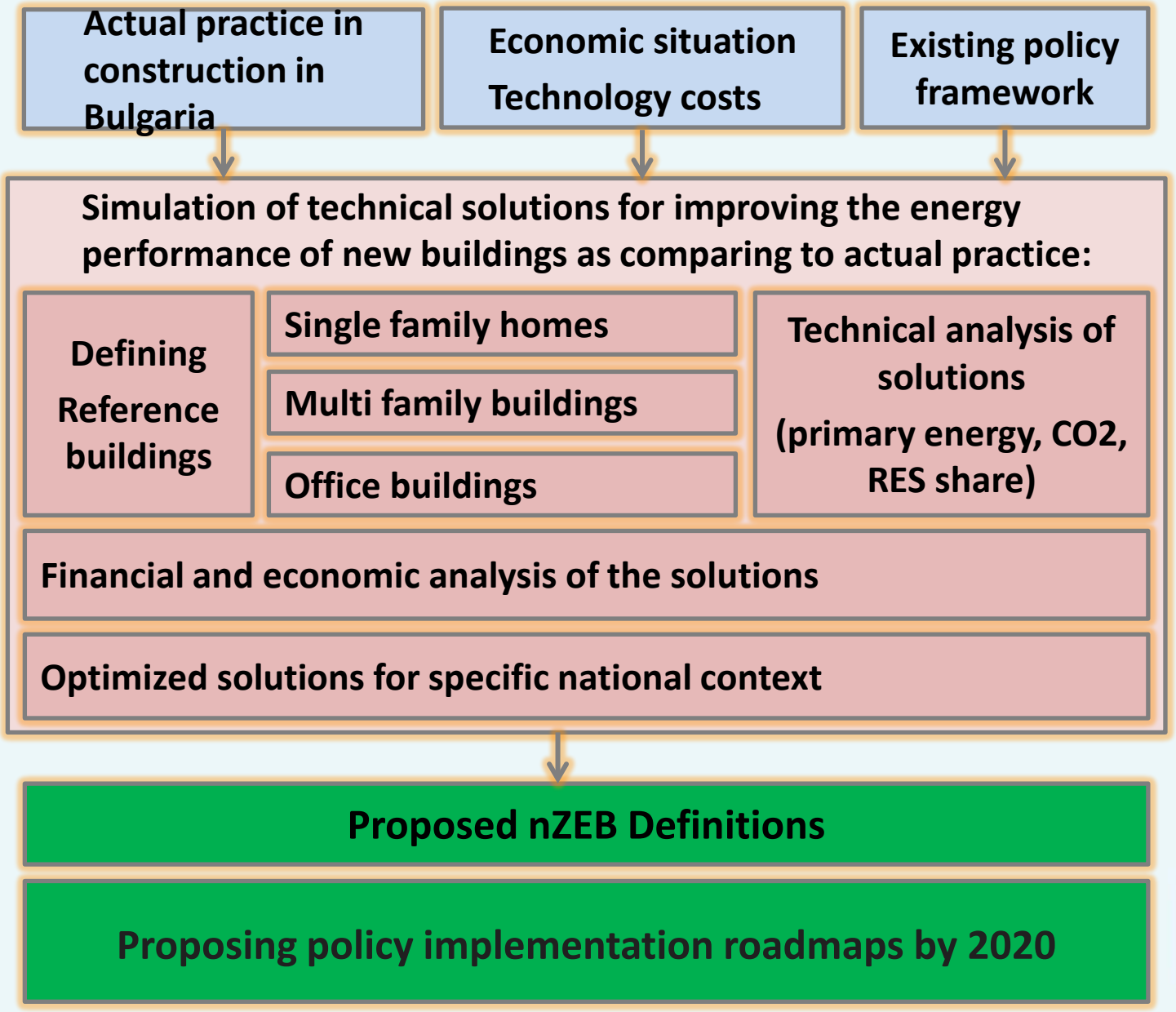
BPIE study for nZEB definitions and implementation roadmap in Bulgaria



