SUBREGION A

Andorra
Austria
Belgium
Denmark
Finland
France
Germany
Greece
Iceland
Ireland
Italy
Liechtenstein
Luxembourg
Monaco
Netherlands
Norway
Portugal
Spain
Sweden
Switzerland
United Kingdom

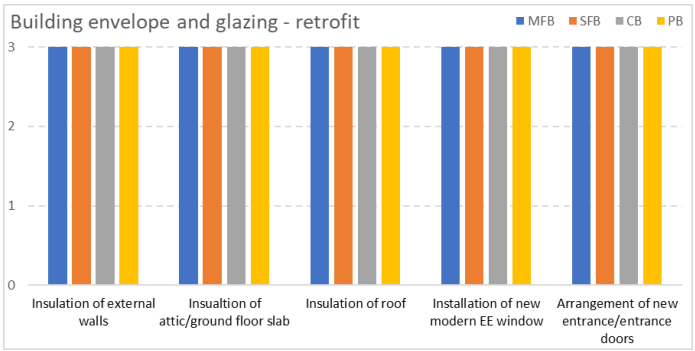
ANDORRA

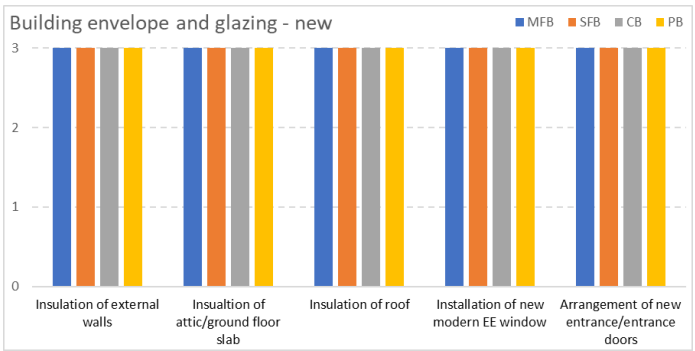
OVERVIEW

96% of energy consumed in Andorra is imported. Since 2010, several initiatives have been undertaken by the government to diversify its energy mix by adding renewable energy sources (hydro, solar, wind, and biomass). Small-scale renewable energy projects supporting the sustainable development of island communities are underway.

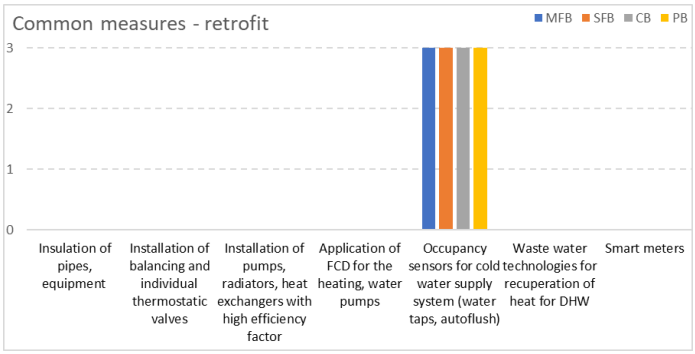
Public buildings account for the greatest energy demands in the Andorran economy. The Andorran government is promoting uptake of energy efficiency of buildings and renewable energy by way of project competitions. The number of projects in this area is growing every year. In particular, in 2015, the government received 196 proposals, 25.6% more than in 2014. The government of Andorra planned to spend about €500,000 to improve energy efficiency of school buildings in 2016.

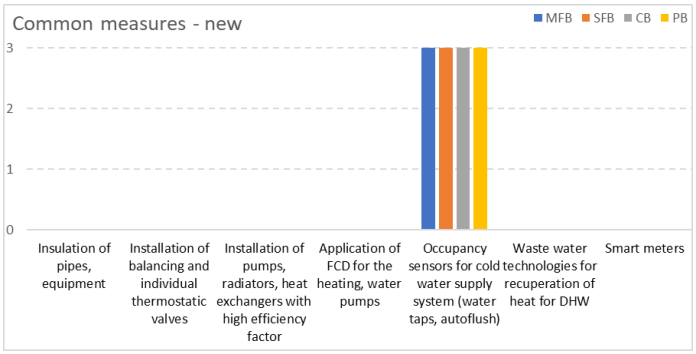
Among the highest priority projects is insulation of schools in the mountainous area. This project is given priority in order to reduce the annual space-heating diesel consumption of approximately 90,000 liters. The installation of thermostatic screens for better insulation is one of the technologies most promoted for school buildings to implement the plan. Renewable energy in buildings are encouraged as a design feature, and the government offers reduced rate tariffs for the use of solar energy. In all Andorran schools, regular audits and inspections are carried out in order to monitor the implementation of these projects.





	Andorra							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	0	0	0	0	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	3	3	3	3	3	3	3	3
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	0	0	0	0	0	0	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Common measures - retrofit
MFB
SFB
CB
PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters

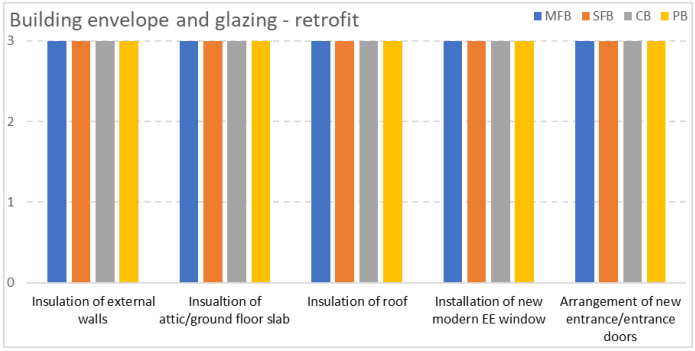

Common measures - new
MFB
SFB
CB
PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters

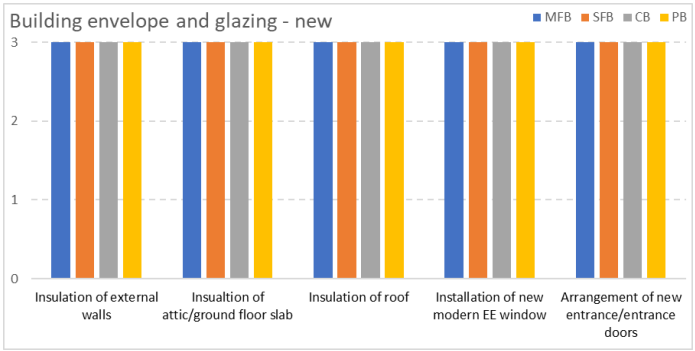
AUSTRIA

OVERVIEW

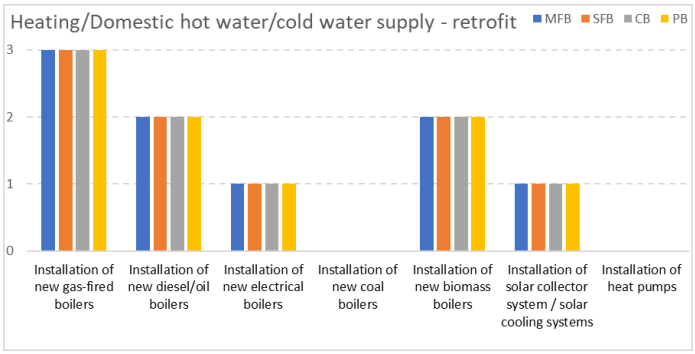
The Austrian government has undertaken considerable efforts to promote and implement energy efficiency trends in the buildings sector. Subsidies and mandatory standards are used to enable adaptation of appropriate technologies in both new construction and existing building retrofits. The share of energy consumption for end-use in households in 2016 demonstrates that space heating is the most important at 71%, but is on decline from previous years - mainly due to better insulation. The share of electric appliances is at 13%; while the efficiency of appliances has improved, total consumption has increased due to positive rebound. The shares of energy used for water heating and air cooling are approximately 12% and 0.1%, respectively. Promoting the Passivhaus energy efficient construction paradigm, with very low space heating demand and other certifications, has contributed to an increase in the number of buildings with reduced energy consumption.

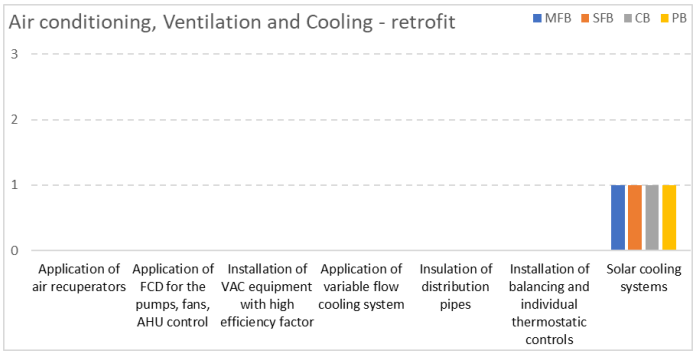
Renewable energy sources are actively promoted in the construction of new buildings and in renovations. In addition, increasing fossil fuel prices will give a market advantage to energy efficient buildings in the future. Subsidies for promoting adoption of high energy efficiency technologies in residential buildings are planned to be continued in the future. The federal and provincial governments are in agreement and collaborate on these topics.

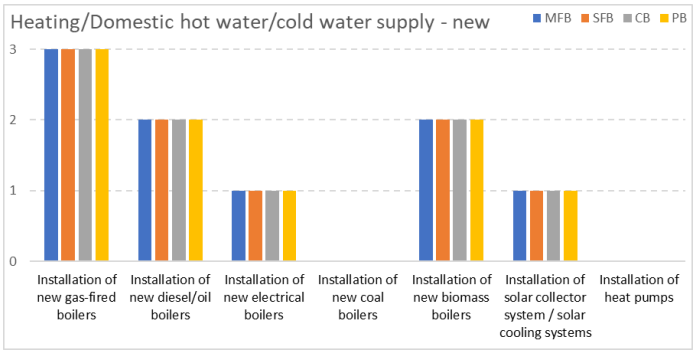


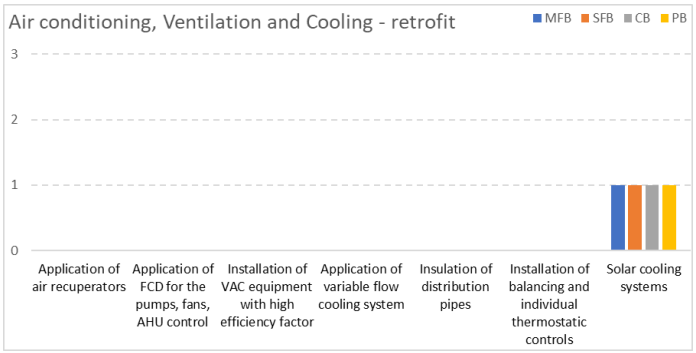


	Austria							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	2	2	2	2	2	2	2	2
Installation of new electrical boilers	1	1	1	1	1	1	1	1
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	2	2	2	2	2	2	2	2
Installation of solar collector system / solar cooling systems	1	1	1	1	1	1	1	1
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	2	2	2	2	2	2	2	2
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	1	1	1	1	1	1	1	1
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	1	1	1	1	1	1	1	1
3.4 Appliance								
EE appliance (labelling)	2	2	2	2	2	2	2	2
3.5 Lighting								
Installation of EE lamps (LED/CFL)	1	1	1	1	1	1	1	1
Occupancy/motion/ambient lighting sensors	0	0	1	2	0	0	2	2
Exterior lighting control	0	0	1	2	0	0	1	2
Application of "day light" solutions in architecture	0	0	1	2	0	0	2	2


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
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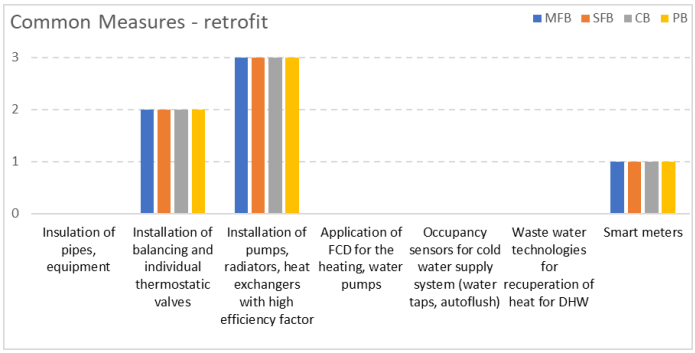
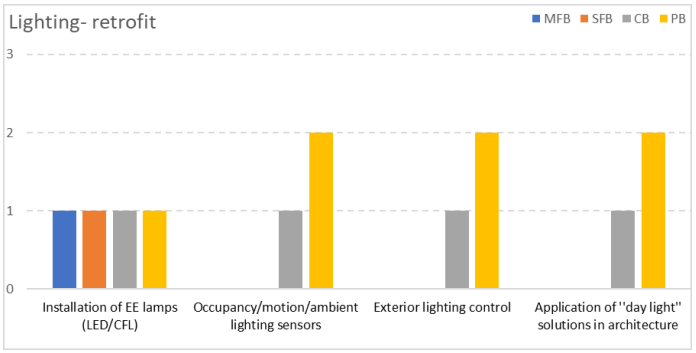
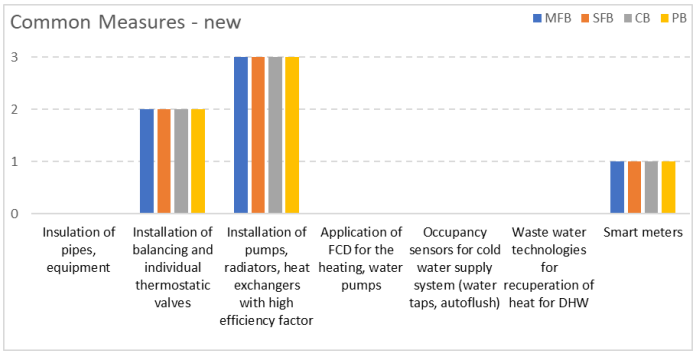
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common Measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common Measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
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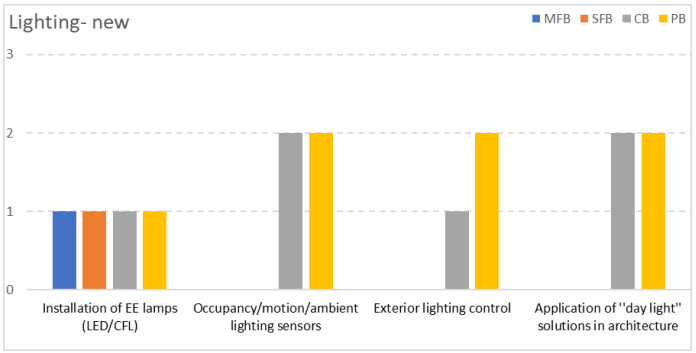
Smart meters

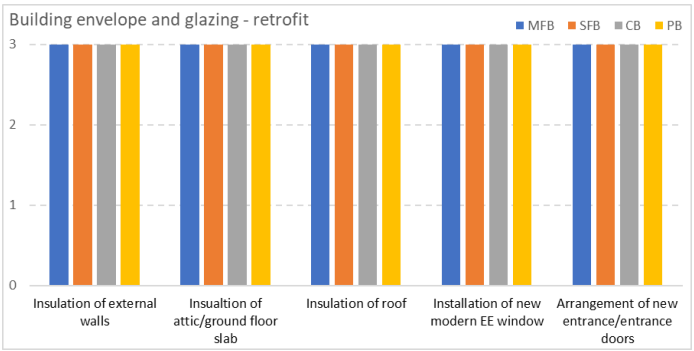

Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

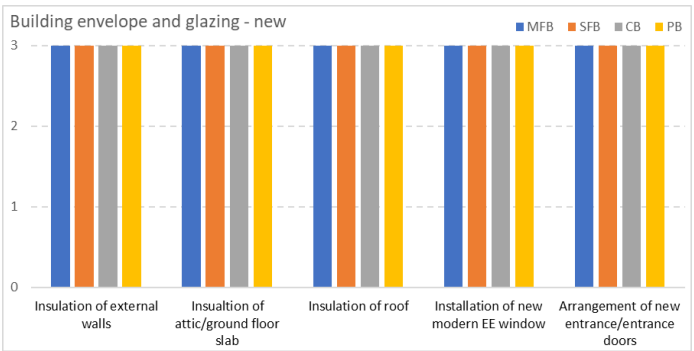
BELGIUM

OVERVIEW

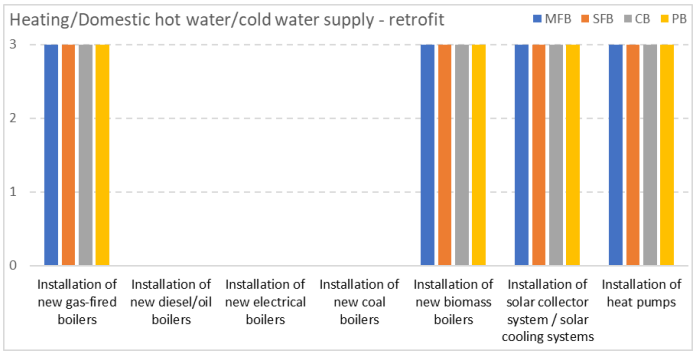
In Belgium, the responsibility for regulating energy consumption and efficiency is shared between the federal and three regional (Brussels, Flanders, Walloon) governments.

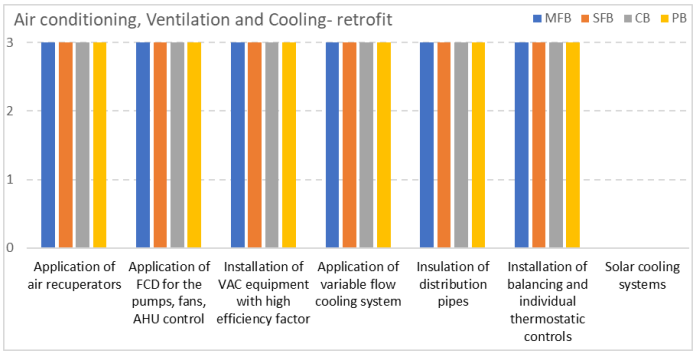
Brussels: In 2007, the Brussels capital region launched a call for buildings sector energy efficiency improvement projects (BATEX - BATiment EXemplaire). The Passivhaus standard has emerged as a de facto energy standard over the course of six calls. This initiative has spurred the market, and encouraged innovation from both private and public participants.
Flanders: Energy performance requirements for new and renovated buildings in Flanders first started in January 2006. Regulations mandating a progressive tightening of performance requirements have garnered a strong positive response from the buildings sector. In particular, NZEBs are gaining interest from a rapidly growing mix of building professionals. Effective enforcement of relevant regulations a key driver for annually increasing energy performance.
Walloon: EPBD-compliant regulations have been in place in the Walloon region since 2007; they were updated in 2013 to comply with the EPBD decree. They are well-known and fully supported by local architects, engineers, and contractors. Walloon has extended the study on cost optimality, focusing on renovation of the residential and commercial building stock, in line with Article 4 of the Energy Efficiency Directive.

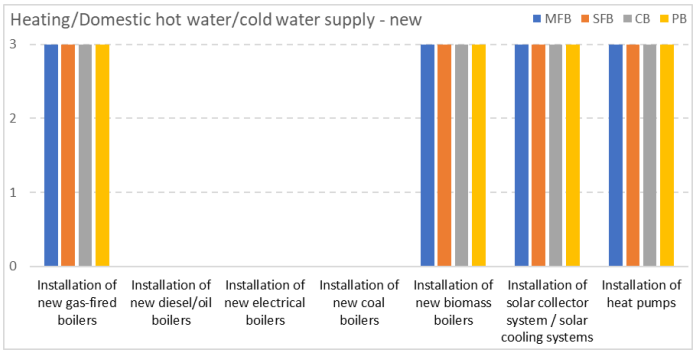


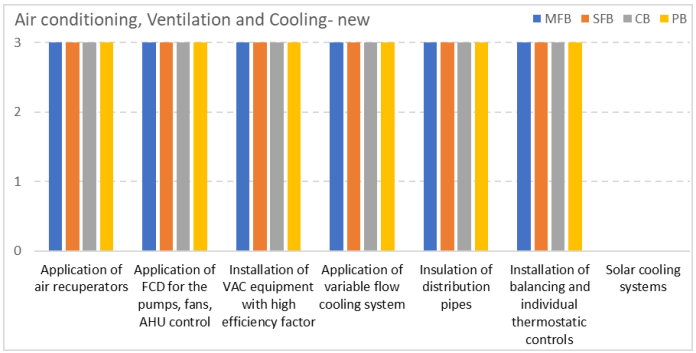


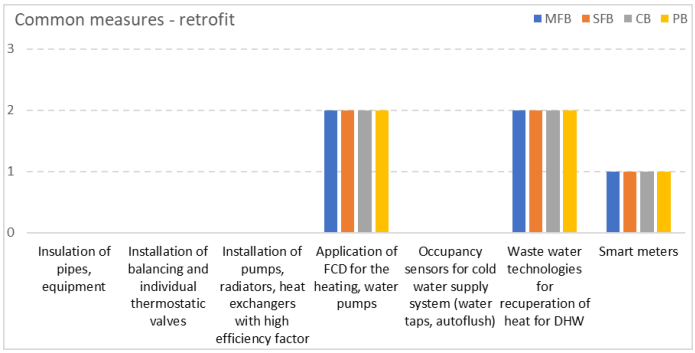
	Belgium							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	3	3	3	3	3	3
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	2	2	2	2	2	2	2	2
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	2	2	2	2	2	2	2	2
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	2	2	2	2	2	2	2	2
Smart meters	1	1	1	1	1	1	1	1
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	2	2	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	2	2	3	3	3	3	3	3
Exterior lighting control	2	2	3	3	3	3	3	3
Application of "day light" solutions in architecture	2	2	3	3	3	3	3	3

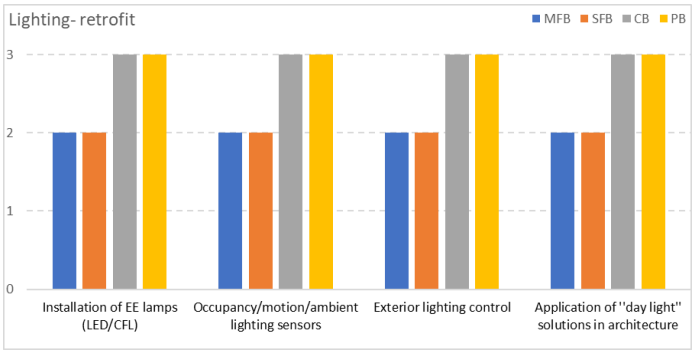

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

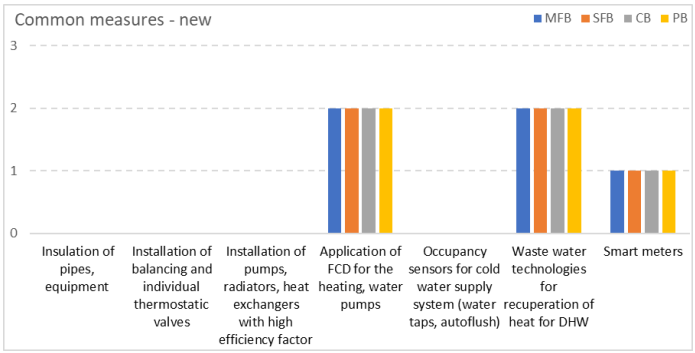

Air conditioning, Ventilation and Cooling- retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

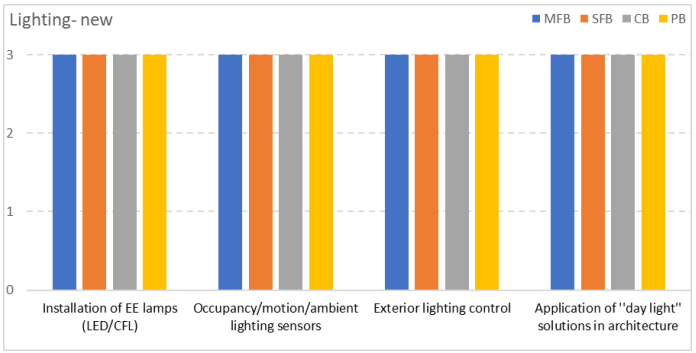

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

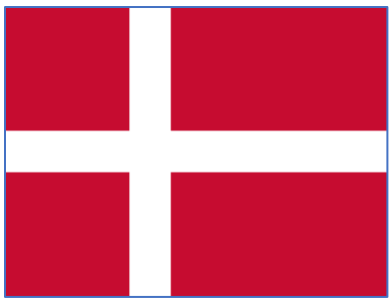

Air conditioning, Ventilation and Cooling- new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture



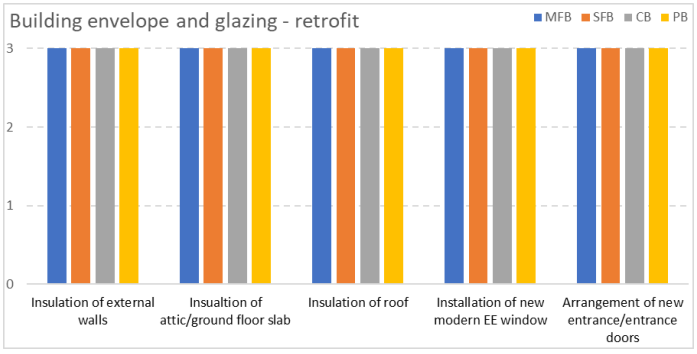
DENMARK

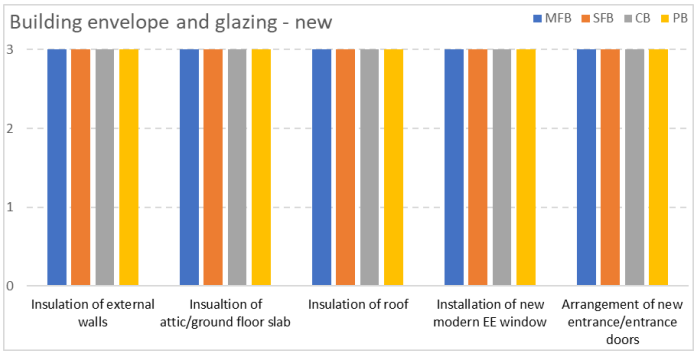
OVERVIEW

The energy efficiency policies in Denmark had always been pragmatic, considering the future use of energy in buildings. The first energy efficiency policies for buildings were introduced in 1961. Even though these regulations were only concerned with thermal insulation, they resulted in substantially less energy waste in new buildings, which became much cheaper to operate, healthier, and more pleasant to live in.

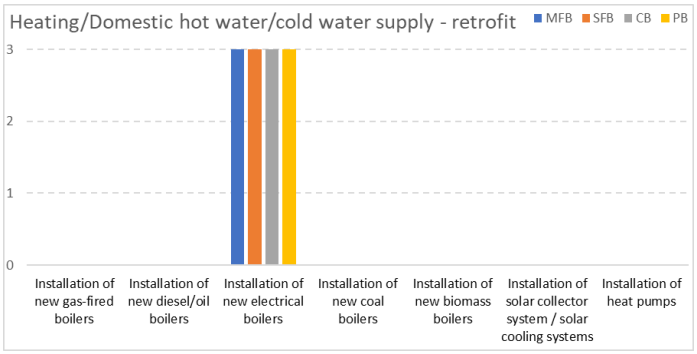
Improving the energy efficiency of buildings and modifying behaviour in connection with buildings is a high priority in the Danish public and consumer information campaign. This involves publishing material on energy-efficient solutions, information on building regulations, and better access to information and knowledge about energy renovation.

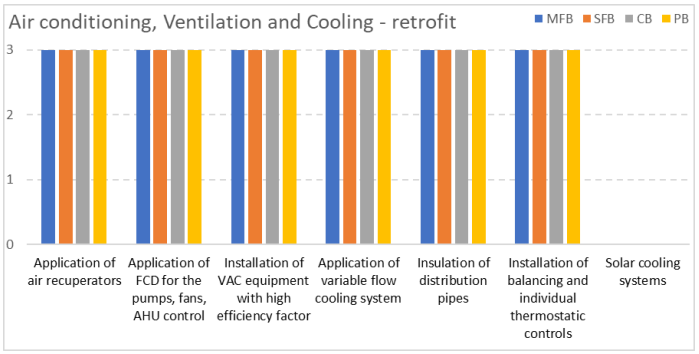
The Danish Energy Agreement in 2012 forbade the installation of oil and natural gas boilers in new buildings starting from 2013. It was further mandated that, from 2016, new oil boilers cannot be installed in existing buildings in areas with district heating or natural gas supply.

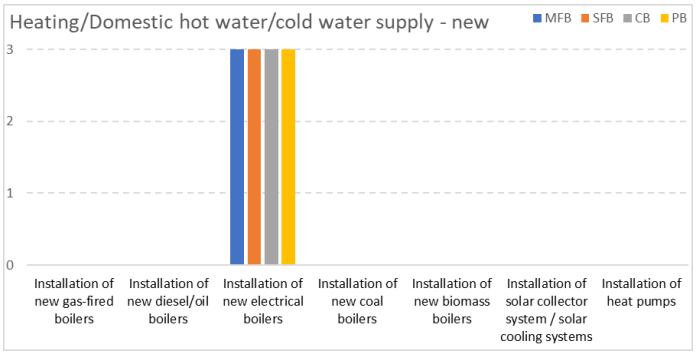


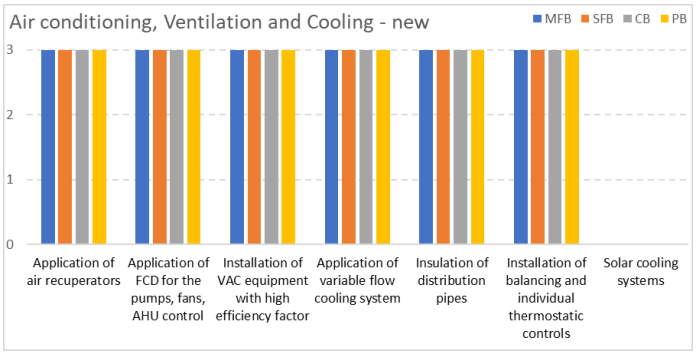


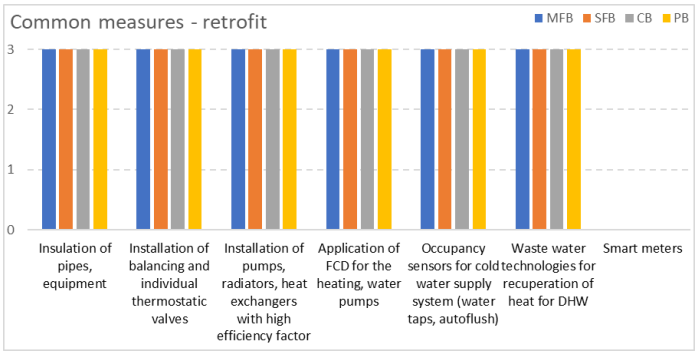
	Denmark							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	3	3	3	3	3	3	3	3
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	3	3	3	3	3	3	3	3
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	3	3	3	3	3	3	3	3
Exterior lighting control	3	3	3	3	3	3	3	3
Application of "day light" solutions in architecture	3	3	3	3	3	3	3	3

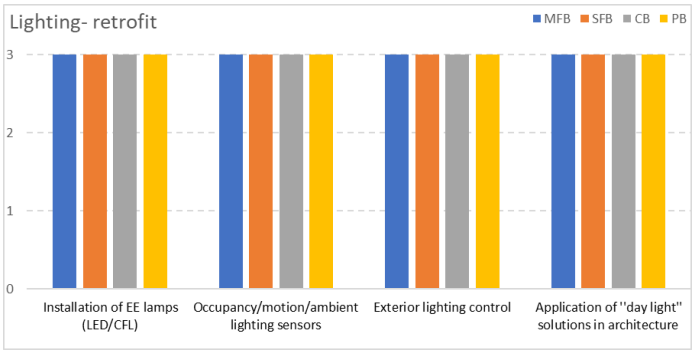

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

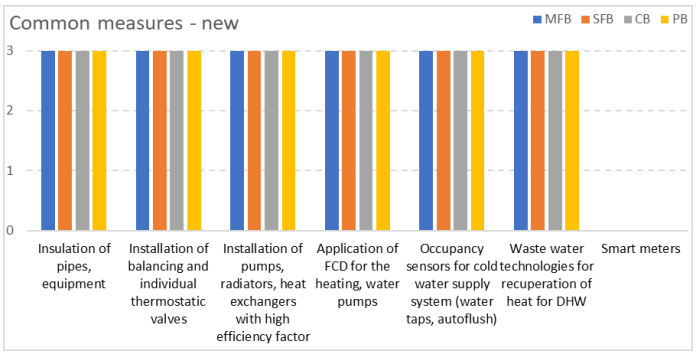

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
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Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
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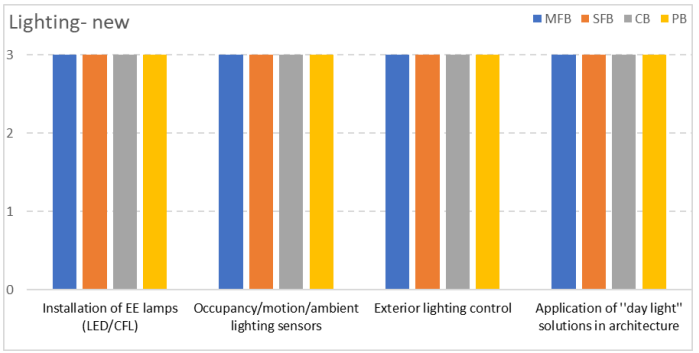
Lighting- new
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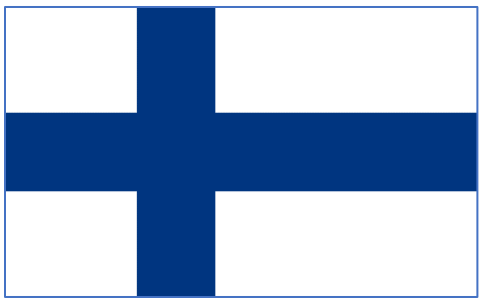
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture



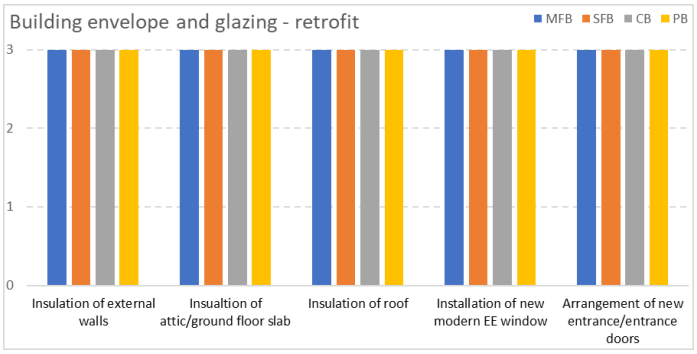
FINLAND

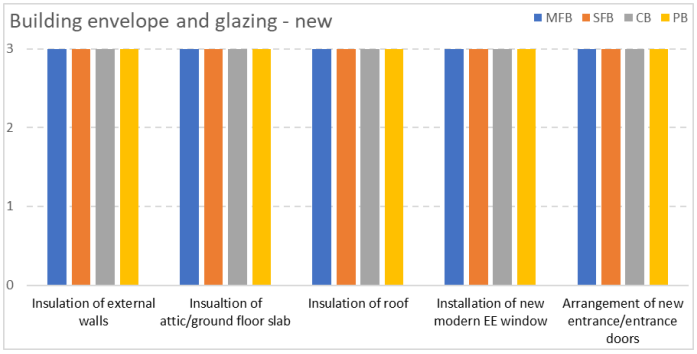
OVERVIEW

Finland is a pioneer in developing strategies to save energy. The role of an end-user has evolved over time from a passive consumer to active prosumer. Homeowners are involved in an evolutionary approach in building and configuring residential energy systems. Renewable energy and micro-generation technologies have become supporting sources to scale up capacity. The concept of “domestication pathways” describes this phenomenon.

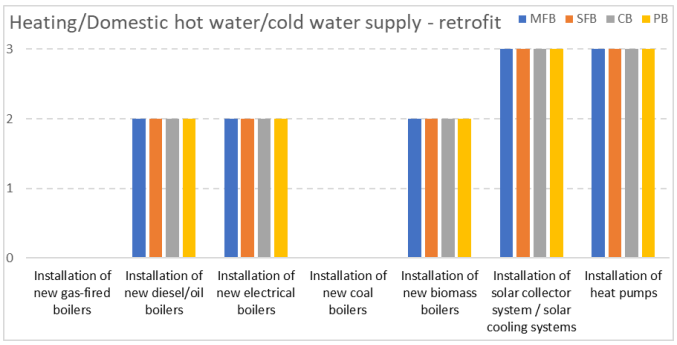
Energy use in buildings is approximately 40% of end use; space heating in buildings consumes 22% of final energy. In residences, space heating accounts for 50% of household demand, followed by water heating, use of electrical appliances, and lighting.

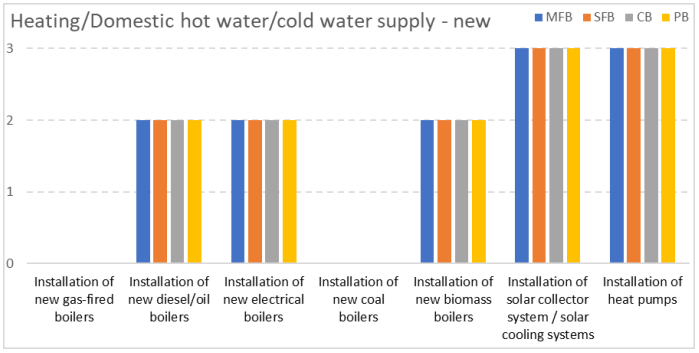
The government organizes annual week-long events and campaigns to increase consumer awareness of rational energy use concepts. These events are supported by companies and communities all across Finland. The government funds energy-related R&D, considering innovation to be key to achieving national energy efficiency and climate targets. Accordingly, Finland is well-known as an incubator of internationally competitive innovations.

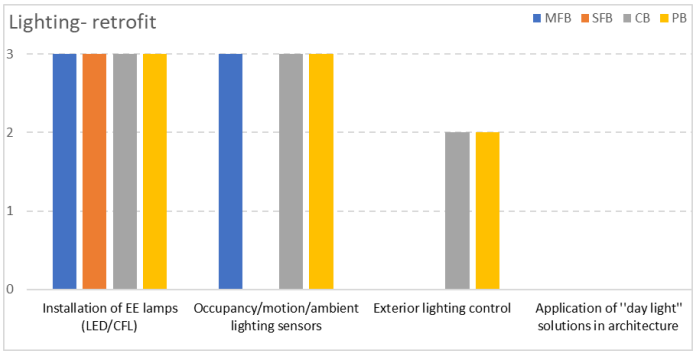


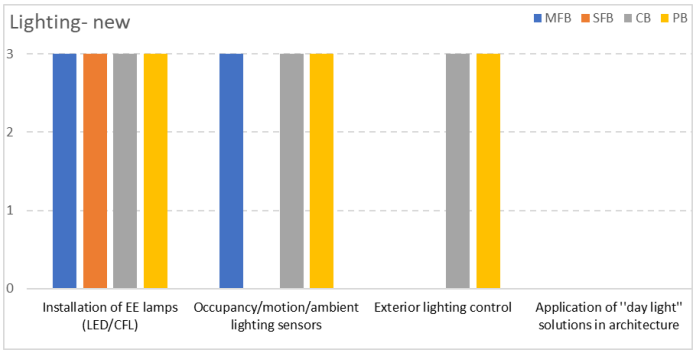


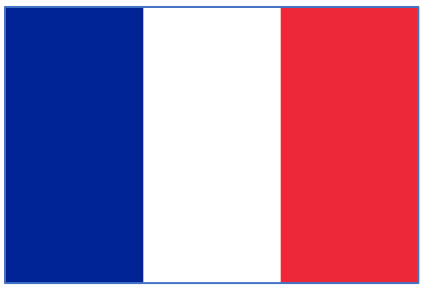
	Finland							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	2	2	2	2	2	2	2	2
Installation of new electrical boilers	2	2	2	2	2	2	2	2
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	2	2	2	2	2	2	2	2
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	3	0	3	3	3	0	3	3
Exterior lighting control	0	0	2	2	NI	0	3	3
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

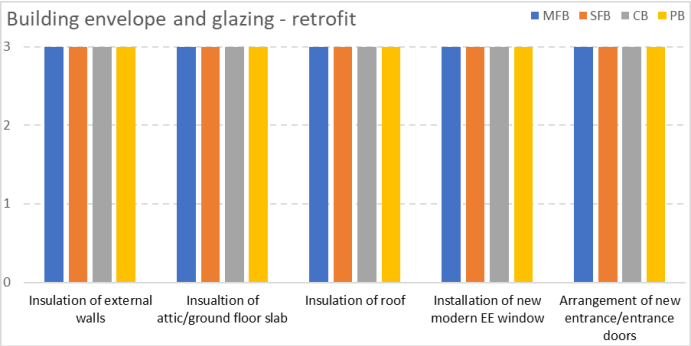


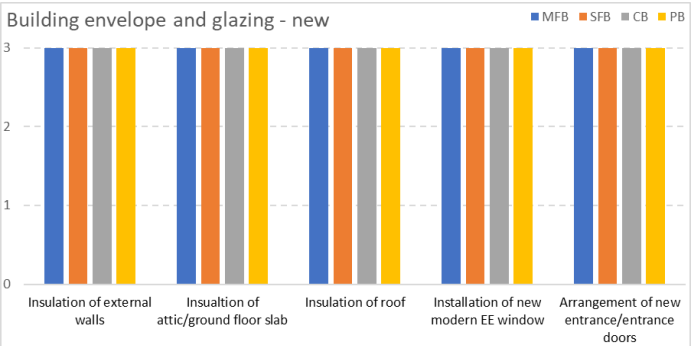
FRANCE

OVERVIEW

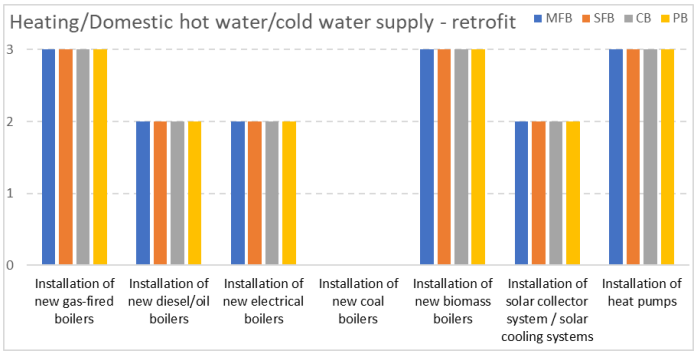
France met the NZEB requirement in 2012 through its thermal regulation RT 2012, which sets high standards for energy consumption. A new environmental regulation is under preparation on both the carbon footprint of the building on its entire life-cycle, and to further extend the energy efficiency requirement. The regulation will develop the concept of Positive Energy Buildings (Bâtiments à Energie Positive - BEPOS).

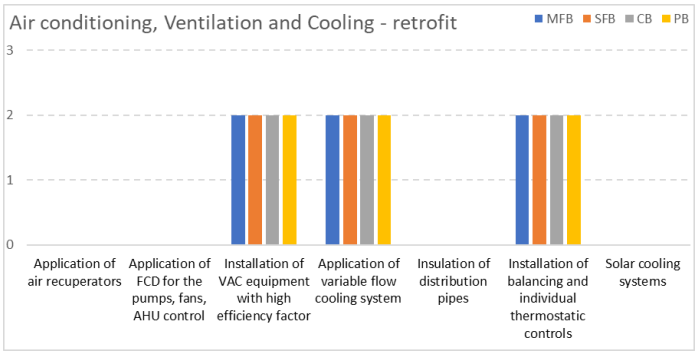
The HQE Green Building label is the second green building certification in the world. It relies on a unique performance-based vision of sustainable buildings: not listing actions to be taken but the results to be achieved (including energy performance and climate change). It includes a particularly unique emphasis on building management and collaboration to facilitate the involvement of stakeholders in building construction and use. Throughout France, 500,000 residential units and 2,000 nonresidential buildings, totaling 85 million m² are HQE certified. In addition, more than 800,000 residential units and 120 million m² of nonresidential buildings are also currently “EFFINERGY” certified. Every year, 50,000 more residential units are new “NF habitat HQE” certified, representing around 15% of the residential new buildings market.

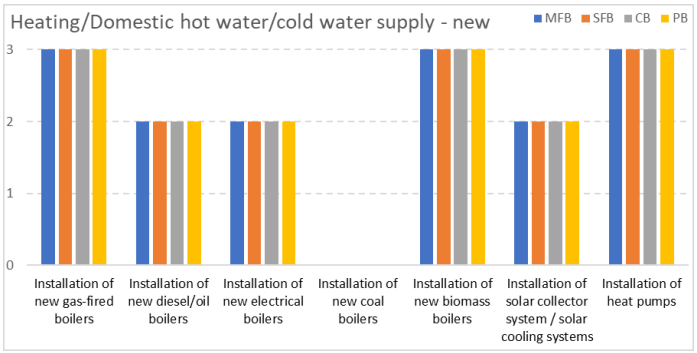


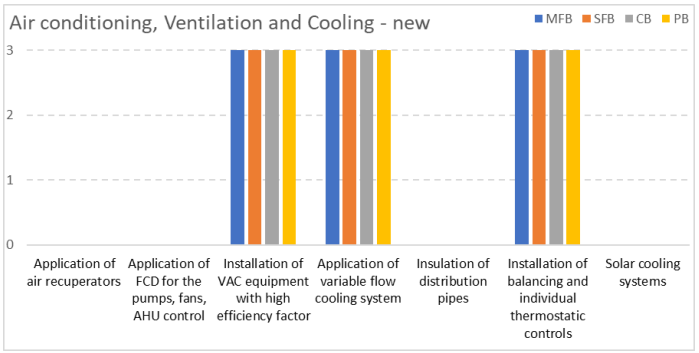


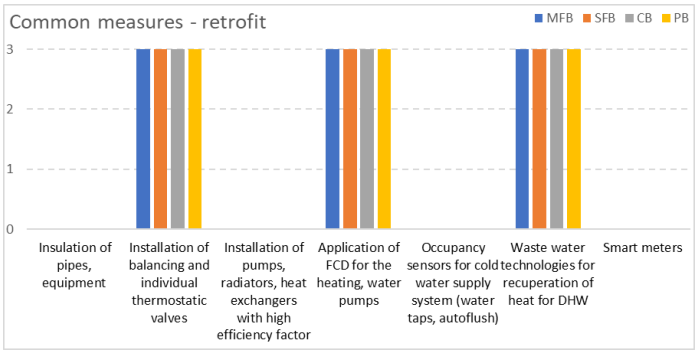
	France							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	2	2	2	2	2	2	2	2
Installation of new electrical boilers	2	2	2	2	2	2	2	2
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	3	3	3	3	3	3
Installation of solar collector system / solar cooling systems	2	2	2	2	2	2	2	2
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	2	2	2	2	3	3	3	3
Application of variable flow cooling system	2	2	2	2	3	3	3	3
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	2	2	2	2	3	3	3	3
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	2	2	2	2	2	2	2	2
Occupancy/motion/ambient lighting sensors	0	0	3	3	0	0	3	3
Exterior lighting control	0	0	3	3	0	0	3	3
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