Authors:
BPIE, Ecofys Germany, EnEffect Bulgaria

Soon available at: www.bpie.eu

Structure of the study and methodological approach



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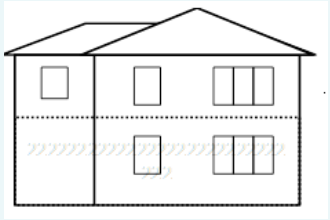
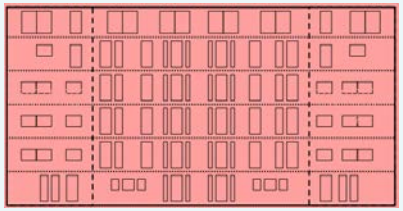
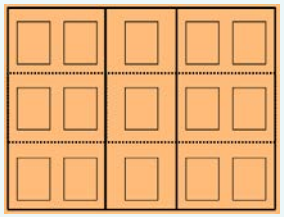
Reference buildings for new constructions in Bulgaria







Characteristics	Reference SFH	Reference MFH	Reference Office
Number of conditioned floors	2	6	3
Net floor area	127 m²	2870 m²	886 m²
Room height	2.65 m	2.73 m	3.00 m
U-walls	0.34 W/(m²K)	0.64 W/(m²K)	0.46 W/(m²K)
U-roof	0.27 W/(m²K)	0.30 W/(m²K)	0.32 W/(m²K)
U-floor	0.55 W/(m²K)	0.55 W/(m²K)	0.46 W/(m²K)
U-windows, frame fraction	1.70 W/(m²K); 21%	1.70 W/(m²K), 15%	1.70 W/(m²K), 15%
Window fraction (window/wall-ratio)	13% (only 5% on N & W facades)	23%	50%
Shading	None	None	Internal blinds, manual control
Heating system	Wood boiler (set point: 20°C) Heating efficiency: 0.82	District Heating (set point: 20°C) Heating efficiency: 0.99	Heat pump, fan coils (set point: 20°C) Heating efficiency: 3.3
DHW system	Combination of wood boiler and electric heater. DHW efficiency: 0.93 (40% Wood = 0.82, 60% electric heater = 1.00)	Same as for heating DHW efficiency: 0.99	Decentralised direct electric
Ventilation system	Natural/window ventilation (0.35 1/h)	Natural/window ventilation (0.5 1/h)	Mechanical ventilation 70% heat recovery
Cooling system	Split system (set point: 26°C) SEER: 3.2	None	Compression chillers, fan coils (set point: 24°C) SEER: 3.3
Internal gains	13.5 W/m²	20 W/m²	30 W/m²

Simulated nZEB variants and heating solutions

	Reference SFH	Reference MFH	Reference Office
V0	Reference	Reference	Reference
V1	Improved building shell	Improved building shell	Improved building shell + external shading
V2	Improved building shell + solar collectors	Mech. ventilation with heat recovery	Improved building shell + external shading + improved lighting
V3	Improved building shell + mech. ventilation with heat recovery	Improved building shell + mech. ventilation with heat recovery	Improved building shell + external shading + improved lighting + improved windows + improved heat recovery
V4	Nearly passive house standard	Improved building shell + mech. ventilation with heat recovery + solar collectors	

A	Air source heat pump	Air source heat pump	Central air/water heat pump
B	Ground collector brine heat pump	Ground collector brine heat pump	Central brine/water heat pump
C	Wood pellet boiler	Wood pellet boiler	Central wood pellet boiler
D	Gas condensing boiler	Gas condensing boiler	Central gas condensing boiler
E		District Heating	District heating

Additionally: with and without CO_2 compensation (by a rooftop PV system)

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Selected nZEB optimal solutions

	nZEB solution	Brief Description	Heating system	Additional annualised costs (Base year 2010) [€/m²yr]	Additional annualised costs comparing with average reference actual price [%]
SFH	V1A	Improved building shell	Air heat pump	**-7.73**	**-14.7%**
	V3B	Improved building shell + mech. ventilation with heat recovery	Brine heat pump	**-3.20**	**-6.1%**
	V3C		Bio Pellet	**-2.26**	**-4.4%**
MFH	V1C	Improved building shell	Bio Pellet	**0.53**	**1.15%**
	V3B	Improved building shell + mech. ventilation with heat recovery	Brine heat pump	**2.21**	**4.8%**
	V4C	Improved building shell + mech. ventilation with heat recovery + solar collectors	Bio Pellet	**2.01**	**4.4%**
Office	V2A	Improved building shell + external shading + improved lighting	Air heat pump	**4.24**	**12.15%**
	V2C		Bio Pellet	**9.47**	**27%**
	V3B	Improved building shell + external shading + improved lighting + improved windows + improved heat recovery	Brine heat pump	**9.22**	**26.3%**