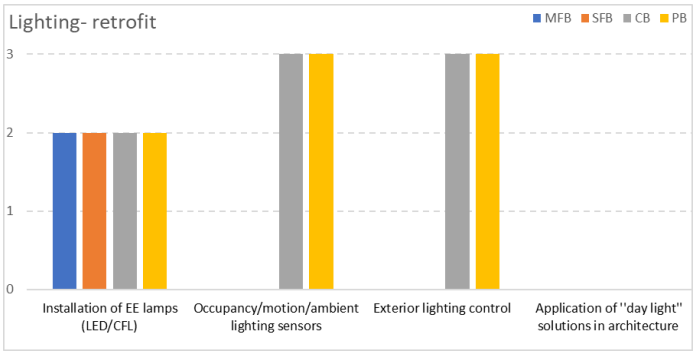

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

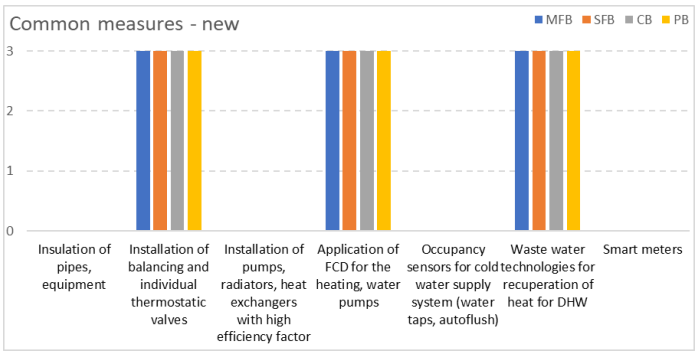

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

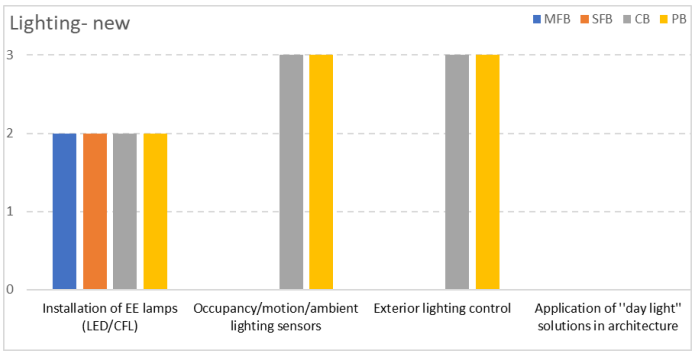

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters

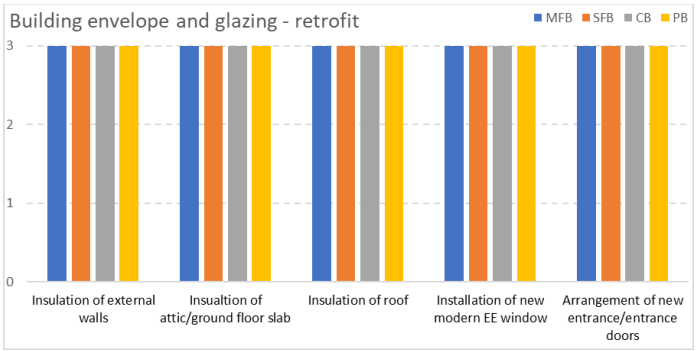

Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

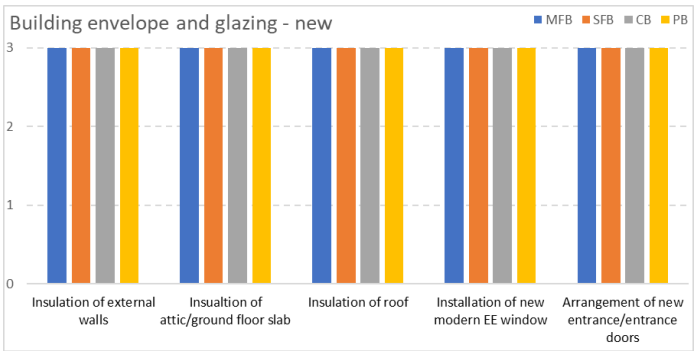
GERMANY

OVERVIEW

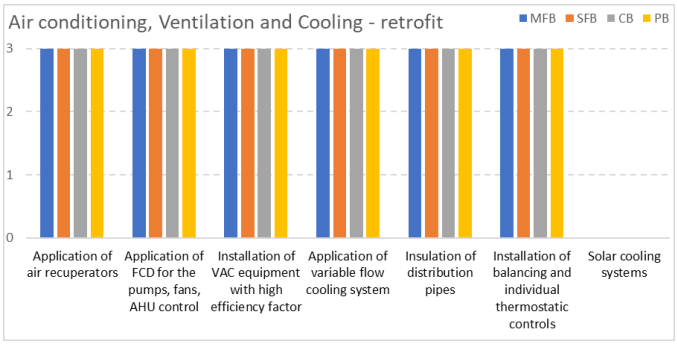
Germany has long been an advocate of promoting energy efficiency measures in buildings. Building energy efficiency is subject to federal legislation, but it is the regional authorities that have the stronger role in implementing energy efficiency policies in the buildings sector.

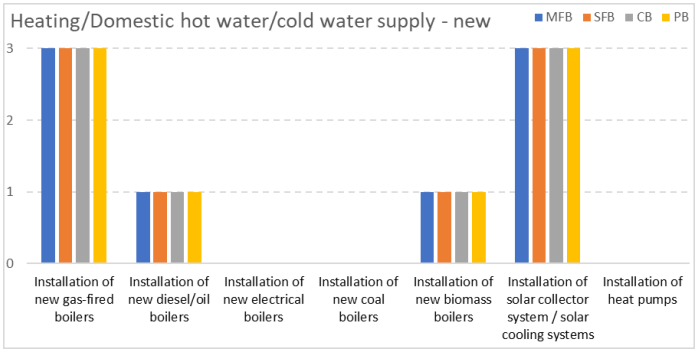
Germany has many advanced buildings with high levels of energy performance. It is thus rather ironic that the country is not progressing as actively as other EU countries in pushing the development of mandatory NZEB regulations. This is due to a challenge which must be taken into account while advocating a set of energy efficiency policies, and may be interesting for the lesson it could provide to other countries. The population tends to have high levels of energy efficiency awareness, so new buildings in Germany already tend to exceed the energy efficiency criteria by a substantial margin. If NZEB mandates are introduced, the cost of affordable house rent for new houses will increase, but with a lower increase in energy performance. The challenge is that the government must find a balance between providing affordable housing to the people while maintaining NZEB standards for new and existing buildings. Overly strict requirements can lead to investment reluctance in existing households. Income and expenditure gaps also need to be considered to ensure investment in energy efficiency to achieve climate goals.

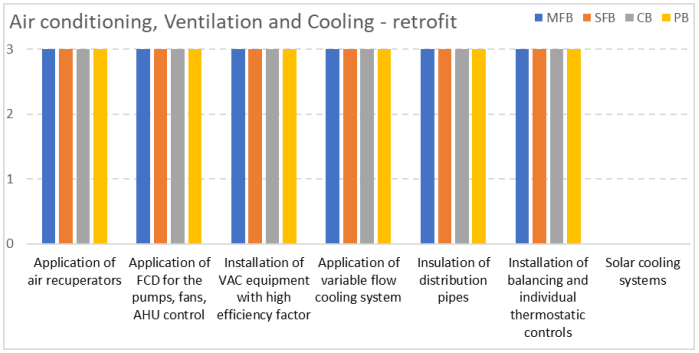


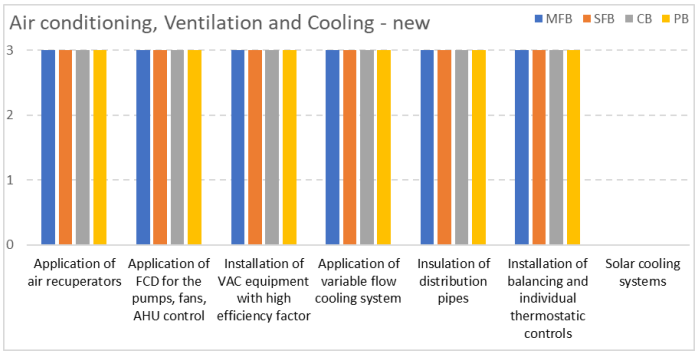


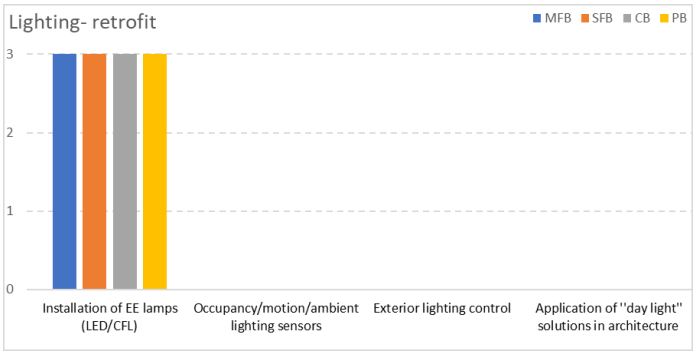
	Germany							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	1	1	1	1	1	1	1	1
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	1	1	1	1	1	1	1	1
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

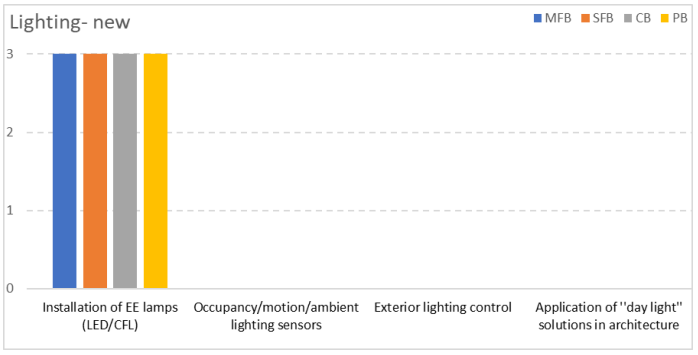

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

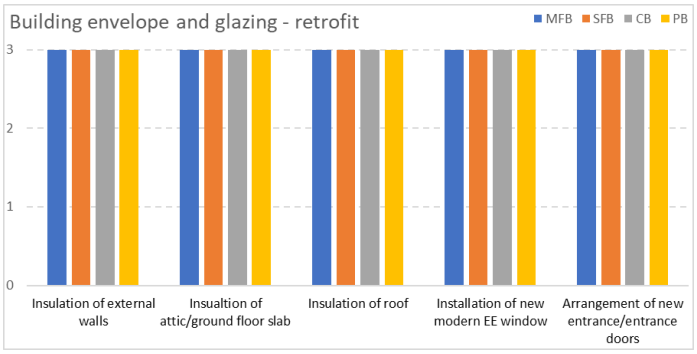
GREECE

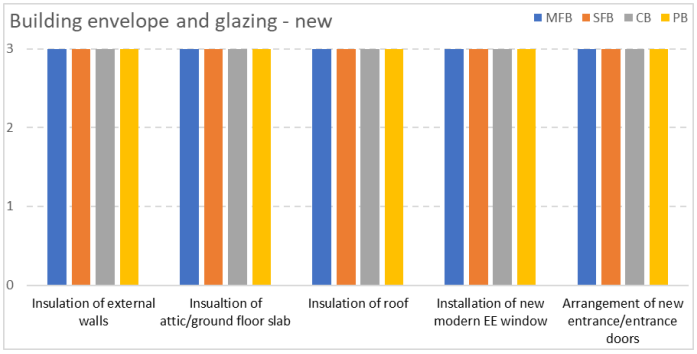
OVERVIEW

The share of total final consumption (TFC) of energy in residential buildings in Greece is 41%. The energy mix based on the total final consumption in the buildings sector is composed of electricity at 48%, oil as the second-largest source representing 28%, biofuels at 13%, and natural gas is 8%.

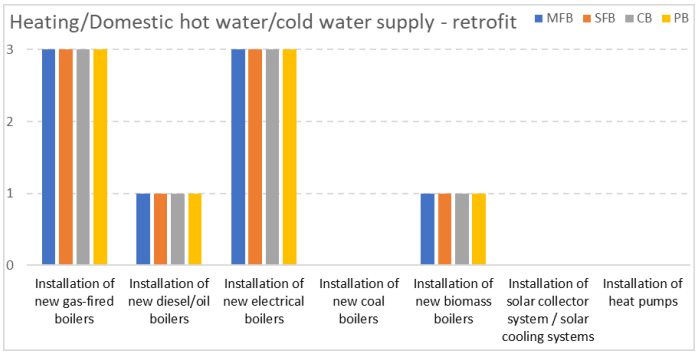
Space heating accounts for the majority (57%) of TFC in the residential sector and energy consumption in space heating is declining due to economic reasons. Oil heaters were predominantly used until 2014, but the trend is shifting to low cost alternatives, due to rising fuel prices and lower household incomes.

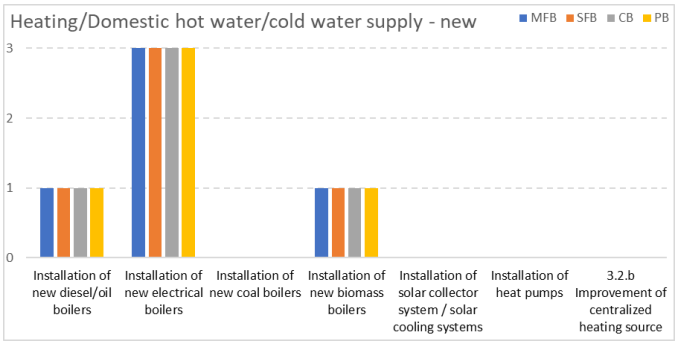
Another factor influencing the uptake of energy efficiency measures in the buildings sector is the occupancy rate. Approximately 35% of Greece's residential buildings are either empty or only seasonally occupied. The high prevalence of partial occupancy dramatically reduces the ROI on energy efficiency measures. Owners of secondary / vacation residences are understandably less motivated to invest in improving energy efficiency, exacerbating low levels of efficiency within Greece's building stock.

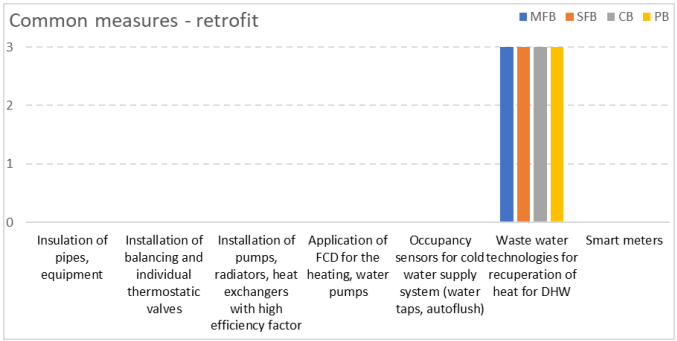


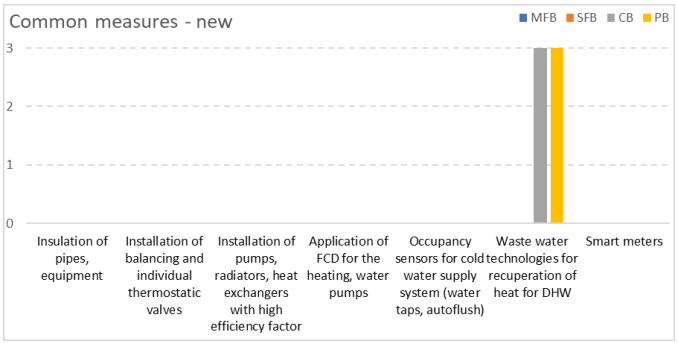


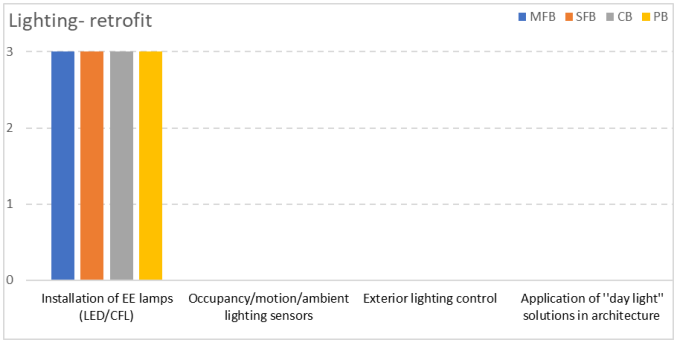
	Greece							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	1	1	1	1	1	1	1	1
Installation of new electrical boilers	3	3	3	3	3	3	3	3
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	1	1	1	1	1	1	1	1
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	0	0	0	0	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	3	3	3	3	0	0	3	3
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

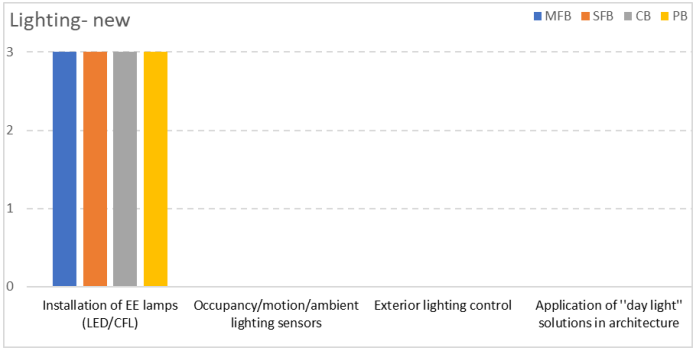

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

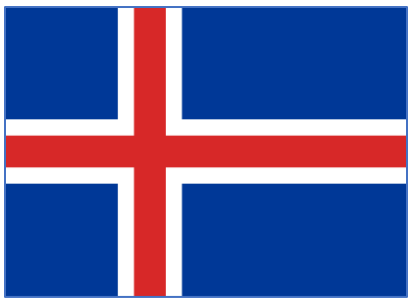

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps
3.2.b Improvement of centralized heating source


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

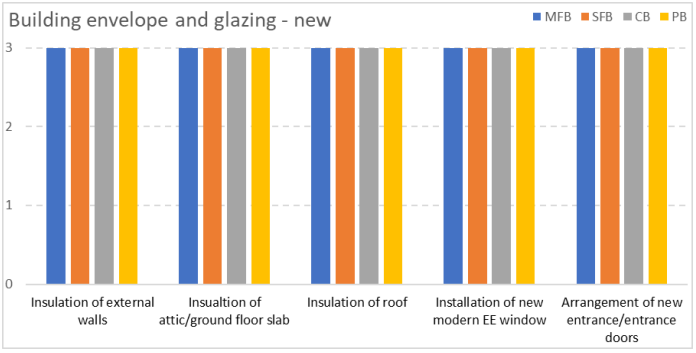


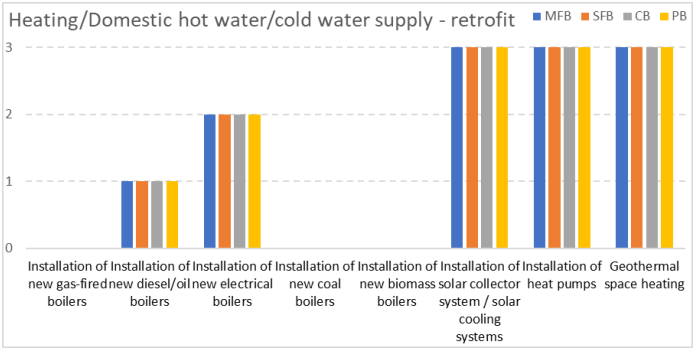
ICELAND

OVERVIEW

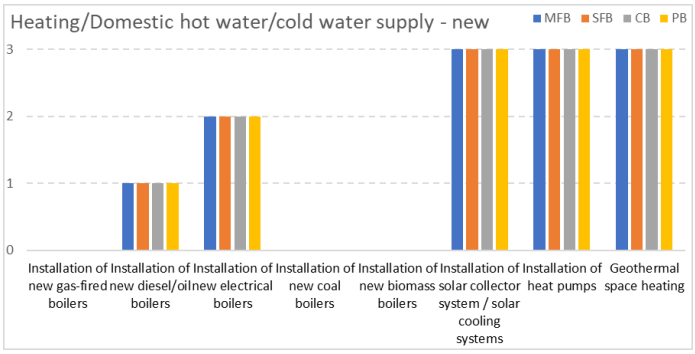
Iceland was granted derogation from Directive 2002/91/EC on energy performance of buildings, under the EEA Agreement. This was justified by the fact that its implementation in Iceland would not contribute to the achievement of the overall goals of the Directive. There is no need for special methods to ensure that renewable energy sources are used, as 99% of Iceland's electricity and heat is generated from renewable sources. Consumers have full access to all the renewable energy they need through the national grid or local geothermal district heating plants.

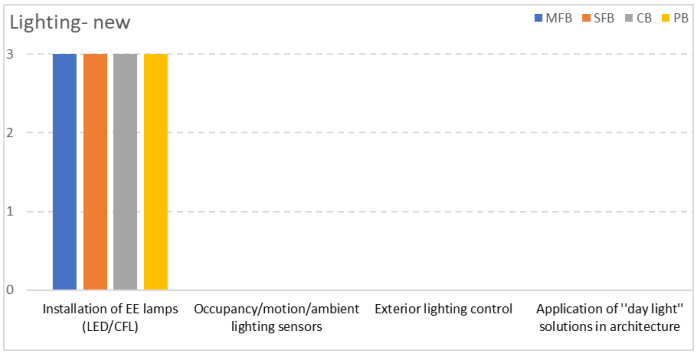
Due to the special features of their energy situation, Iceland has requested derogation from Directive 2006/32/EC on energy end-use efficiency and energy services, and is requesting derogation from Directive 2010/31/EC on energy performance of buildings.

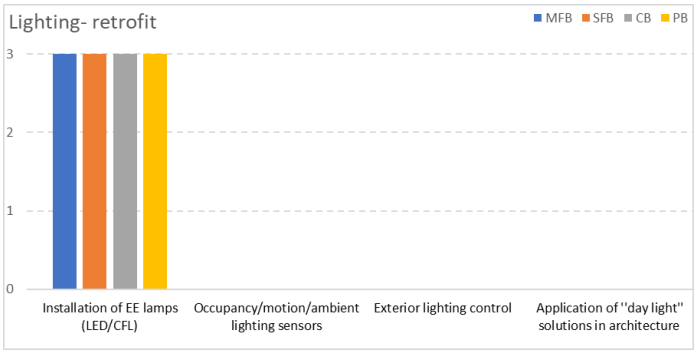


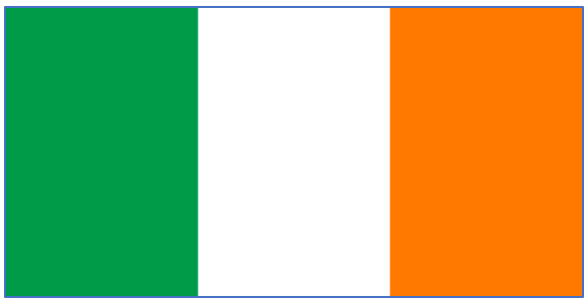


	Iceland							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	0	0	0	0	3	3	3	3
Insualtion of attic/ground floor slab	0	0	0	0	3	3	3	3
Insulation of roof	0	0	0	0	3	3	3	3
Installation of new modern EE window	0	0	0	0	3	3	3	3
Arrangement of new entrance/entrance doors	0	0	0	0	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	1	1	1	1	1	1	1	1
Installation of new electrical boilers	2	2	2	2	2	2	2	2
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
Geothermal space heating	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - new
MFB
SFB
CB
PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps
Geothermal space heating


Lighting- new
MFB
SFB
CB
PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture


Lighting- retrofit
MFB
SFB
CB
PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture



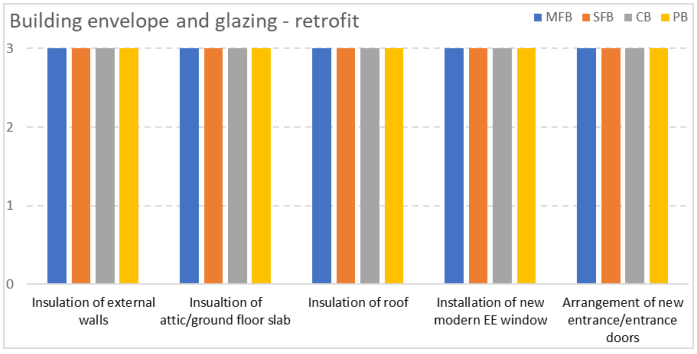
IRELAND

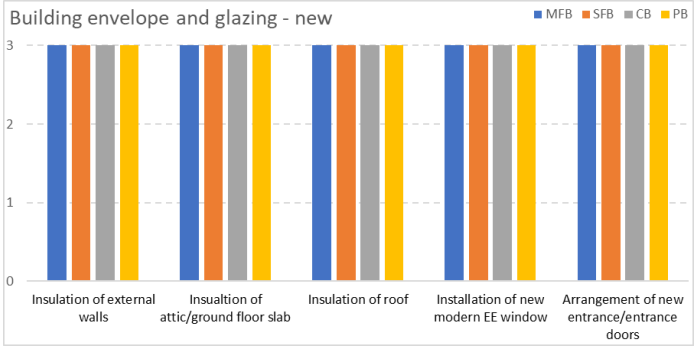
OVERVIEW

Ireland's energy consumption per dwelling is among the highest in Europe.

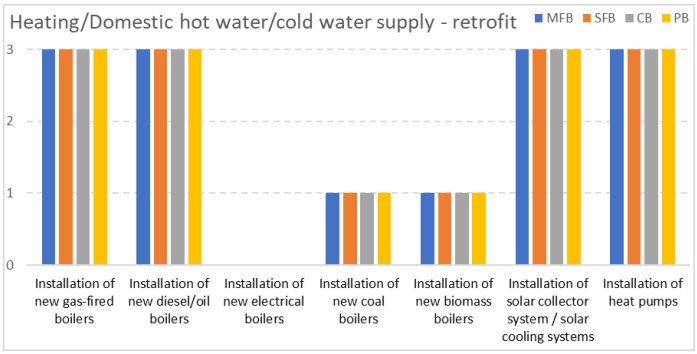
Largely, this is due to the fact that approximately half of the building stock was built before the introduction of building standards mandating minimal thermal performance levels. Many of these buildings would hence be subject to less demanding local authority bylaws and draft regulations. Additionally, many Irish residences are rural detached homes which tend to be larger – and have more rooms (5.6 per capita in 2002) – than the average European home; critically, they also tend to be off the natural gas distribution grid. Irish dwellings, on the whole, have the fourth largest floor area (104 m^2) in the EU, behind only Luxembourg, Denmark, and Malta. On the Building Energy Rating scale, the average residential building in Ireland has a D rating.

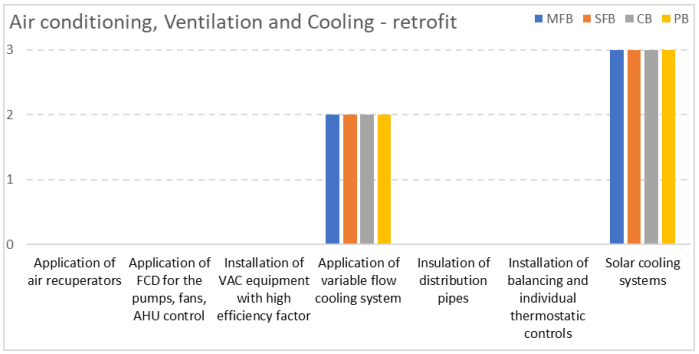
In spite of these disadvantages, Ireland has already begun to make progress on energy efficiency measures. Government incentives and subsidies have resulted in energy efficiency upgrades in nearly one sixth of all homes in the country.

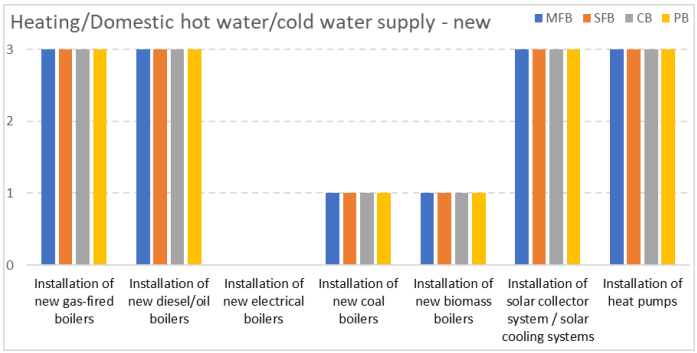


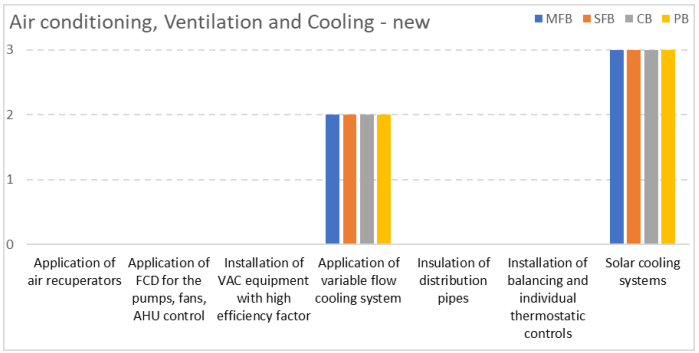


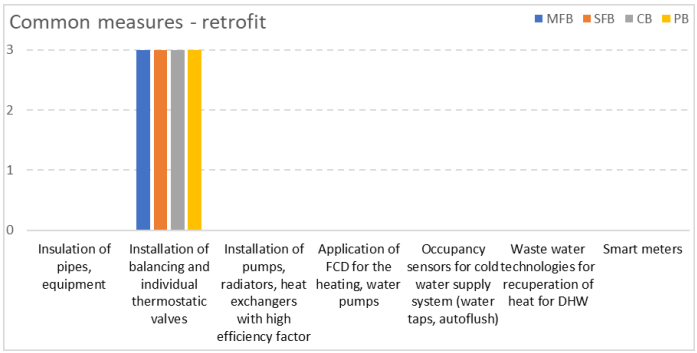
	Ireland							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	3	3	3	3	3	3	3	3
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	1	1	1	1	1	1	1	1
Installation of new biomass boilers	1	1	1	1	1	1	1	1
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	2	2	2	2	2	2	2	2
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	3	3	3	3	3	3	3	3
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

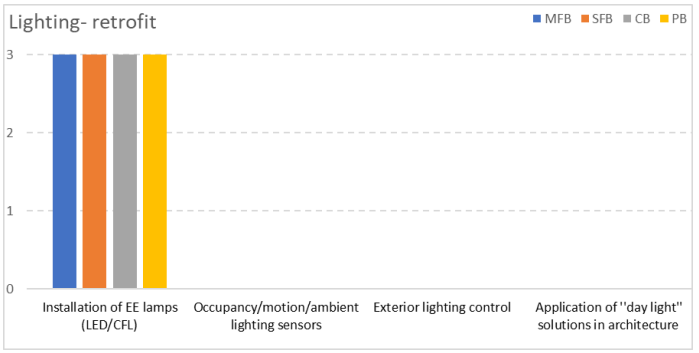

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

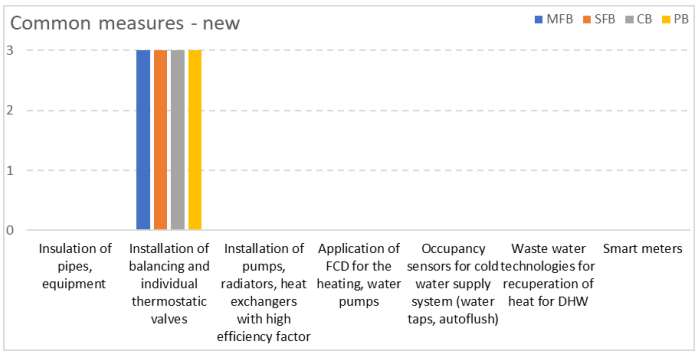

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

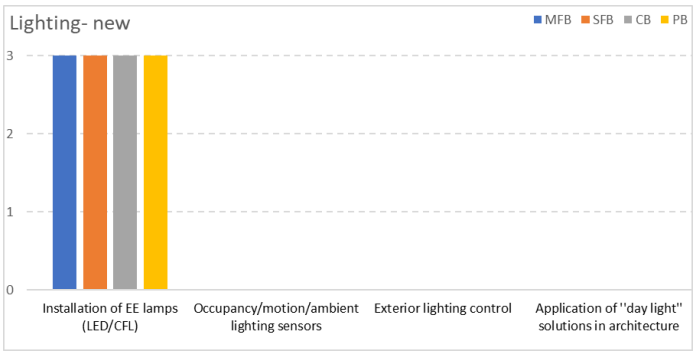

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

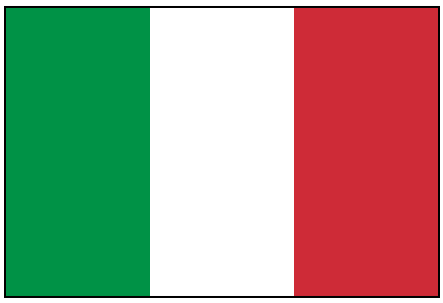

Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture



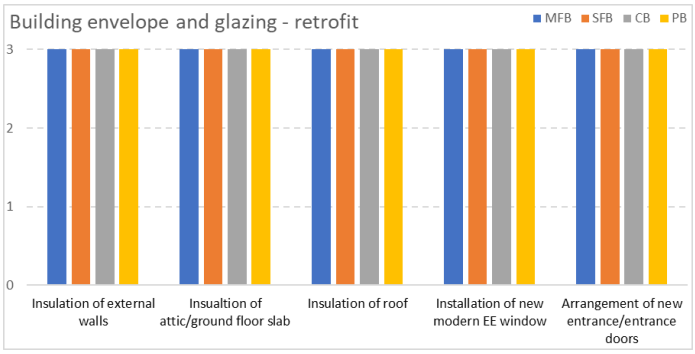
ITALY

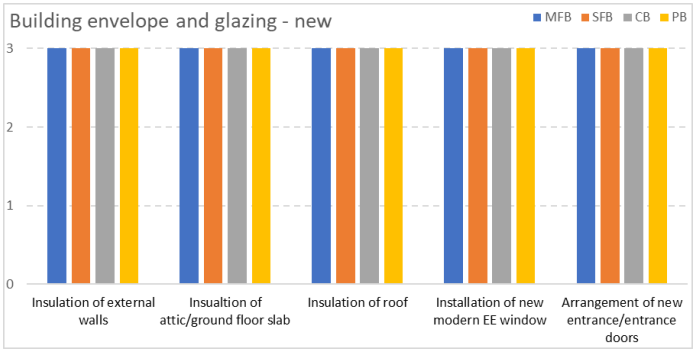
OVERVIEW

In 2014, tax deduction incentives were designed and implemented to support retrofitting the existing stock of buildings in Italy. Tax deductions are available for homeowners, tenants, and businesses using the building for their activities. The scheme encourages the replacement of winter heating systems with condensing boilers or efficient heat pumps, replacement of lighting fixtures, installation of solar thermal systems and building shell insulation.

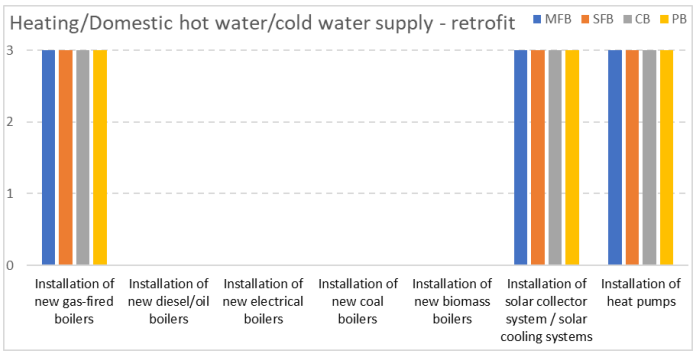
In addition, the Comprehensive Renovation programme applies to an entire building, with no constraints on the technologies used, but with the need to certify, upon completion of the renovation, that the overall energy performance is within limits set by the state. This initiative is combined with a directive to increase the uptake of renewable energy sources. The combined efforts are intended to renewably provide 50% of energy required for space heating, cooling, and water heating.

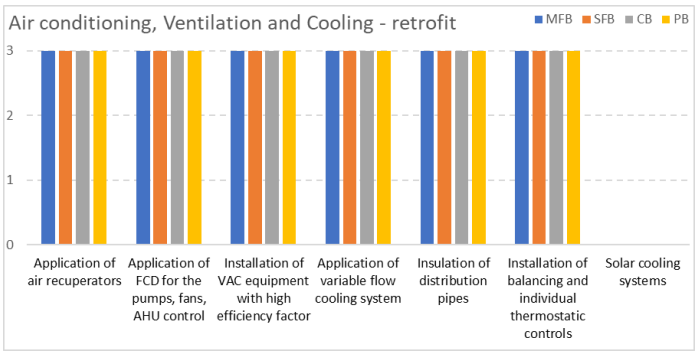
This initiative will be further expanded to develop an NZEB era, and establish a credible action plan for further construction of high energy efficiency buildings.

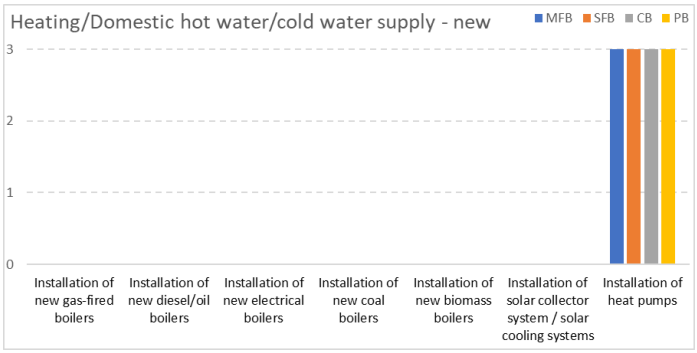


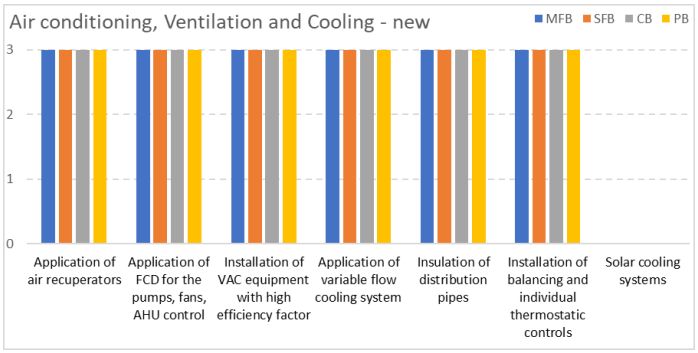


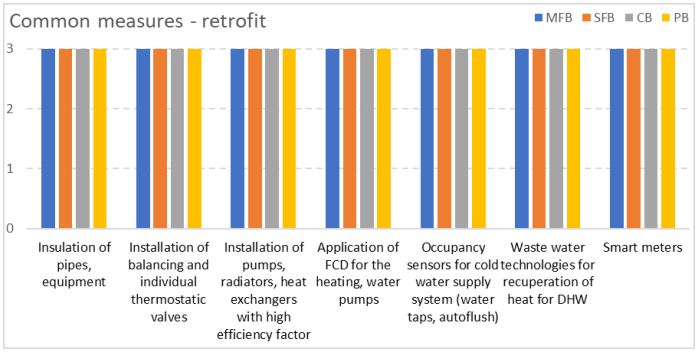
	Italy							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	3	3	3	3	0	0	0	0
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	3	3	3	3	3	3	3	3
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	3	3	3	3	3	3	3	3
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	0	0	0	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	3	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

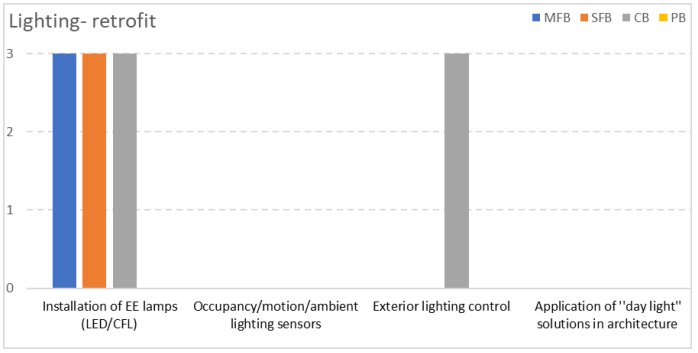

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

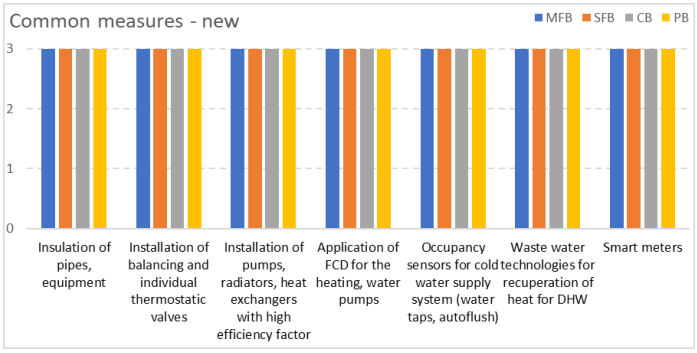

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

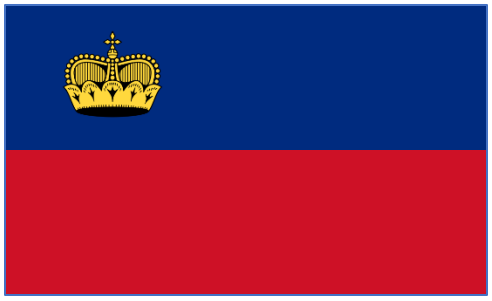

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters



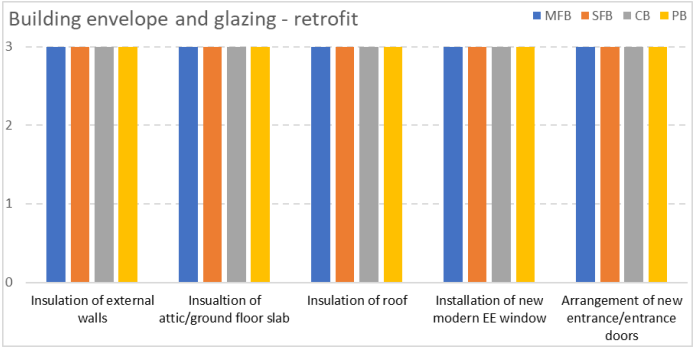
Liechtenstein

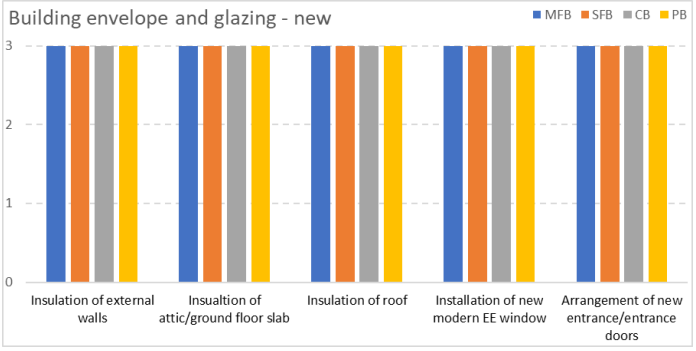
OVERVIEW

The Government of Liechtenstein passed an Energy Efficiency Act in 2008, promoting the renovation of existing buildings, and supporting implementation of energy efficiency technologies in new residential buildings. The focus of this act is on space heating, thermal solar, and solar photovoltaics. Reduced energy consumption due to this act is estimated at the equivalent of 4 million litres of fuel oil.

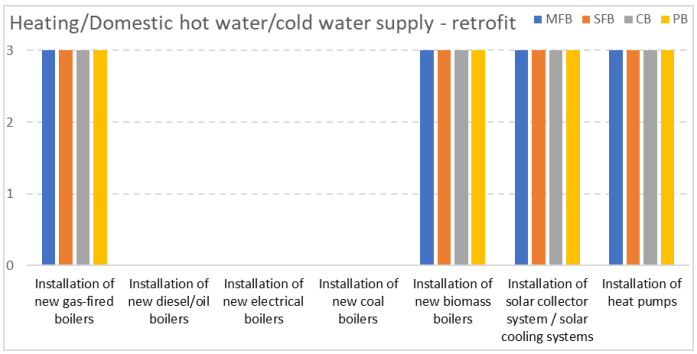
To further extend energy efficiency efforts, the government introduced Energy Strategy 2020. Key tenets of this strategy are to achieve 20% increase in residential renewable energy production, 20% increase of energy efficiency in buildings, and 20% reduced greenhouse gas emissions; all targets are relative to 1990, and must be met by 2020.

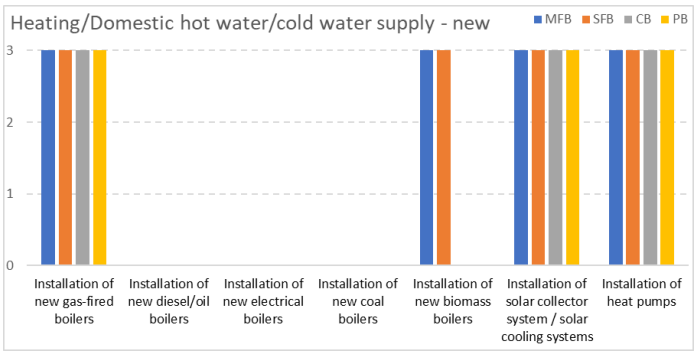
The government provides financial support to facilitate the adoption of energy saving technologies in buildings, particularly as regards the renovation of existing buildings and residential installations. The technology focus is on block heating plants (natural gas and wood), and solar collectors. Liechtenstein is almost at full capacity as regards woodchip-burning space heating systems.





	Liechtenstein							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	3	3	3	3	0	0
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	0	0	0	0	0	0	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB
SFB
CB
PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB
SFB
CB
PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

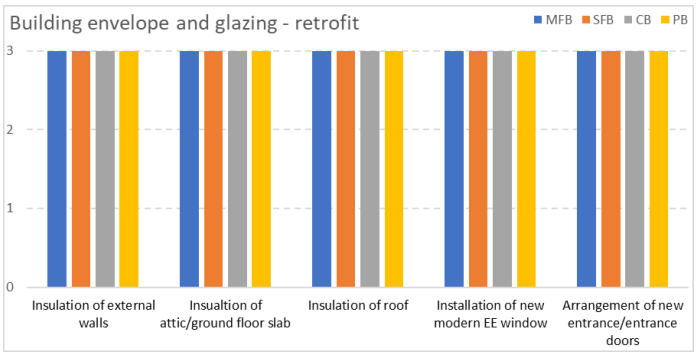
LUXEMBOURG

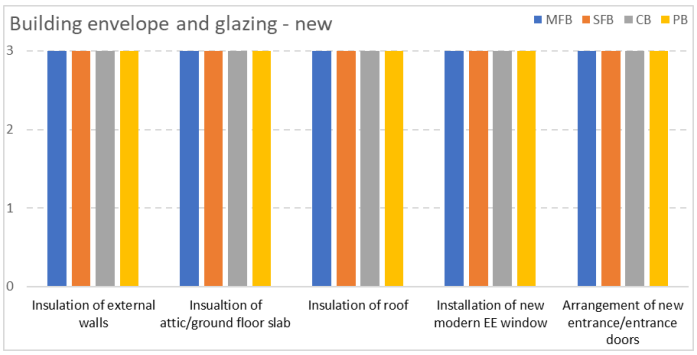
OVERVIEW

Luxembourg can be used as an interesting case study for advocating the implementation of energy performance certificates (EPC) for promoting economic and social benefits of adopting energy efficiency in the buildings sector. The country had adopted measures to promote EPCs much before they were made mandatory through the EU directive. Savvy real estate market participants have made use of the EPCs to promote their buildings, especially the highly energy-efficient ones. The most highly rated buildings generate higher rental and sale revenues.

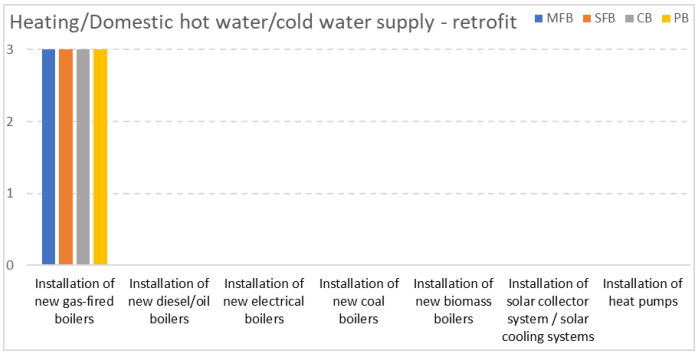
Energy performance certifications and ratings are extensively used by building owners and real estate brokers in media and marketing communications – a high rating is becoming an important differentiating factor. A few real estate websites have even integrated energy efficiency class as a search criterion.