Assumed present costs on the market: SFH: 450 Euro/m², MFH: 363 Euro/m² , Office: 275 Euro/m²
Assumed interest rate: 7.5%

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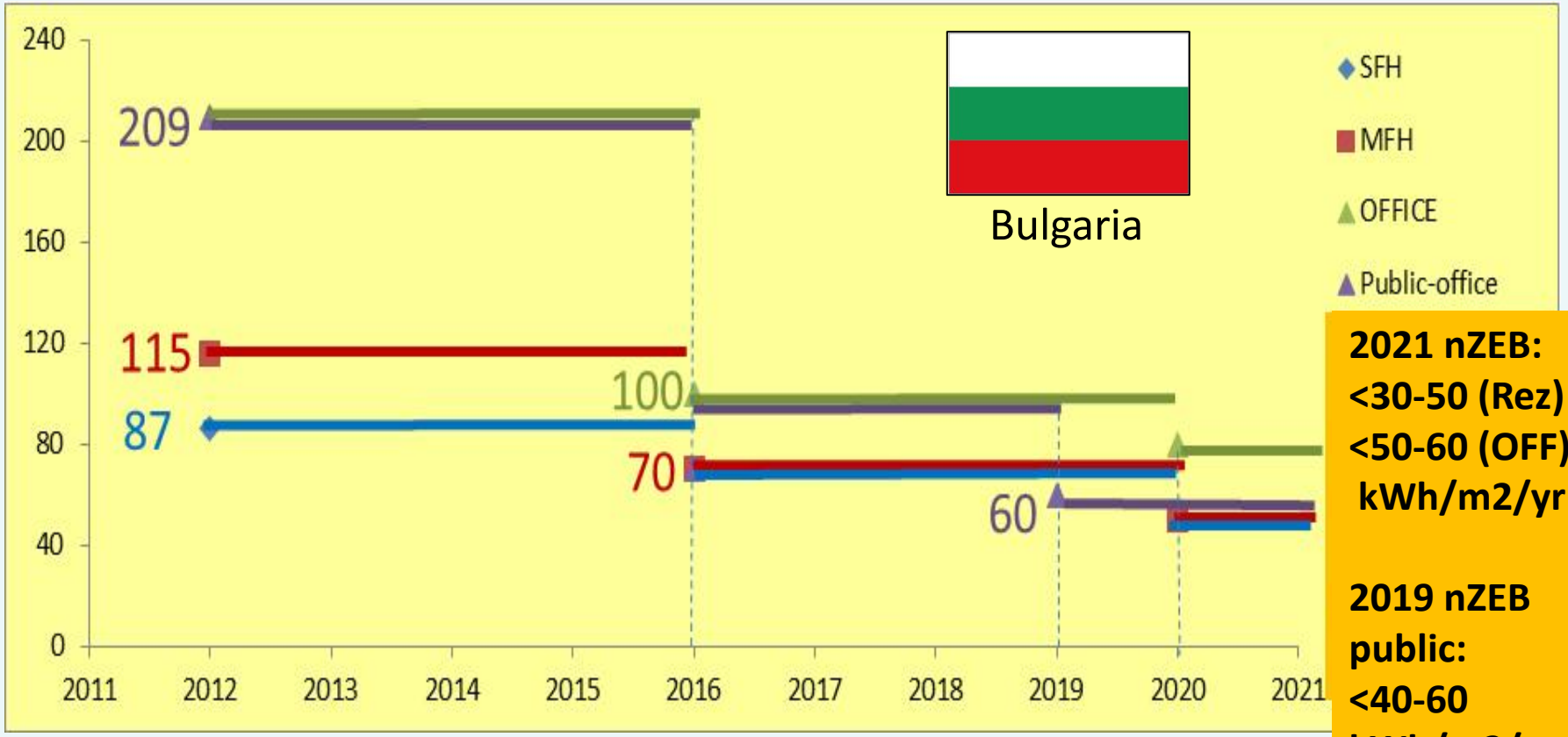
Proposed nZEB definitions - primary energy need (EPBD scope)