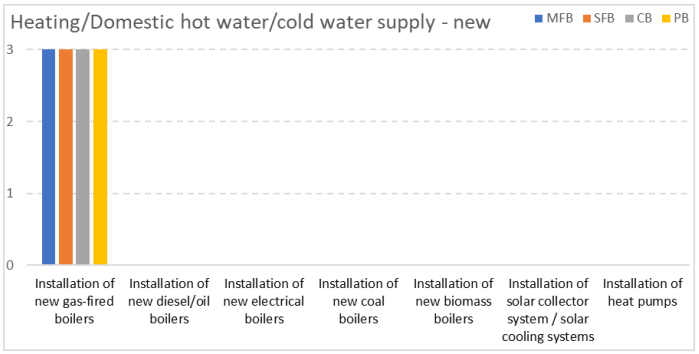
The potential for real economic value, and an aggressive timeline for reinforcing minimum energy performance requirements in residential buildings, has resulted in a high-pressure market environment. Private and public building companies and contractors have accordingly embraced high energy efficiency standards in new construction and retrofit projects.

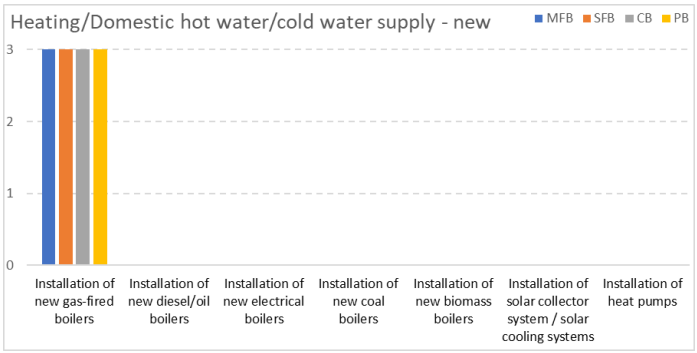


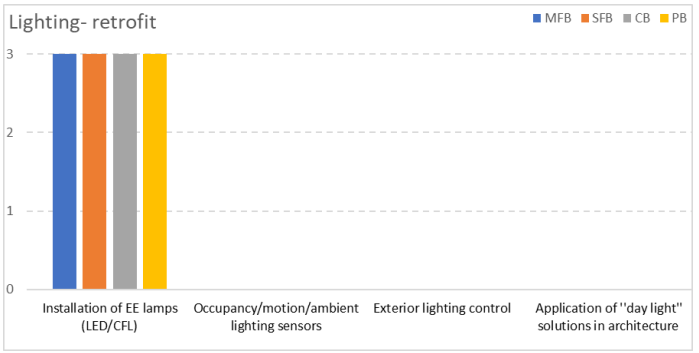


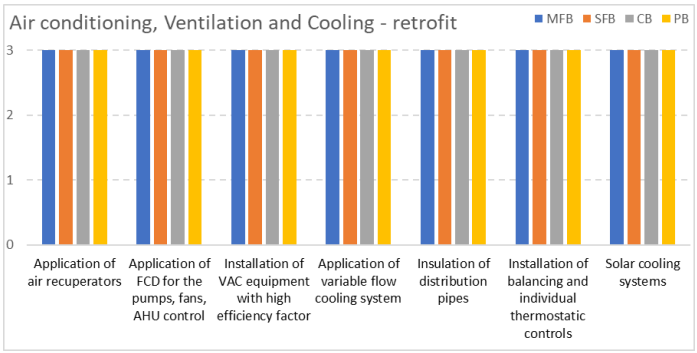
	Luxembourg							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	0	0	0	0	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	3	3	3	3	3	3	3	3
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

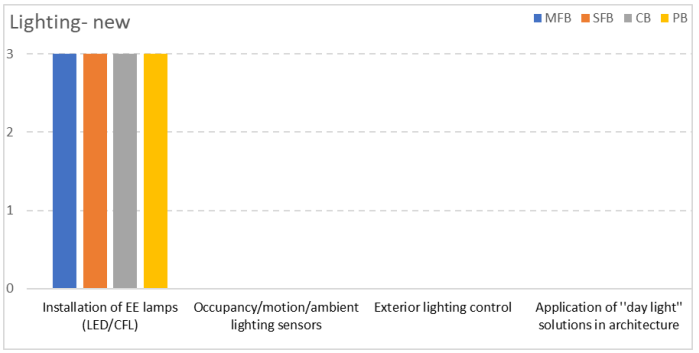

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

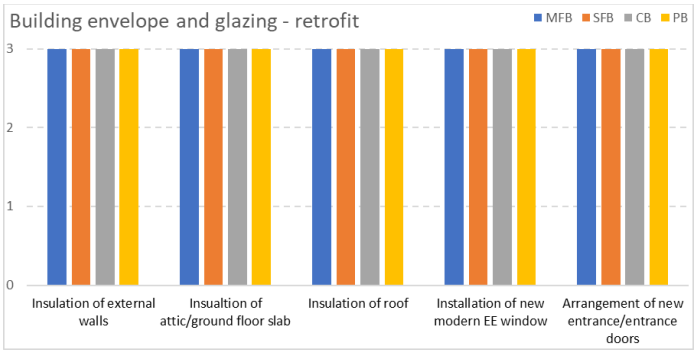

Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

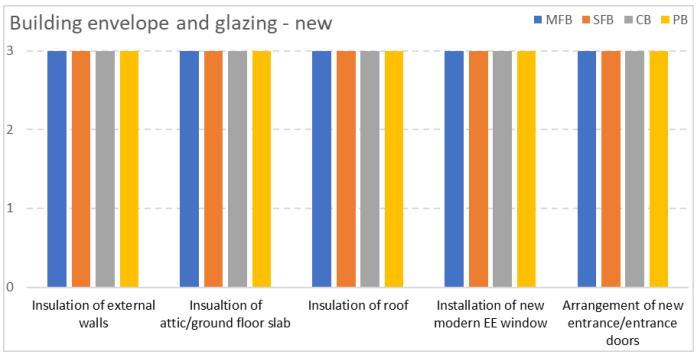
MONACO

OVERVIEW

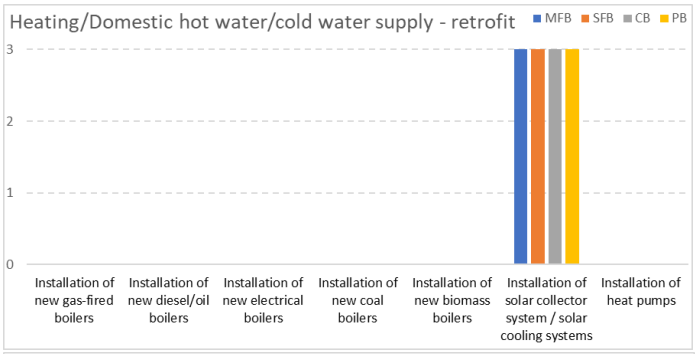
Monaco has committed itself to reducing, by 2020, energy consumption by 20%, and CO_2 emissions by 30%. In addition, the government has committed to cut greenhouse gas emissions by 50% by 2030, and to become carbon neutral by 2050. While the independence and diversity of its energy supply has improved in recent years, the principality still imports most of its electricity. Noteworthy exceptions are the Fontvieille district heating network and seawater heat pumps which provide self-sufficiency when it comes to thermal energy. The government should invest more effort to encourage further development of local energy production. This will likely be a critical factor in meeting stated energy consumption and emissions reduction targets. Several regulations are now in place to promote increased building energy efficiency and penetration of renewable energy sources (predominantly solar and geothermal).

However, Monaco has a unique challenge to overcome in implementing these transitions. The high population density hinders major energy transition projects, such as building renovations, installing district heating / cooling networks, and adding renewable energy generators. In addition, buildings in Monaco rely more heavily on electrically-powered heating and air conditioning systems than elsewhere in France. Energy consumption is hence less predictable, as it is more highly dependent on temperature variations.





	Monaco							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	3	3	3	3	3	3	3	3
Exterior lighting control	3	3	3	3	3	3	3	3
Application of "day light" solutions in architecture	3	3	3	3	3	3	3	3


Heating/Domestic hot water/cold water supply - retrofit
MFB
SFB
CB
PB
3
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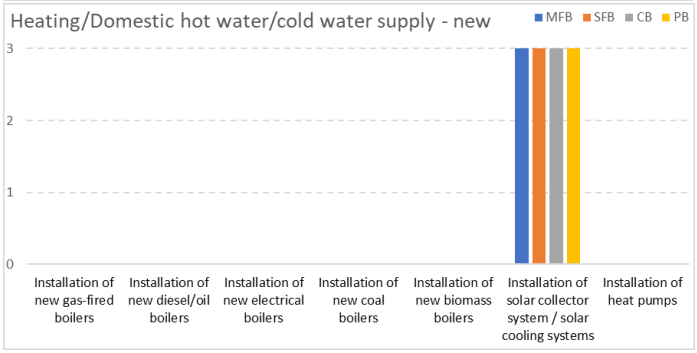
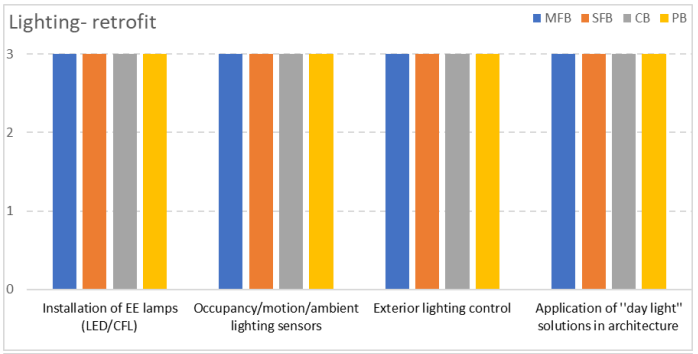
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB
SFB
CB
PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB
SFB
CB
PB
3
2
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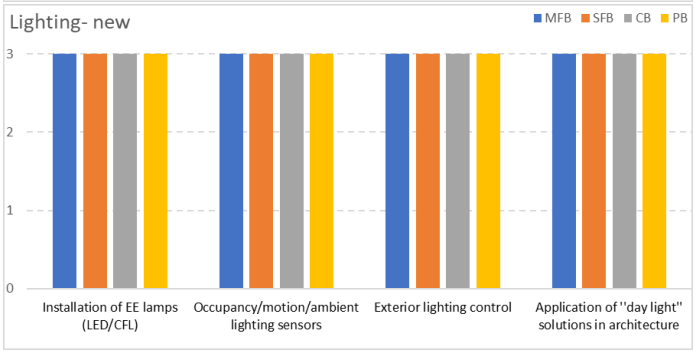
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture


Lighting- new
MFB
SFB
CB
PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture

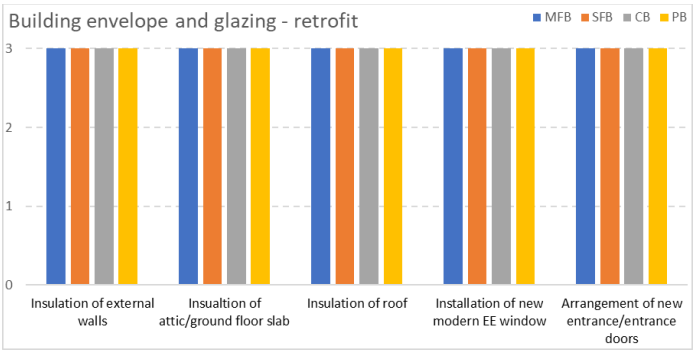
NETHERLANDS

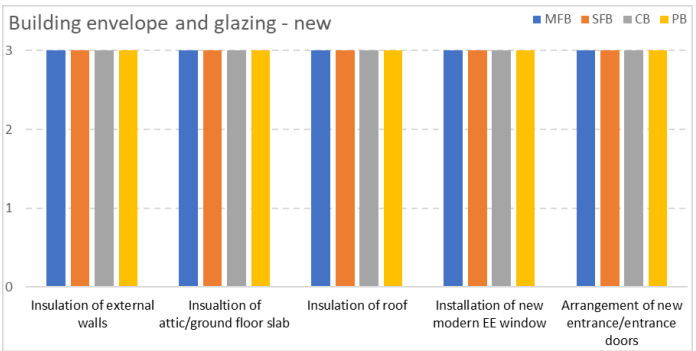
OVERVIEW

In 2013, the buildings sector accounted for approximately 30% of all energy consumed in the Netherlands. The majority of this 30% is used for heating, cooling, and electricity for appliances and lighting. Electricity use in the Netherlands is on the rise, as residents rely more on electrification of household chores (i.e., dish washers & clothes dryers), electronic devices become more prevalent, and bicycles are increasingly augmented with electric power. At the same time, the consumption of gas for space conditioning in residential buildings has been declining, due to the installation of more efficient insulation.

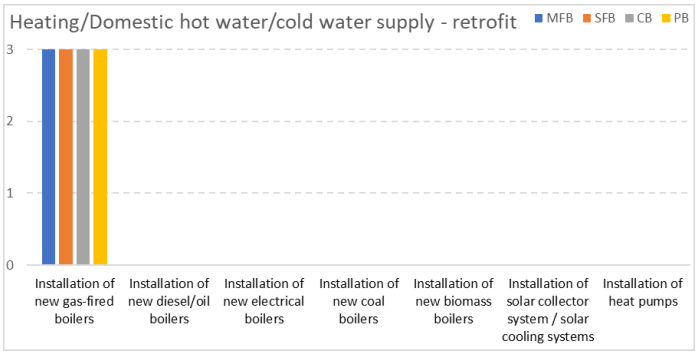
Nearly a third of the total stock of residential buildings in the Netherlands is non-profit housing. The fact that non-profit housing dominates the market should facilitate renovating a substantial proportion of existing dwellings to improve energy efficiency, as obtaining a good ROI is less of a concern. This is a unique opportunity for the Netherlands to reduce energy consumption and greenhouse gas emissions on a national scale.

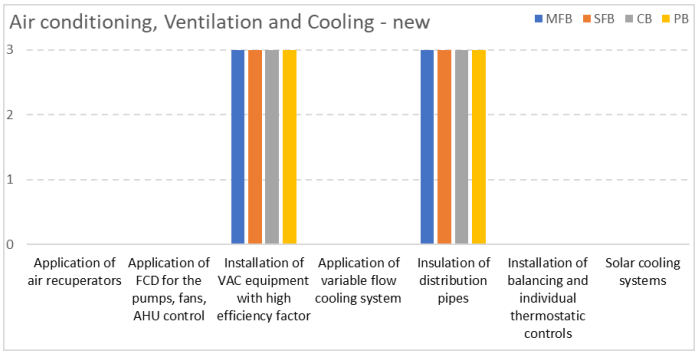
There have been several initiatives to promote energy efficiency renovation of existing dwellings, but these have been hindered by insufficient assessment and monitoring. The Dutch government should focus more on monitoring energy improvements in renovations, as it can provide valuable information concerning technical characteristics and the future potential of the measures applied.

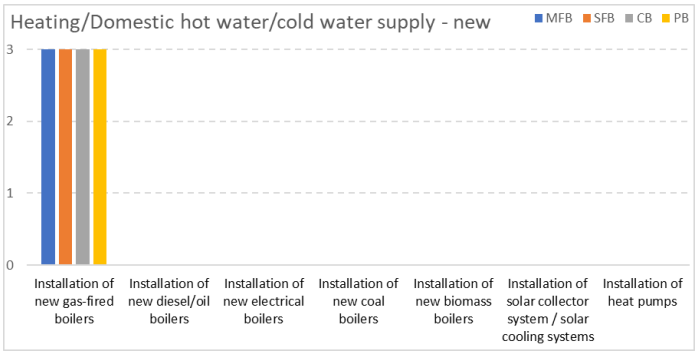


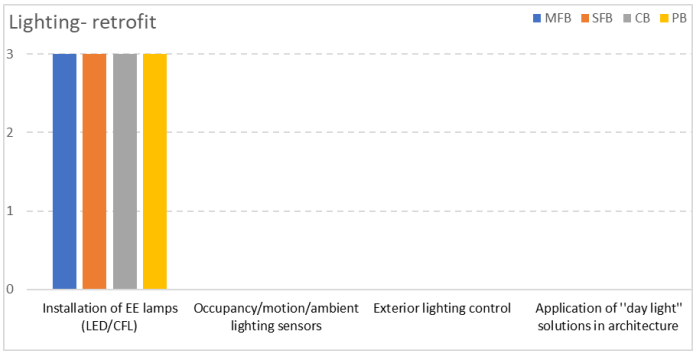


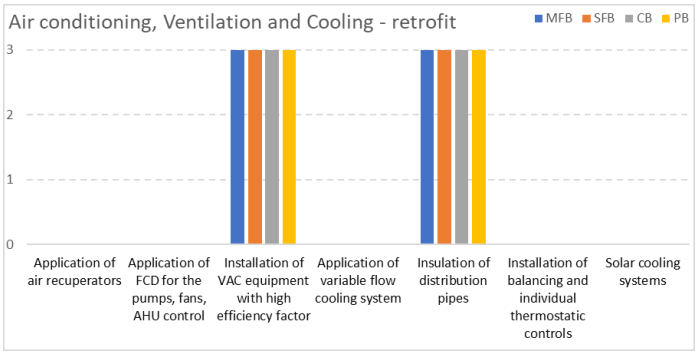
	Netherlands							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	NI	NI	NI	NI	NI	NI	NI	NI
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

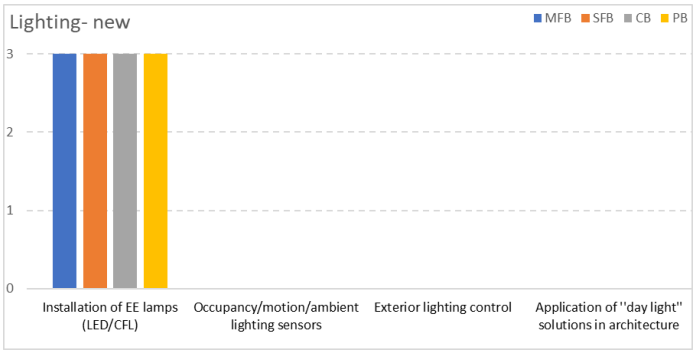

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

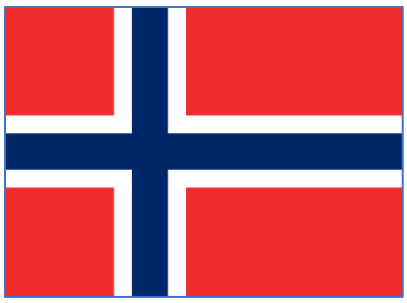

Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture



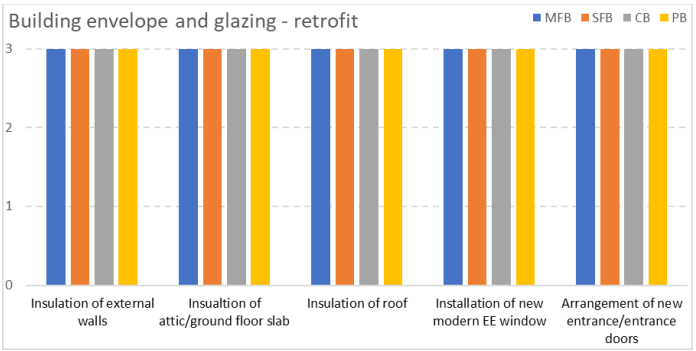
NORWAY

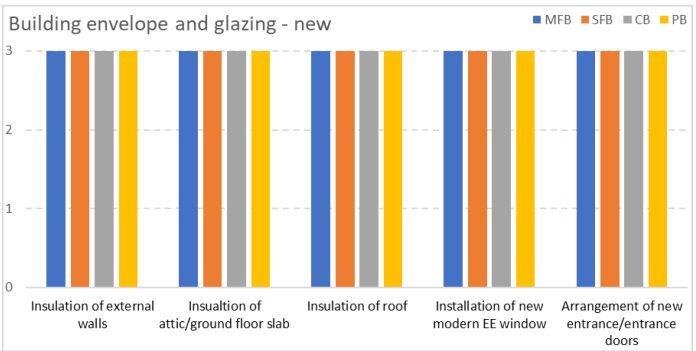
OVERVIEW

The buildings sector consumes approximately 40% of energy in Norway; as the largest consumer, ensuring buildings are energy efficient is, therefore, crucially important. Tools the Norwegian government uses to promote energy efficiency include building regulations, labeling schemes, and informational awareness campaigns. For example, building standards have long been an effective tool in Norway; 1949 saw the introduction of the first energy requirements.

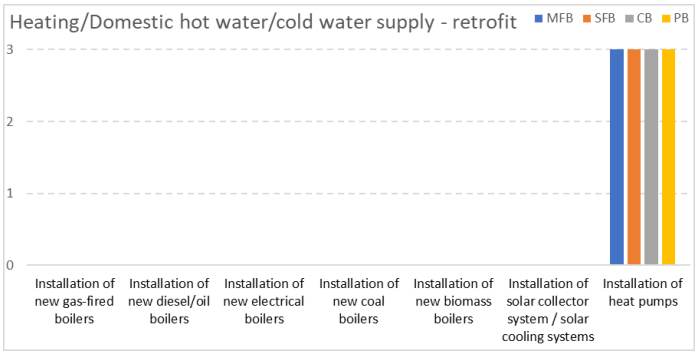
Space heating of buildings is particularly important, with residences, commercial, and public buildings predominantly relying upon oil-fired boilers. This has been changing in recent years, as buildings are switching from fossil fuels to electric boilers, district heating, and heat pumps. Fuel oil and kerosene sales have decreased more than 70% below the 1990 levels. This shift is being driven by higher taxes on fossil fuels, and market expectation of an eventual ban on heating buildings with energy from fossil fuels. While this is a very positive transition, care must be taken to limit reliance on electric heating, to avoid undue strain on the electric utility grid in winter.

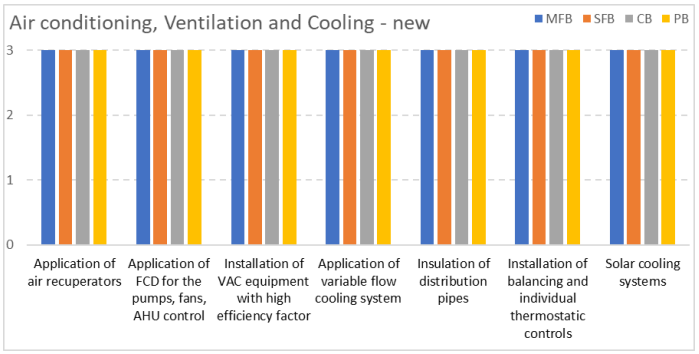
In 2014, the Ministry of Local Government and Modernisation and the Ministry of Petroleum and Energy jointly published district heating system guidelines, detailing how municipalities can require mandatory connection to a local district heating system for new buildings. These guidelines encourage municipalities to modify the requirements to suit local requirements – for example, defining which types of buildings must be connected.

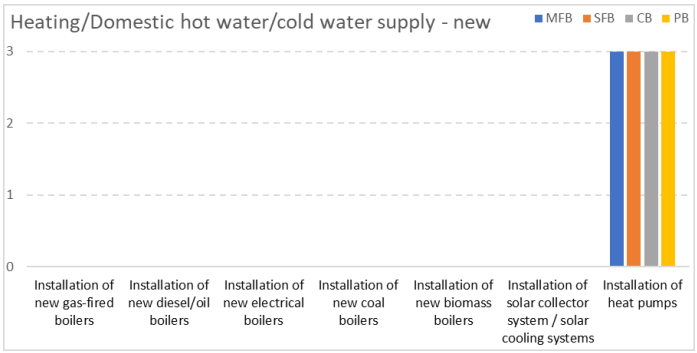


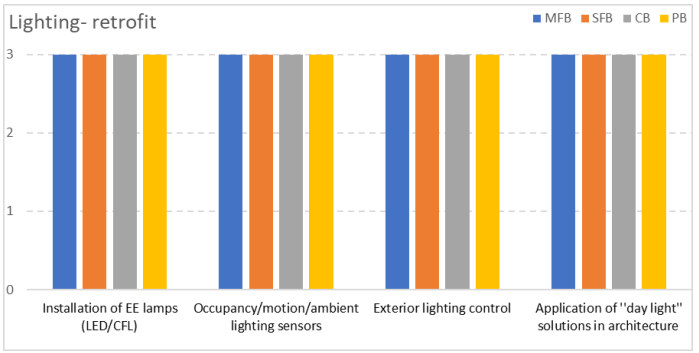


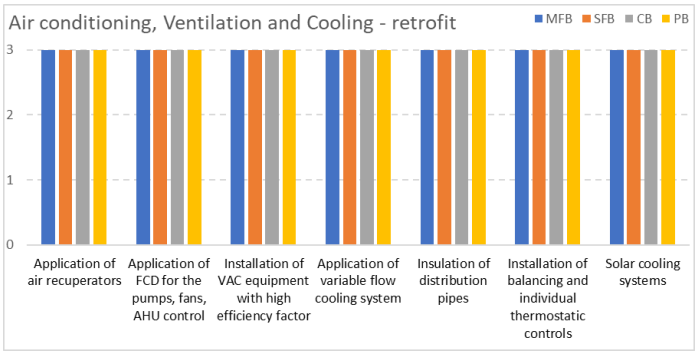
	Norway							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	3	3	3	3	3	3	3	3
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	3	3	3	3	3	3	3	3
Exterior lighting control	3	3	3	3	3	3	3	3
Application of "day light" solutions in architecture	3	3	3	3	3	3	3	3

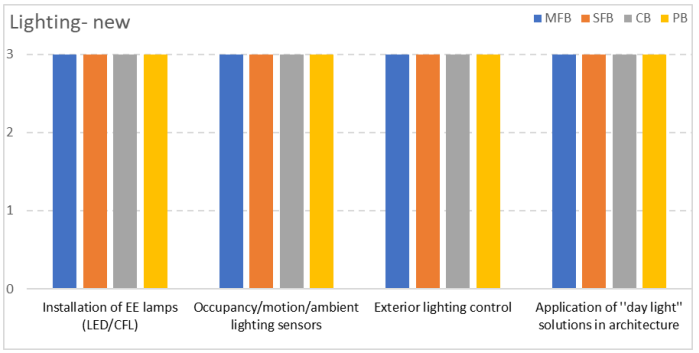

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

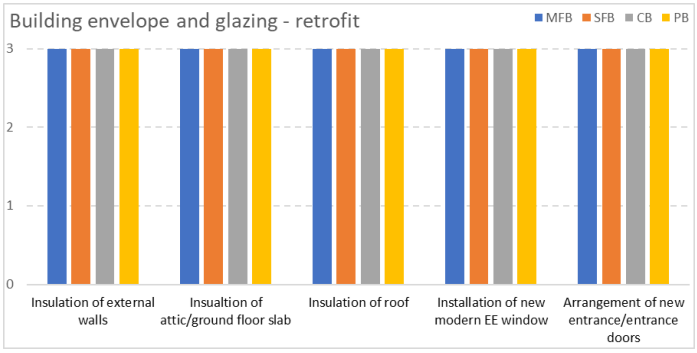

Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

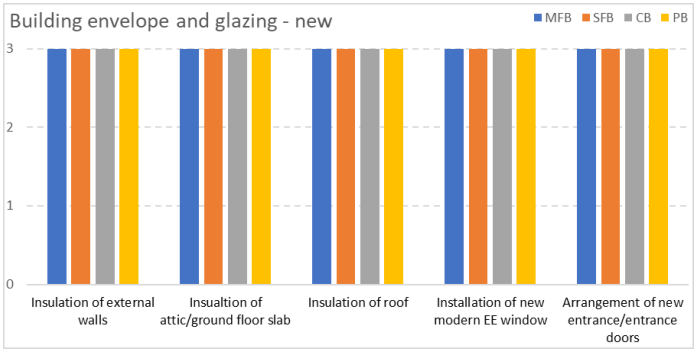
PORTUGAL

OVERVIEW

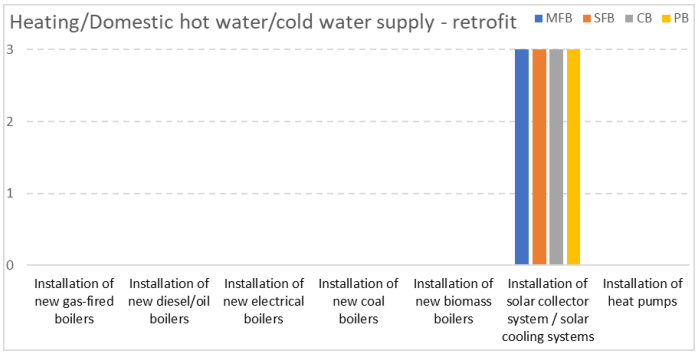
In Portugal, the buildings sector is responsible for approximately 30% of final energy consumption. The DGEG estimates that energy efficiency measures could cut half of this consumption by half. The government has set a target of an energy rating of at least class B for 268,000 residential units by 2020, applicable to both new construction and large-scale renovations. This target was determined within the context of certification systems, considering the number of certified buildings in 2012, forecast scenarios for the evolution of the Portuguese economy, and dynamics of the domestic real estate market. Between 2007 and 2014, annual certification records showed an annual average of 17,000 residential buildings meeting this target; approximately 8% of these achieved through large-scale renovation.

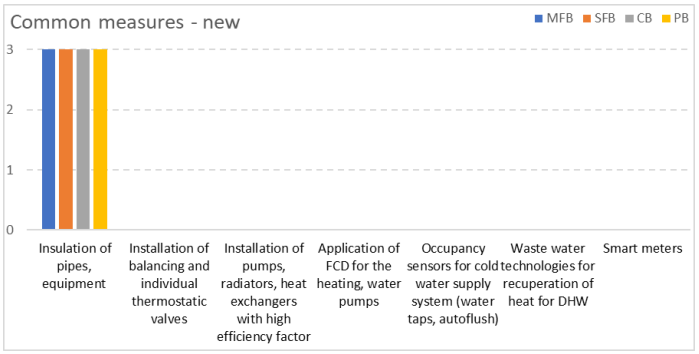
Another focus for the government has been the integration of thermal renewable energy sources (such as solar), largely targeting residential and services buildings, and equipment. This focus was formalized in 2009 with the Solar Thermal Programme initiative, which created a framework of incentives to encourage installation of renewable water heating for residential buildings. This initiative was subsequently extended to other sectors. The cumulative impact of the implantation measures is estimated to have reached 41,160 TOE, representing 56% of the reference target for 2016.

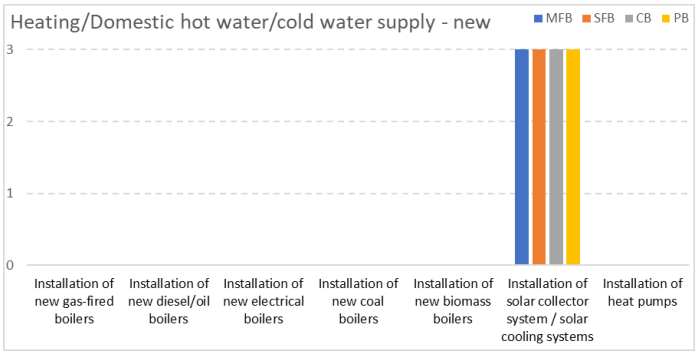


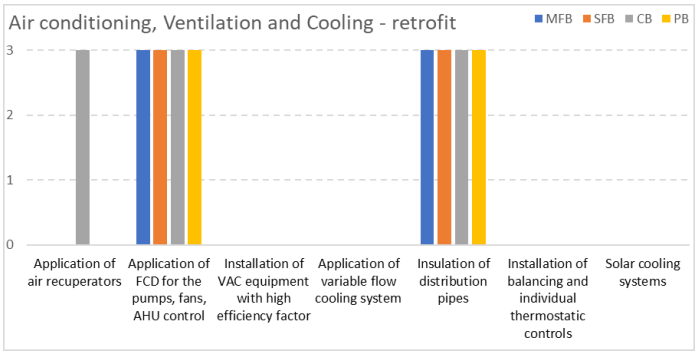


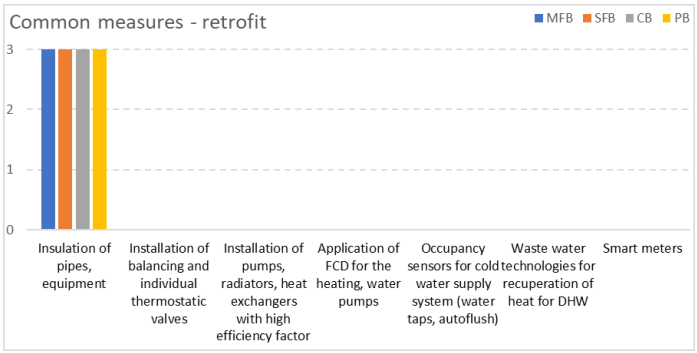
	Portugal							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	0	0	0	0	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	3	0	0	0	3	0
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	0	0	0	0	0	0	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

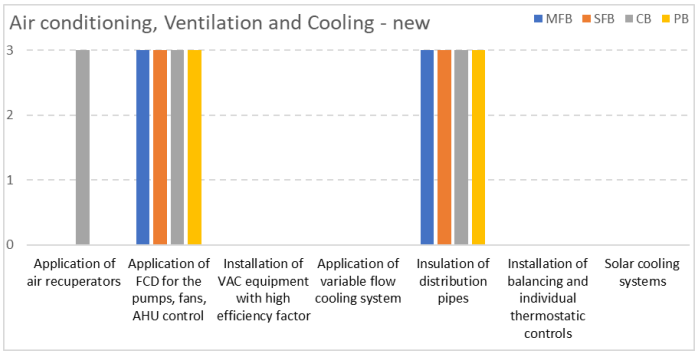

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

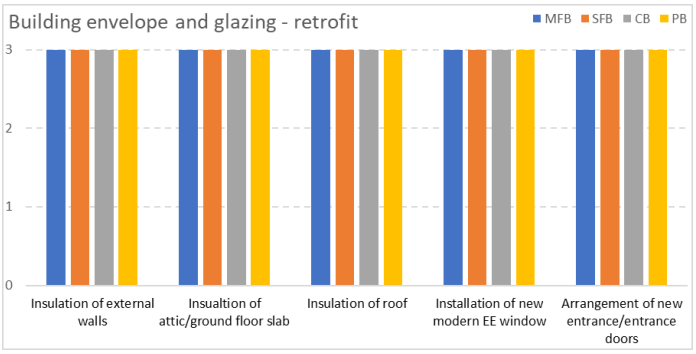
SPAIN

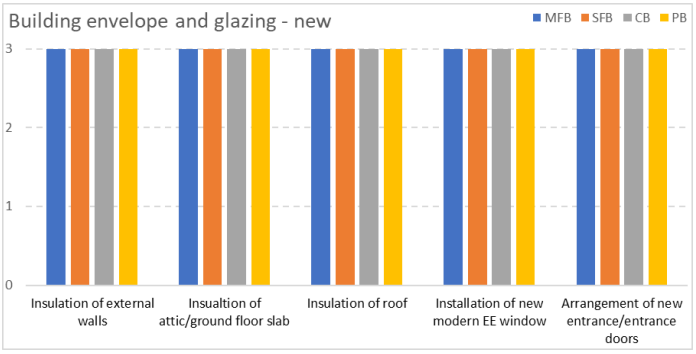
OVERVIEW

The buildings sector in Spain is currently responsible for 31% of energy consumption, with nearly two thirds of this energy consumed for heating, cooling, and ventilation. In 2013 energy consumption in buildings accounted for nearly 65% of electricity consumption. As compared to the whole of the European Union, Spain exhibits substantially lower energy consumption in the buildings sector (40% for EU), but substantially higher reliance on electricity (60% for EU).

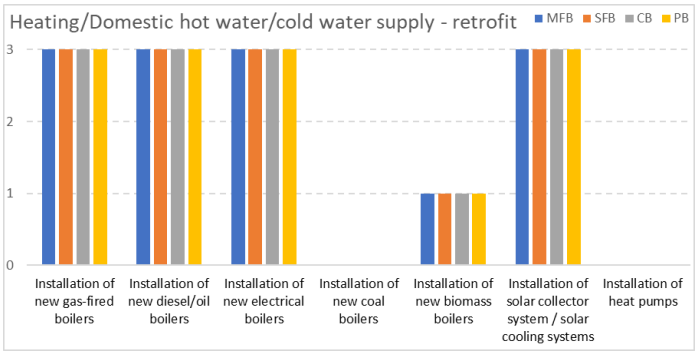
Consistent with neighbouring countries, energy consumption in buildings has been trending downwards. Residential demand in 2013 decreased by approximately 3% (15,015 Ktoe) – about 19% of total final energy consumption. This reduction was associated with reduced consumption of both electricity (3%) and natural gas (9%), meeting 63% of Spanish household demand. The majority (58%) of residential energy demand was met with fossil and renewable fuels, with electricity gaining ground to meet the remaining 42%. Electricity predominantly replaced oil as a fuel source.

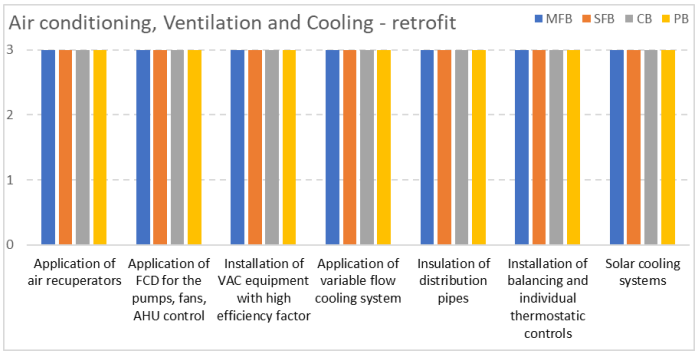
The observed reduction in consumption can be partly attributed to saturation of electrical equipment in Spanish households, as they have been replaced with appliances and lighting that uses energy more efficiently.

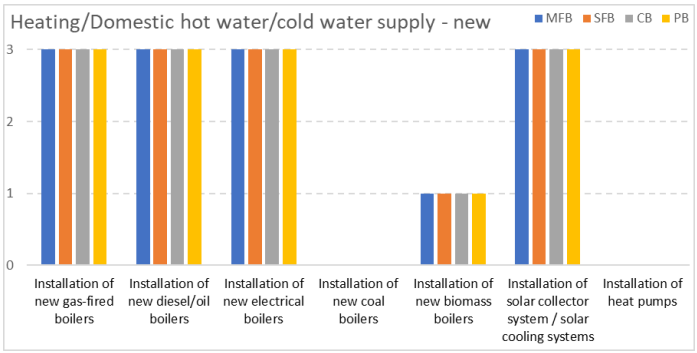


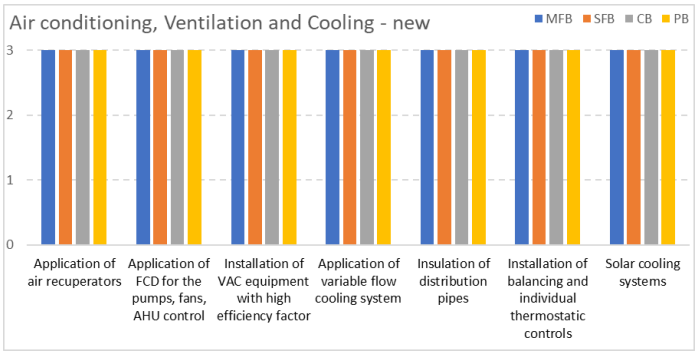


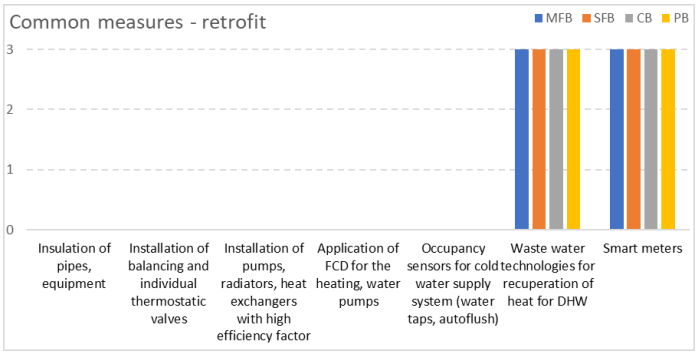
	Spain							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	3	3	3	3	3	3	3	3
Installation of new electrical boilers	3	3	3	3	3	3	3	3
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	1	1	1	1	1	1	1	1
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	3	3	3	3	3	3	3	3
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	3	3	3	3	3	3	3	3
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

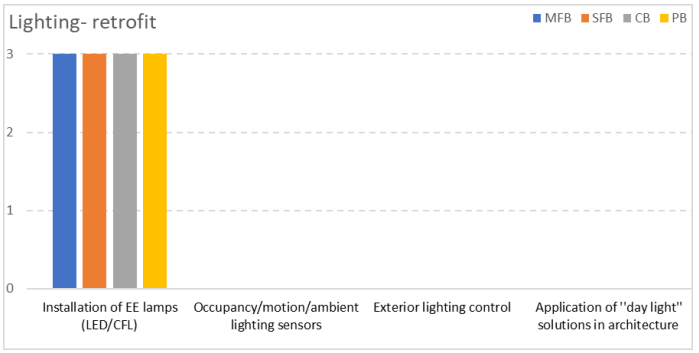

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

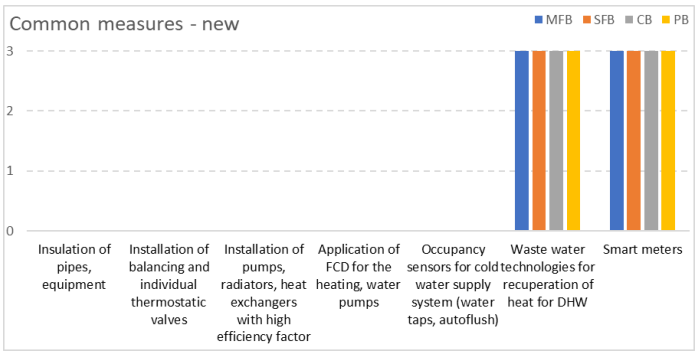

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

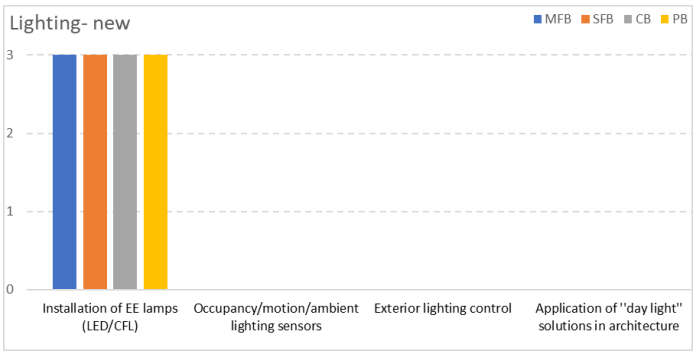

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

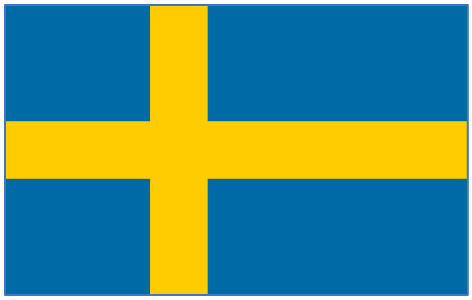

Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture



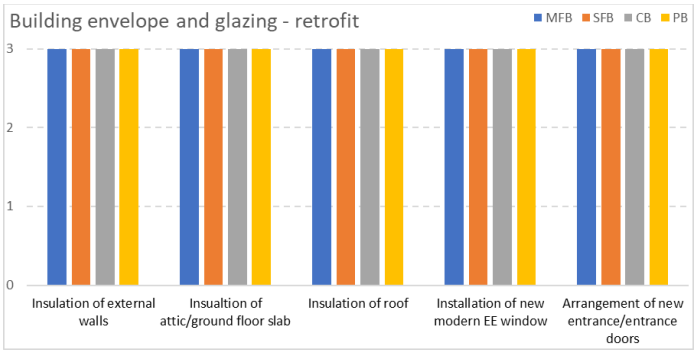
SWEDEN

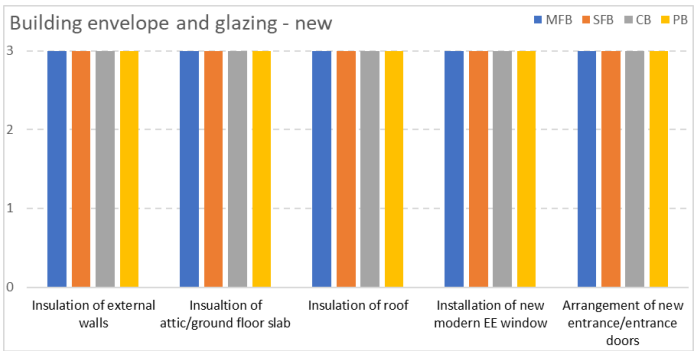
OVERVIEW

Roughly 30% of Sweden's end-use of energy is consumed by residential and commercial buildings, which account for around 7% of total greenhouse gas emissions. In 2008, the Swedish government set up its Delegation for Sustainable Cities, uniting the state, business, and local government to collaborate under a national platform for sustainable urban development. This platform intends to deploy investment programmes and encourage urban development projects targeted at improving the environment, reducing the impact of climate change, and facilitating the export of locally-developed innovations in environmental technology.

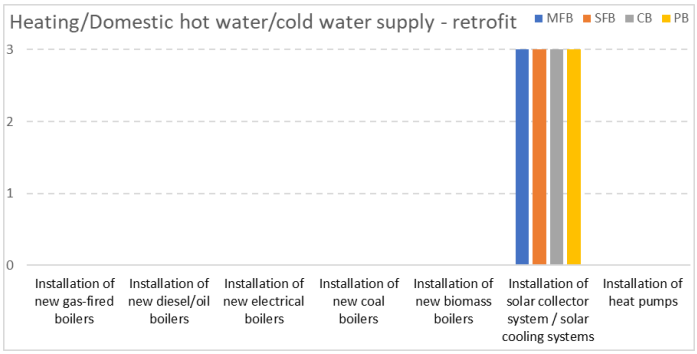
The Swedish government's Energy Agreement mandates the complete phasing out of fossil fuels for heating by 2020. Energy use by both residential and commercial buildings is to be reduced by 20% by 2020, and 50% by 2050, relative to 1995 levels. Sweden has dramatically reduced its dependence on oil; 40% of energy supply is currently from renewable sources, with the intention to increase this to 50% by 2020. Much of this energy system transition is driven by Swedish municipalities, and sustainable development has become a mainstream component of regular activities.

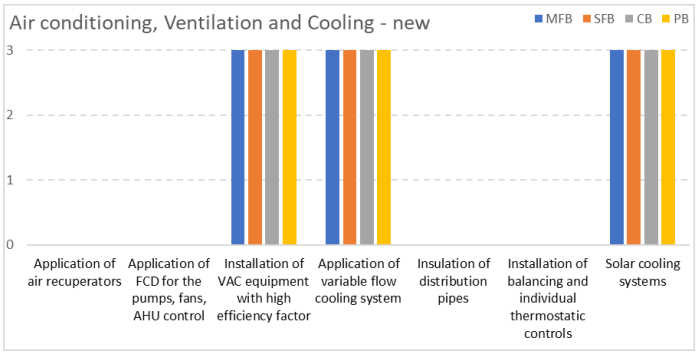
District heating has been established in large parts of Sweden and serves 90% of all multi-family housing. The share of fossil fuels for district heating has been reduced from 80% in 1990 to less than 13% today, largely by transitioning to biofueled combined heat and power plants, and the use of surplus industrial heat.