2021 nZEB:
<30-50 (Rez)
<50-60 (OFF)
kWh/m2/yr

2019 nZEB public:
<40-60 kWh/m2/yr

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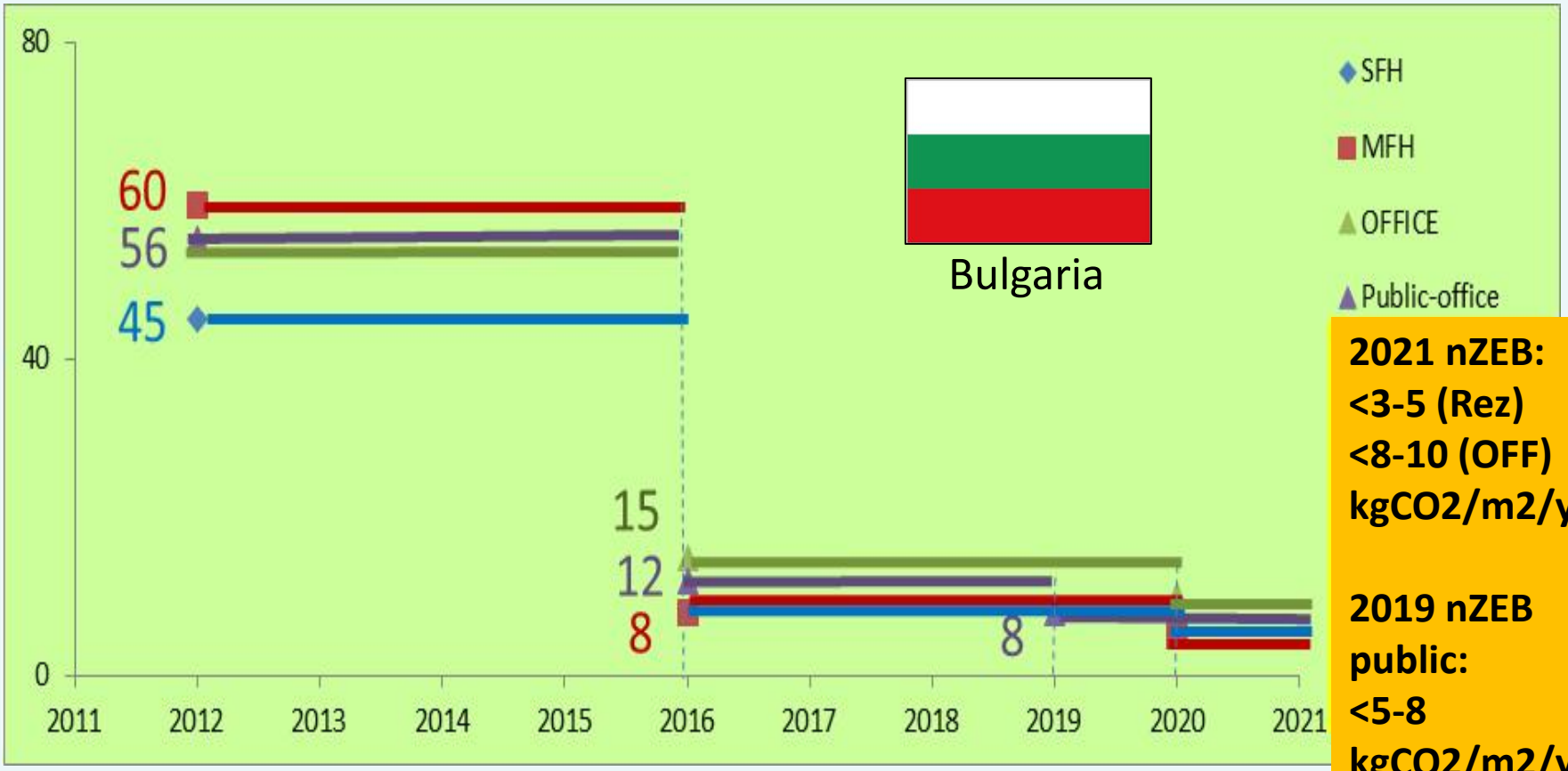
Proposed nZEB definitions - CO2 emissions in primary energy



2021 nZEB:
<3-5 (Rez)
<8-10 (OFF)
kgCO2/m2/yr

2019 nZEB public:
<5-8
kgCO2/m2/yr

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Proposed nZEB definitions – Renewable energy share [%]

	2015/ 2016	2019	2020/ 2021
Single Family Buildings	>20		>40
Multi Family Buildings	>20		>40
Office Buildings	>20		>40
Public Office Buildings	>20	>50	

RES share may be adjusted at regional level, according to the local potential.