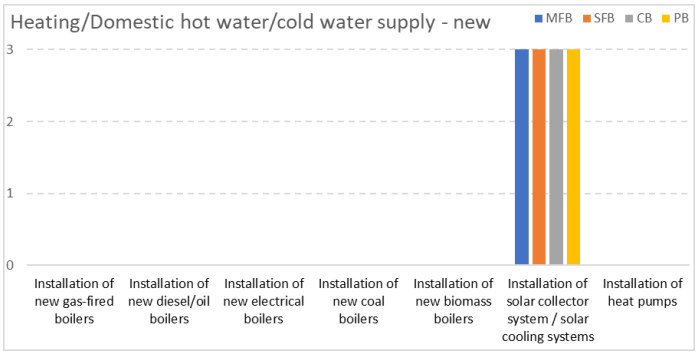


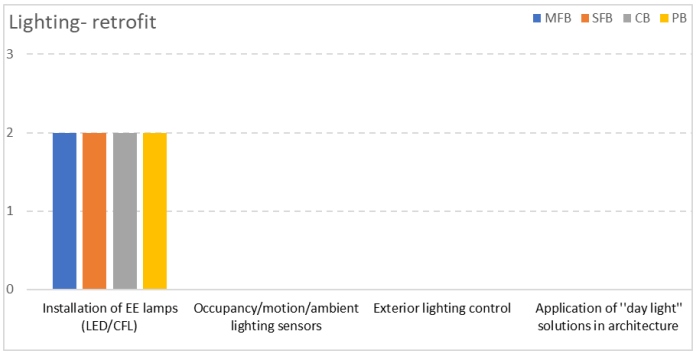


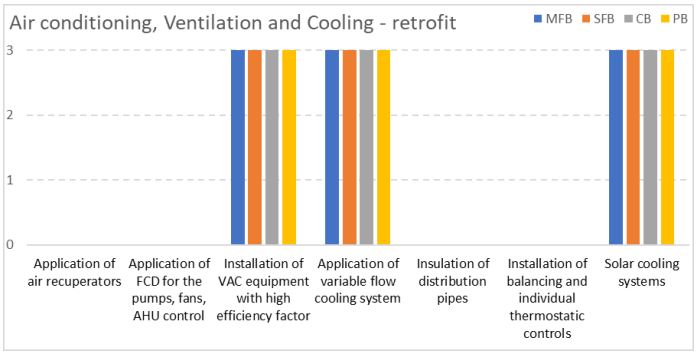
	Sweden							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	3	3	3	3	3	3	3	3
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	2	2	2	2	2	2	2	2
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

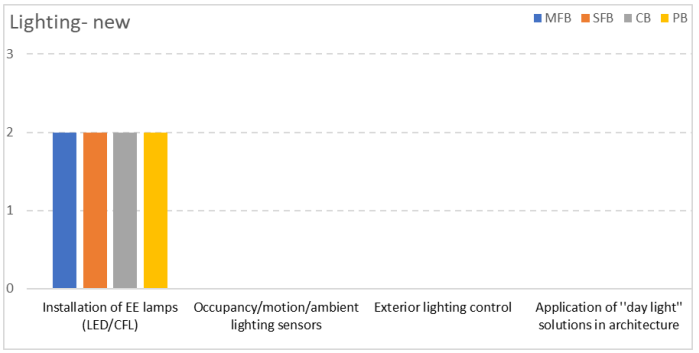

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

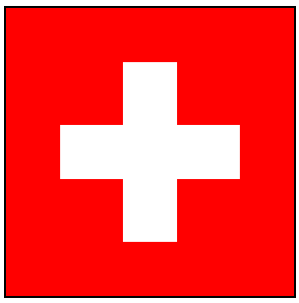

Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

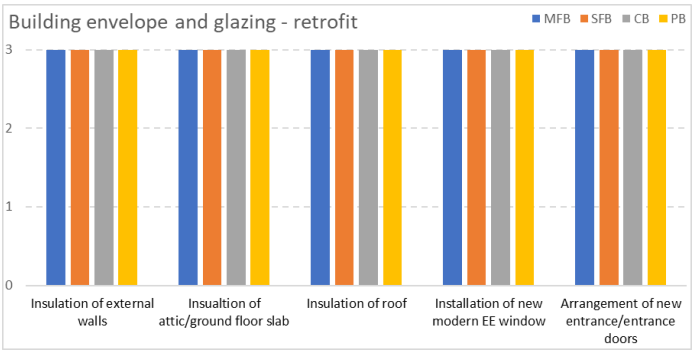


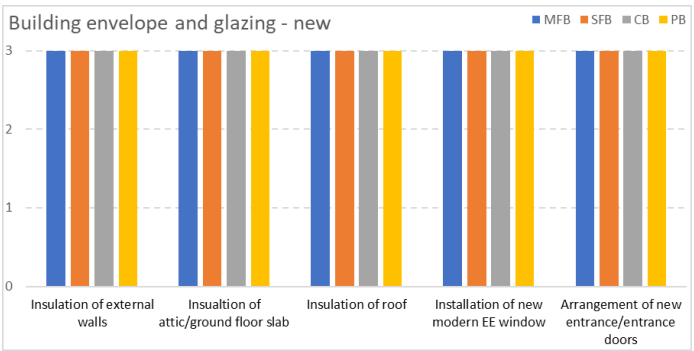
SWITZERLAND

OVERVIEW

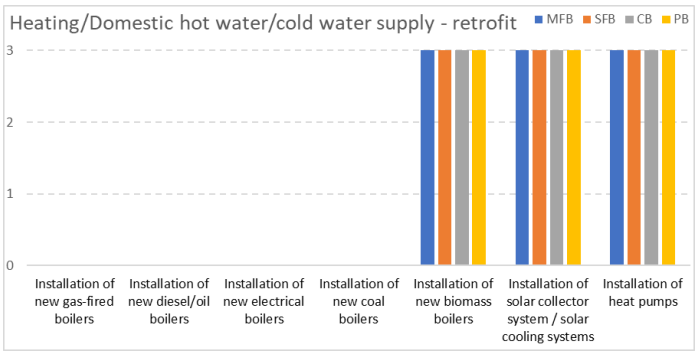
Nearly one fifth of the Swiss building stock was constructed before 1920. The building stock then grew sharply between the 1960s and 1990s, constituting approximately 33% of the building stock. Residential buildings account for about 75% of the total building area of 623 million m^2, so renovation of residential buildings is a particularly important target for improving energy efficiency. Residential buildings are split nearly evenly between single-family and multi-family residences; with 35% currently owner-occupied. Switzerland's owner occupancy rate is one of the lowest in Europe.

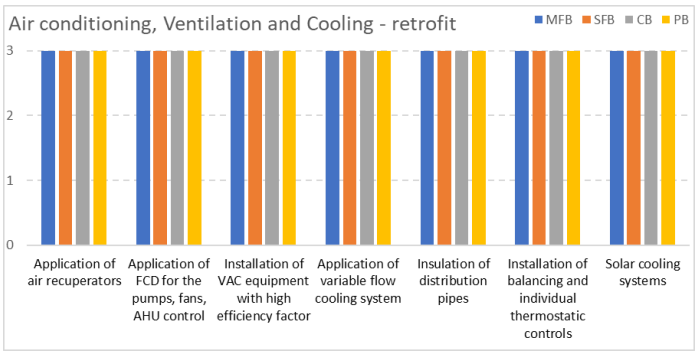
The four building energy efficiency technologies that are perceived to be the best for both new construction and deep retrofits are solar photovoltaic systems, multiply-glazed windows, brine heat pumps, and use of recycled materials. Energy supply technologies complement high mandatory standards for building shell insulation. District heating is mainly used in large cities, and is being expanded to include renewable energy sources. There is strong potential to combine low temperature / low energy district heating grids with tailored heat pumps. This innovation may be an important emerging low-carbon solution in Switzerland. The Swiss construction sector has a strong preference for low-carbon building materials (wood, low-carbon concrete recycled materials). They are seen to be a crucial aspect of low-carbon buildings, from a holistic perspective.

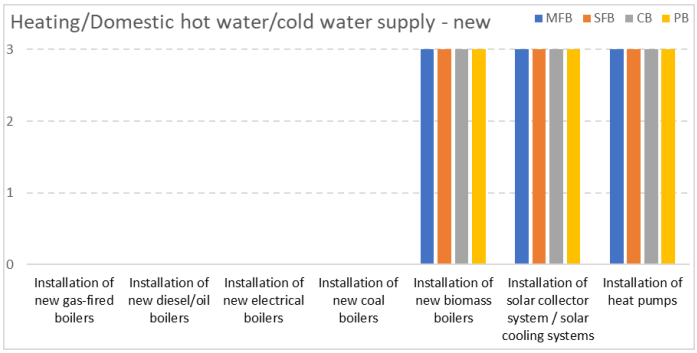


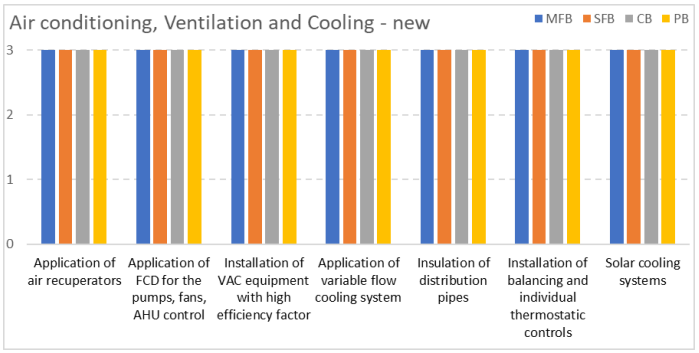


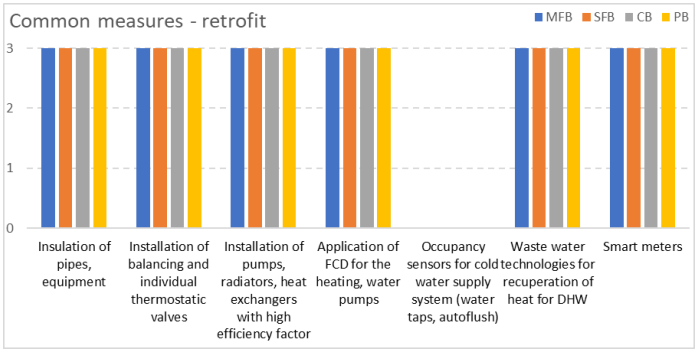
	Switzerland							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	3	3	3	3	3	3
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	3	3	3	3	3	3	3	3
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	3	3	3	3	3	3	3	3
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

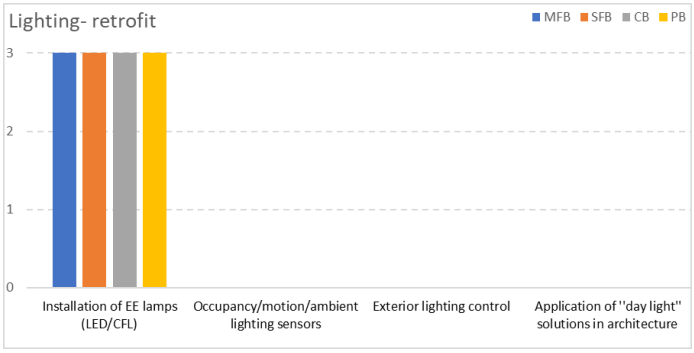

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

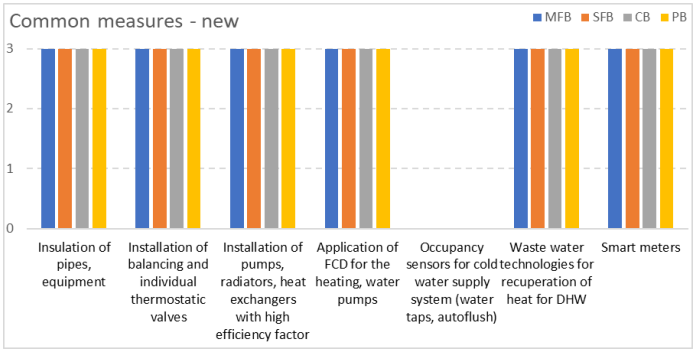

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
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0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
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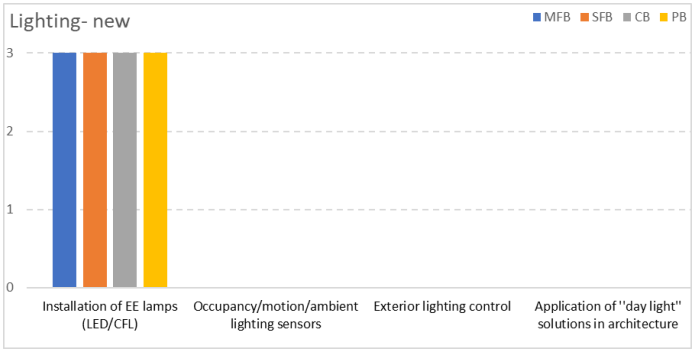
Smart meters

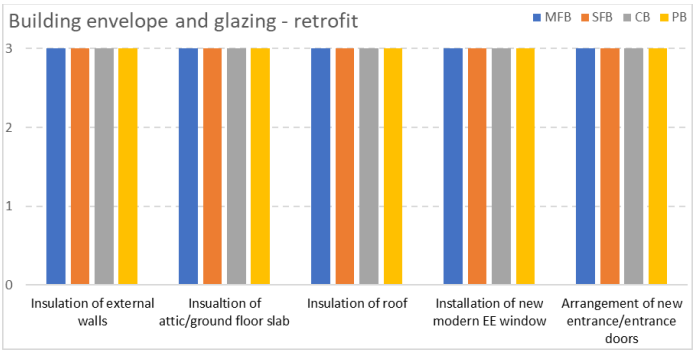

Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

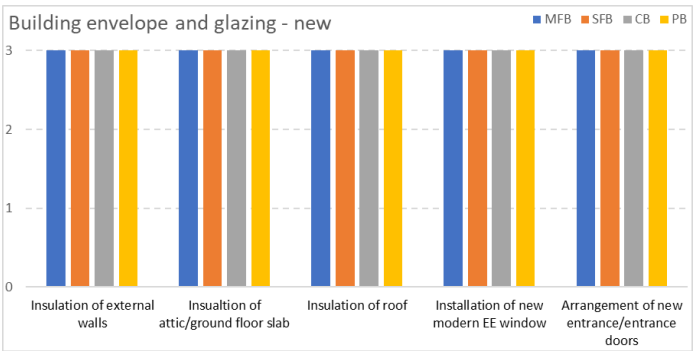
UNITED KINGDOM

OVERVIEW

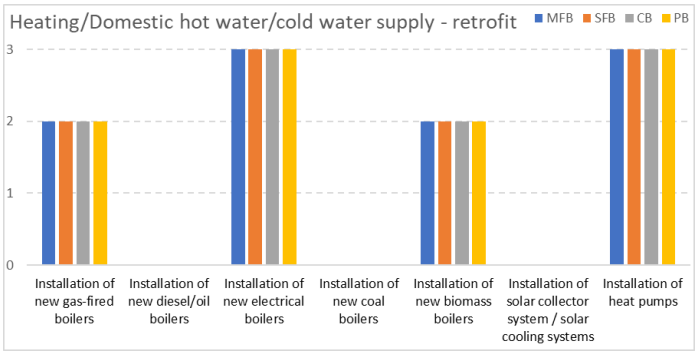
Energy consumption in the UK is on a long-term downward trend; primary energy consumption declined by almost 2% in 2016, while final energy consumption increased by only slightly less. These same quantities dropped by 16% and 9%, respectively, from 2007 levels. Household energy consumption rose by 3% - though only 1% when adjusted for temperatures – possibly due to lower domestic fuel prices. Since 2007, however, household energy consumption decreased by 8%; on a temperature-adjusted basis, this translates into a 13% reduction.

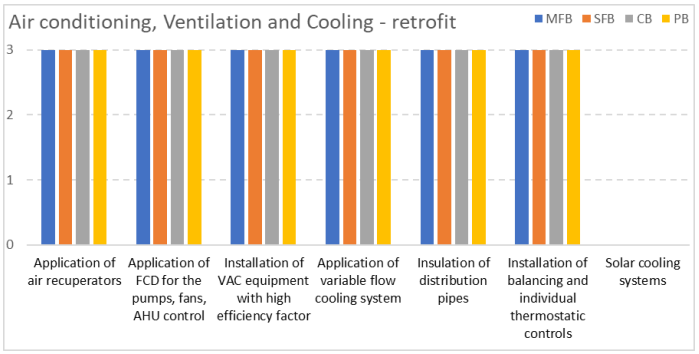
As part of the 2015 Spending Review, the British government announced £295 million of new funding earmarked for financing public-sector energy efficiency projects. Scotland and Wales will receive £40 million of the Spending Review award. In Wales, for example, the Green Growth Wales program provides interest-free financing for energy efficiency projects undertaken by public-sector organisations. To implement Article 8 (4-6) of the EU Energy Efficiency Directive (2012/27/EU), the UK has established the Energy Savings Opportunity Scheme (ESOS), a mandatory energy assessment scheme for UK organisations. ESOS is administered by the Environment Agency. Qualifying organizations must perform ESOS assessments every 4 years, auditing energy used by buildings, industrial processes, and transport to identify cost-effective energy reduction measures.

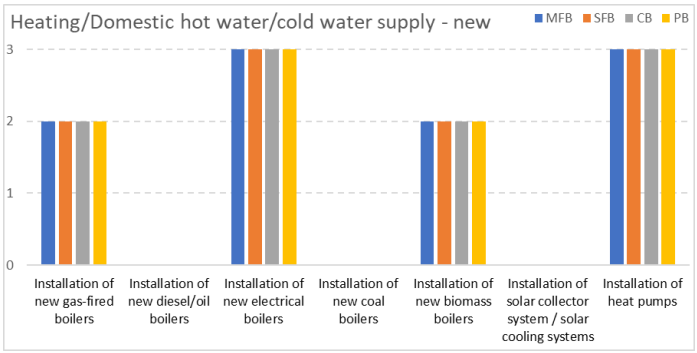


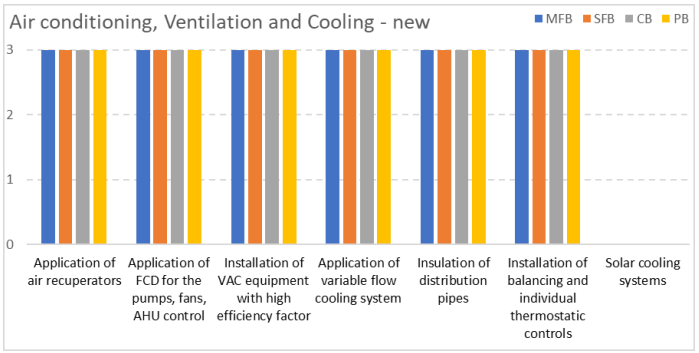


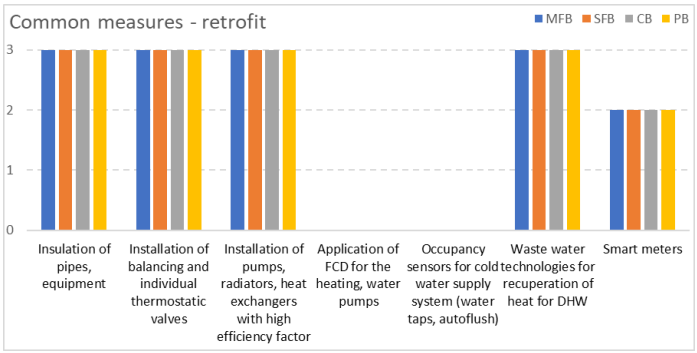
	United Kingdom							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	2	2	2	2	2	2	2	2
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	3	3	3	3	3	3	3	3
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	2	2	2	2	2	2	2	2
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	1	2	1	2	2	2	2	2
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	2	2	2	2	2	2	2	2
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	3	3	3	3
Exterior lighting control	0	0	0	0	3	3	3	3
Application of "day light" solutions in architecture	0	0	0	0	3	3	3	3

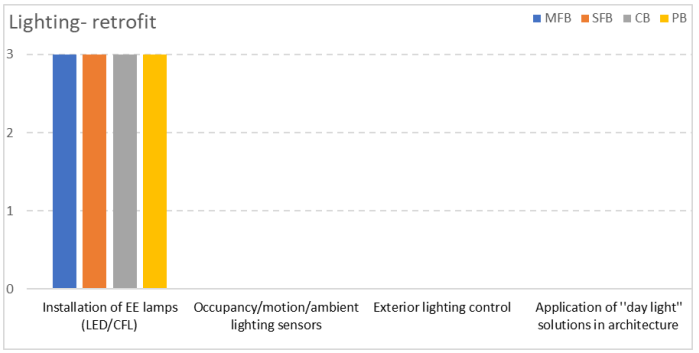

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

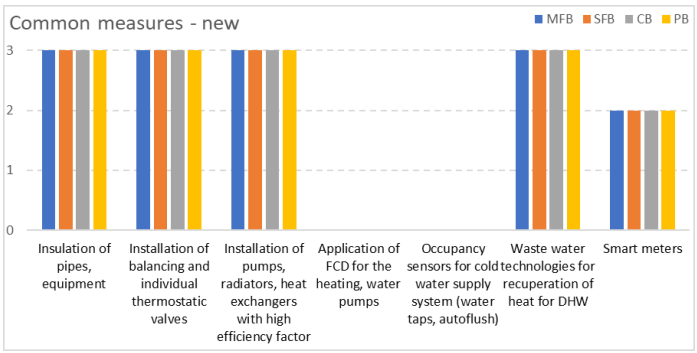

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
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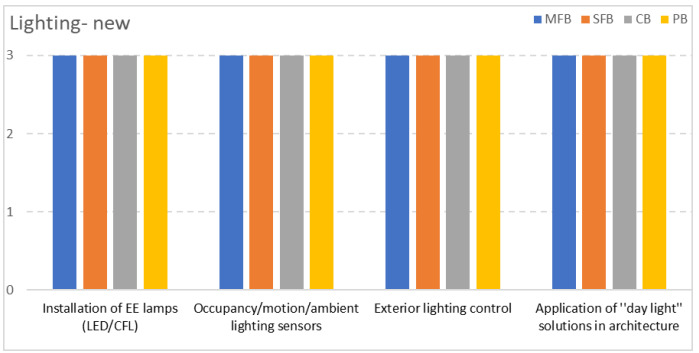
Smart meters


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

SUBREGION B

Bulgaria

Croatia

Cyprus

Czech Republic

Estonia

Hungary

Latvia

Lithuania

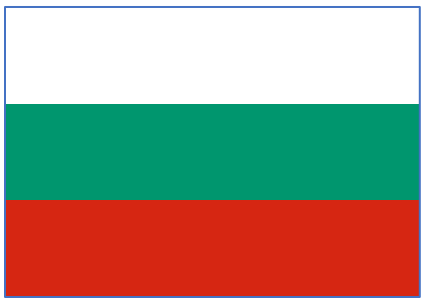
Malta

Poland

Romania

Slovakia

Slovenia

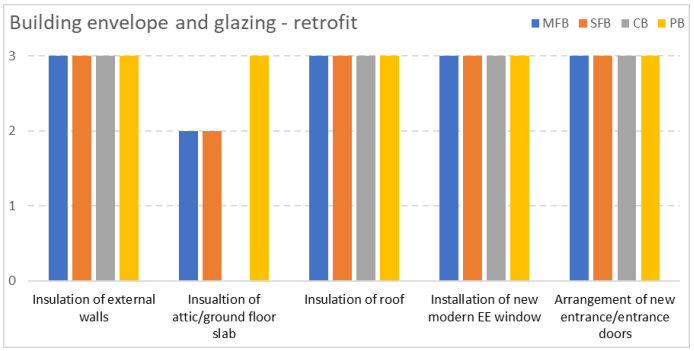


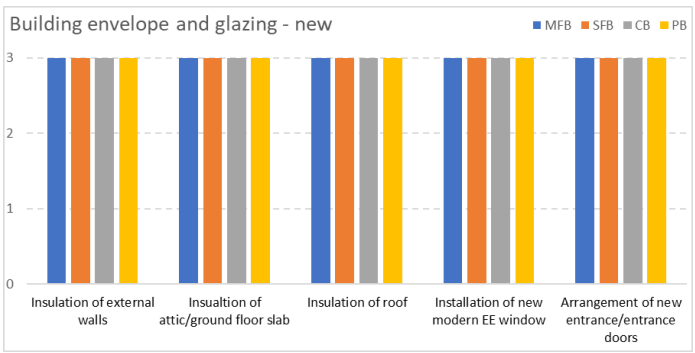
BULGARIA

OVERVIEW

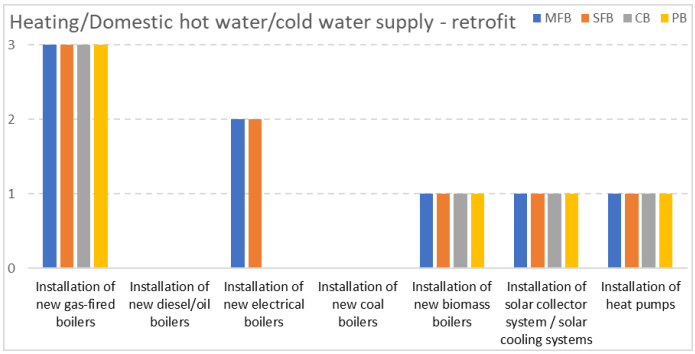
Bulgaria relies on coal and nuclear power for baseload energy generation. Lignite coal is a major local resource; the country imports much less coal than the EU average. These two sources allow the country a degree of energy independence. Otherwise, Bulgaria imports natural gas to meet the remainder of its local energy demand.