Estimated macro-economic benefits between 2020-2050

Indicator	Effect
CO_2 emissions savings in 2050	4.7-5.3 Mio t CO2
Cumulative energy savings in 2050	15.3 -17 TWh
Additional annual investments	38 - 69 Mio Euro
Additional new jobs	649 - 1180 Full time employees

Example: simulation results for single family home

	Final specific demand [kWh/m²/yr]	Without CO_2 compensation				With CO_2 compensation (by additional PV)			
		Primary energy demand [kWh/m2/yr]	CO_2 emissions [kgCO_2/m²/yr]	Renewable share [%]	Total additional annualised costs [Euro/m2/yr]	Primary energy demand [kWh/m2/yr]	CO_2 emissions [kgCO_2/m2/yr]	Renewable share [%]	Total additional annualised costs [Euro/m2/yr]
V0-Reference	169.9	86.4	45.1	90%	0	n.a	n.a.	n.a.	0
V1 - Air heat pump	25.5	51.1	6.4	35%	-11.23	0	0	135%	-7.73
V1 - Brine heat pump	21.2	42.5	5.4	35%	-6.37	0	0	135%	-3.46
V1 - Bioboiler	91	21.9	0.5	99%	-4.28	11.6	0	104%	-3.57
V1 - Gas boiler	91	102	18.5	1%	-5.58	36.4	10.2	37%	-1.07
V2 - Air heat pump	19.4	39	4.9	35%	-9.78	0	0	135%	-7.11
V2 - Brine heat pump	15	29.9	3.8	35%	-4.95	0	0	135%	-2.9
V2 - Bioboiler	71	16.6	0.3	99%	-3.93	6.3	0	106%	-3.22
V2 - Gas boiler	71	79.4	14.4	1%	-5.23	26.1	7.7	38%	-1.57
V3 - Air heat pump	20.8	41.8	5.3	35%	-8.78	0	0	135%	-5.92
V3 - Brine heat pump	18.1	36.4	4.6	35%	-5.69	0	0	135%	-3.2
V3 - Bioboiler	72.1	18.8	0.6	98%	-2.96	8.5	0	105%	-2.26
V3 - Gas boiler	72.1	81.6	14.7	1%	-4.27	15.9	6.4	47%	0.23
V4 - Air heat pump	15.6	31	3.9	35%	-7.12	0	0	135%	-4.99
V4 - Brine heat pump	13.5	27.1	3.4	35%	-4.85	0	0	135%	-2.99
V4 - Bioboiler	49.4	13.2	0.5	98%	-2.75	2.9	0	108%	-2.04
V4 - Gas boiler	49.4	55.9	10.1	1%	-3.51	-9.7	1.8	68%	1
	<40	<40	<4	>50	<5	<40	<4	>50	<5
	40<x<60	40<x< 70	4<x<7	30>x<50	5<x<10	40<x<70	4<x>7	30>x<50	5< x<10
	>60	>70	>7	<30	>10	>70	>7	<30	>10

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Proposed nZEB implementation roadmap by 2020

Policy process	• Strategies and planning, milestones, monitoring & evaluation, public consultation
Building codes	• Gradual improvement for meeting proposed targets
Energy certification	• Adjust for more visibility of nZEB. Better control & national database
Enforcement and compliance	• Stricter enforcement/compliance on energy performance of buildings
Reinforce existing /New Policies	• Light support schemes (especially for compensating the high upfront capital for RES) • Better integrate buildings and DH and community policies (minimise the costs) • Support development of supply chain industry (maximise economic benefits) • Stricter public procurement for buildings (public sector) • Remove market barriers
Capacity building	• Reinforce responsibilities. More and targeted info and advice points
Workforce skills	• Basic and long-life educational and training programs for workforce. Need for improving the actual practice in design and construction.
Information and awareness	• More info and guidance, • Support market champions promoting low-energy buildings
Demo projects	• nZEB demo-projects for all building types
Research	• Support research on new technologies and techniques

Thank you!

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