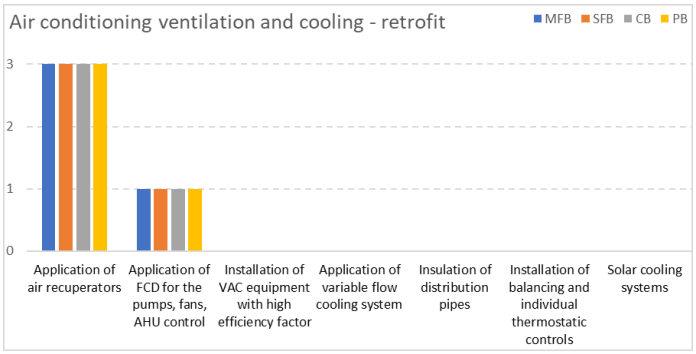
Bulgaria's primary legislation addressing renewable energy is the 2008 Law on the Renewable and Alternative Sources of Energy and Biofuels, promoting energy efficiency, renewable energy sources, and combined heat and power technology. Bulgaria has fully transposed in the legislation all requirements for energy efficiency and energy efficiency in buildings provided by Directive 2009/31/EC and Directive 2012/27/EC. Since 2007, the government has developed many supporting schemes for public buildings (mostly municipal buildings – schools, hospitals, administrative offices, etc.) using Structural and Cohesion Funds of the EU. In 2015 Bulgaria launched the National Programme for Energy Efficiency of Multi-Family Residential Buildings. Under this program, more than 2,000 multi-family residential buildings are expected to undergo renovation. There are various supporting schemes for energy efficiency improvements in buildings including Structural and Cohesion Funds of the EU, EEA Grants scheme etc. with direct subsidy and loans from the Bulgarian Energy Efficiency and Renewables Fund.

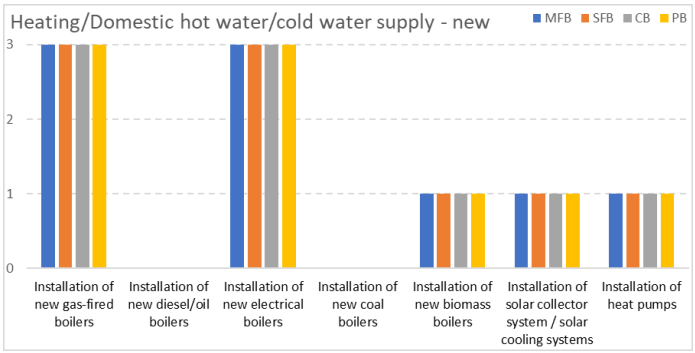


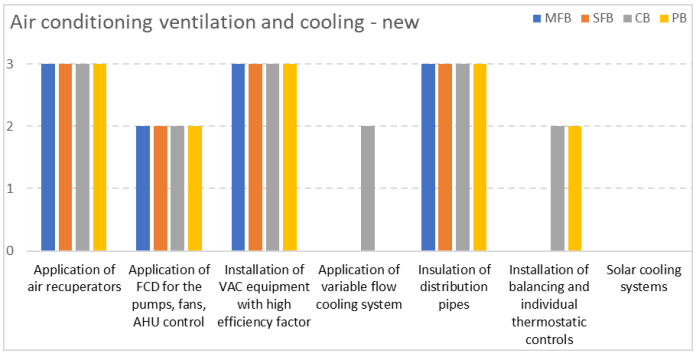


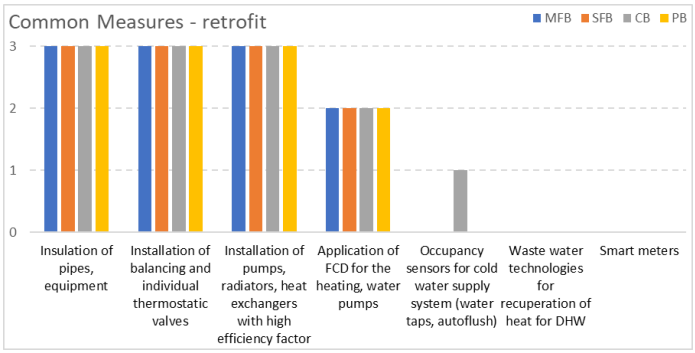
	Bulgaria							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	2	2	0	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	2	2	0	0	3	3	3	3
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	1	1	1	1	1	1	1	1
Installation of solar collector system / solar cooling systems	1	1	1	1	1	1	1	1
Installation of heat pumps	1	1	1	1	1	1	1	1
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	1	1	1	1	1	1	1	1
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	2	2	2	2	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	1	0	0	0	1	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	NI	NI	NI	NI
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	1	1	1	1	2	2	2	2
Installation of VAC equipment with high efficiency factor	NI	NI	NI	NI	3	3	3	3
Application of variable flow cooling system	NI	NI	NI	NI	NI	NI	2	NI
Insulation of distribution pipes	0	0	0	0	3	3	3	3
Installation of balancing and individual thermostatic controls	NI	NI	NI	NI	NI	NI	2	2
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	2	2	3	3	2	2	3	3
Occupancy/motion/ambient lighting sensors	1	NI	2	1	1	NI	2	1
Exterior lighting control	0	0	1	0	0	0	1	0
Application of "day light" solutions in architecture	NI	NI	NI	NI	NI	NI	NI	NI

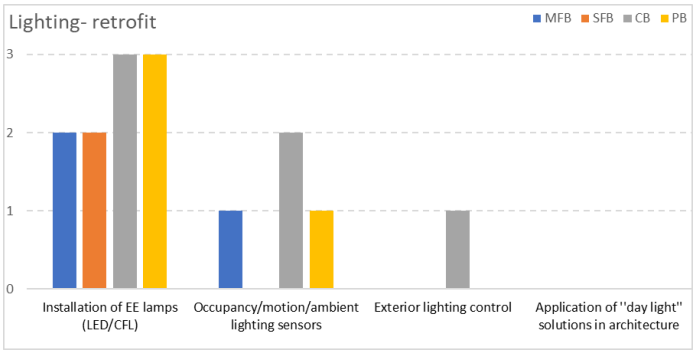

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

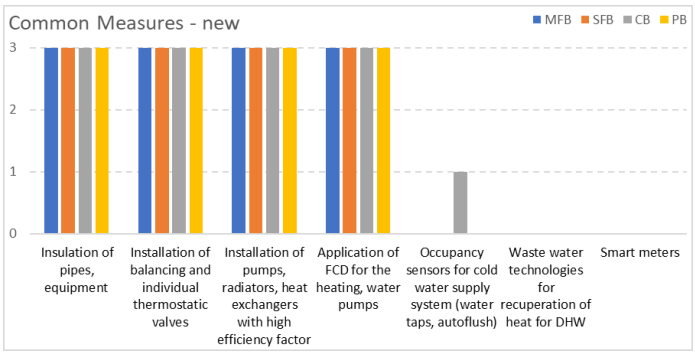

Air conditioning ventilation and cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning ventilation and cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common Measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common Measures - new
MFB SFB CB PB
3
2
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Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
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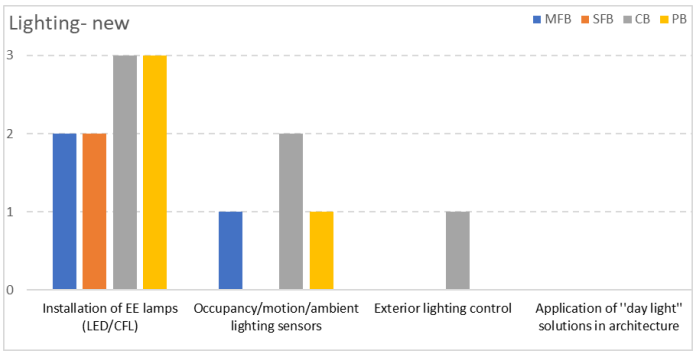
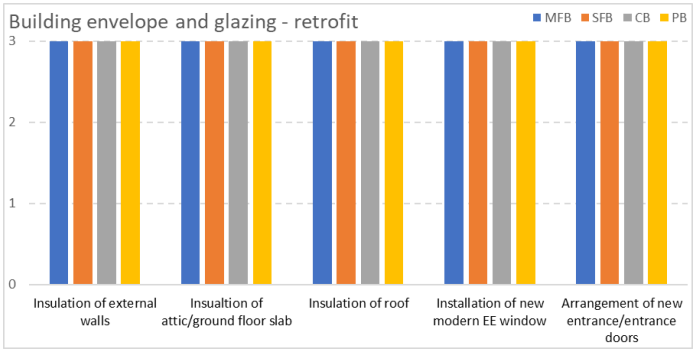

Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

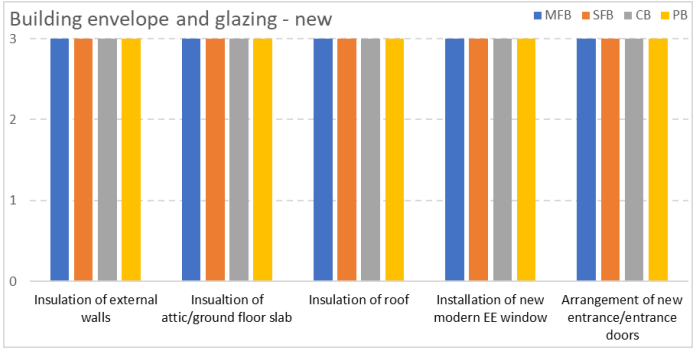
CROATIA

OVERVIEW

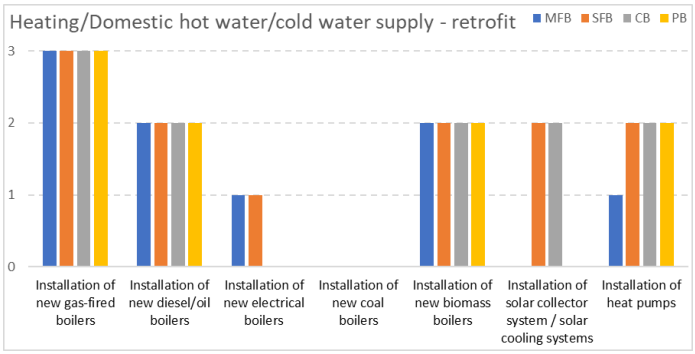
The share of total final energy consumption in Croatia's buildings sector was 38% in 2013, the highest across all sectors (followed by transport). The share of space heating in total energy consumption of households in 2013 was 68.0%, the share of water heating was 8.1%, the share of cooking was around 9%, while the share of electrical appliances was 12.4%. Air cooling had the lowest share – at 2.4%. Considering the high amount of energy consumption in the buildings sector, the government is planning on continuing energy efficiency-related promotions. These include: the establishment of an internet platform for information on available energy efficiency mechanisms, financial instruments, and legal frameworks.

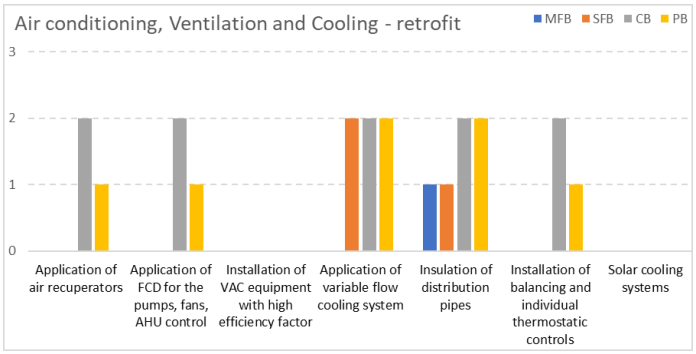
For the purposes of promoting alternative systems in the designs of new buildings, a secondary designer is required to develop an alternative system study prior to developing the main building design. The study provides guidance to the primary designer on how to develop the project. Application of solutions for alternative systems was made mandatory as of January 2015. Measures aimed at achieving energy savings in households represent a significant goal of Croatian energy policy, in accordance with the Energy Development Strategy of the Republic of Croatia. Several programs for refurbishment of single-family houses, multi-family residences, public, and commercial buildings are underway and planned for 2020.

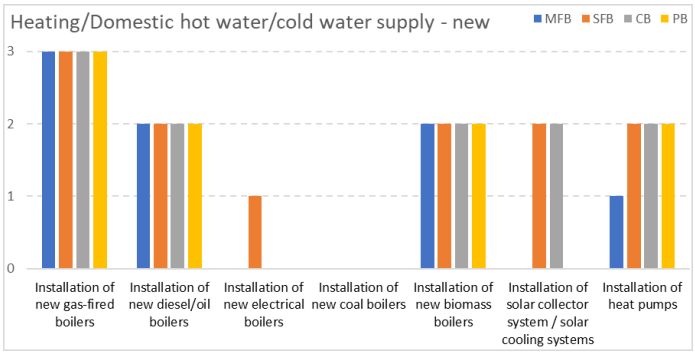


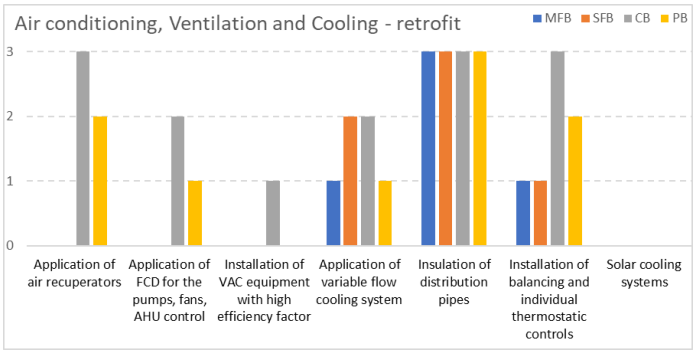


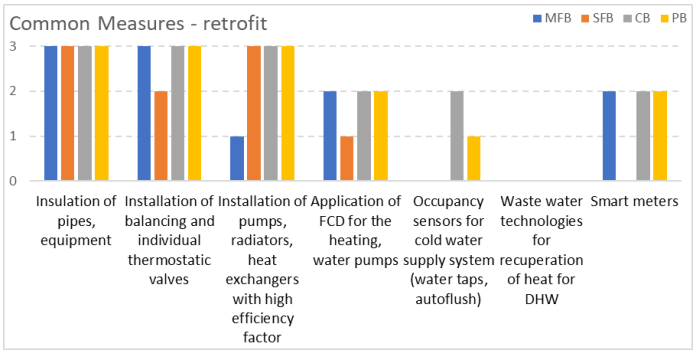
	Croatia							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	2	2	2	2	2	2	2	2
Installation of new electrical boilers	1	1	0	0	0	1	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	2	2	2	2	2	2	2	2
Installation of solar collector system / solar cooling systems	0	2	2	0	0	2	2	0
Installation of heat pumps	1	2	2	2	1	2	2	2
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	2	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	1	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	2	1	2	2	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	2	1	0	0	2	2
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	2	0	2	2	2	1	2	2
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	2	1	0	0	3	2
Application of FCD for the pumps, fans, AHU control	0	0	2	1	0	0	2	1
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	1	0
Application of variable flow cooling system	0	2	2	2	1	2	2	1
Insulation of distribution pipes	1	1	2	2	3	3	3	3
Installation of balancing and individual thermostatic controls	0	0	2	1	1	1	3	2
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	1	2	2	2	2	2	3	3
Occupancy/motion/ambient lighting sensors	0	0	1	1	0	0	2	1
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	2	2

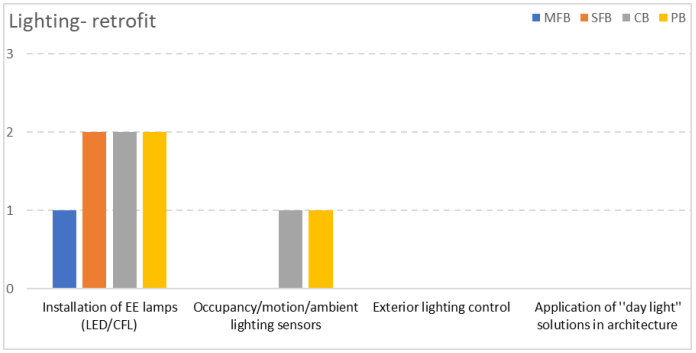

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

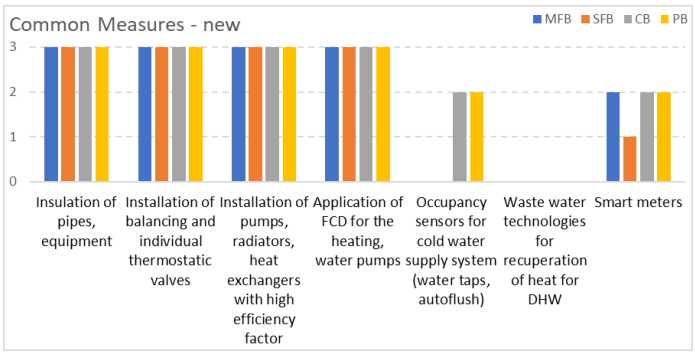

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

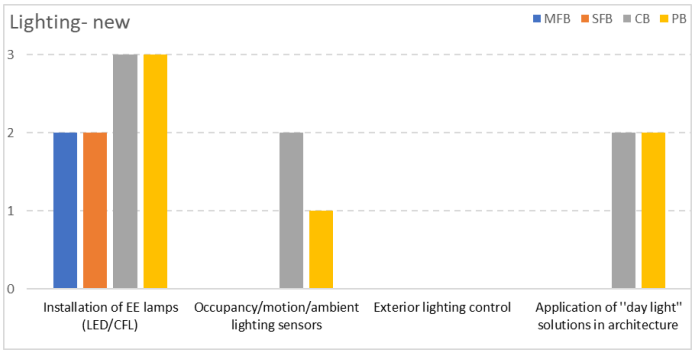

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common Measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture


Common Measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture

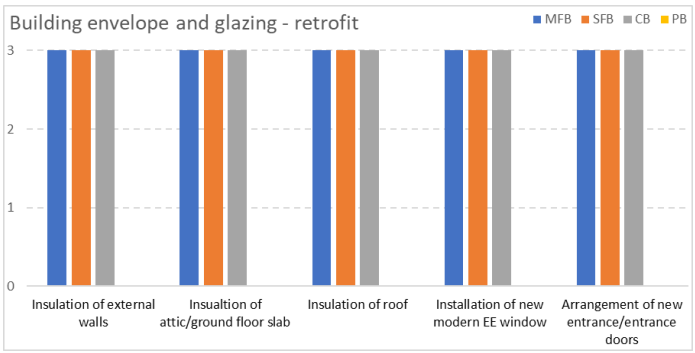
CYPRUS

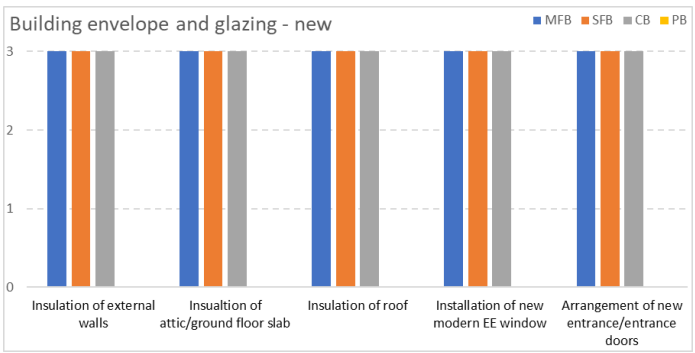
OVERVIEW

Most of the building stock in Cyprus was built during or since the 1980's, but not governed by any building standards with mandatory energy consumption requirements. Hence, the majority of the buildings have low energy efficiency ratings; this is reflected in final energy consumption, which has been increasing rapidly since the 1990s. There is great potential for reducing energy consumption in the Cyprus buildings sector.

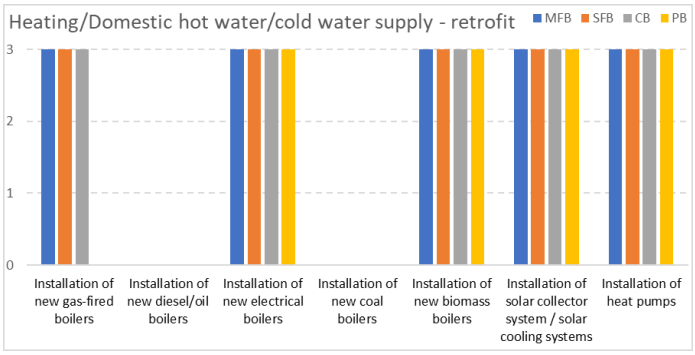
The residential building stock is composed of nearly 300,000 homes used as permanent dwellings and another 78,000 homes used as secondary / vacation homes. Seasonal occupancy results in lower energy consumption by approximately 21% of residences. Electricity accounts for nearly half of the final energy consumption by residences, followed by heating oil and liquified gas. Renewable energy sources, including solar photovoltaics, geothermal heat pumps, and biomass systems accounted for approximately 4% in final energy consumption in 2017.

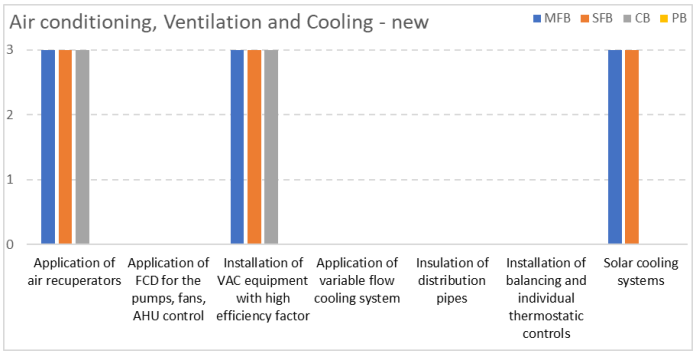
The majority of household energy is consumed by air conditioning and heating systems. In single-family homes, the predominant technology is a boiler-based central heating system; multi-family residences tend to use independent air-conditioning units. Space heating and cooling is lacked by half of the former, and about 18% of the latter. Hence, there are ample opportunities to simultaneously increase energy efficiency, and improve residents' quality of life.

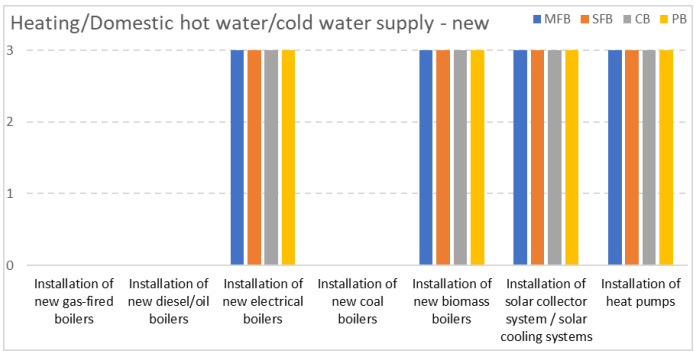


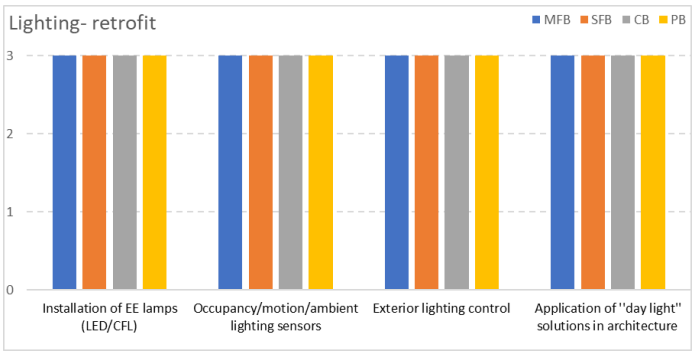


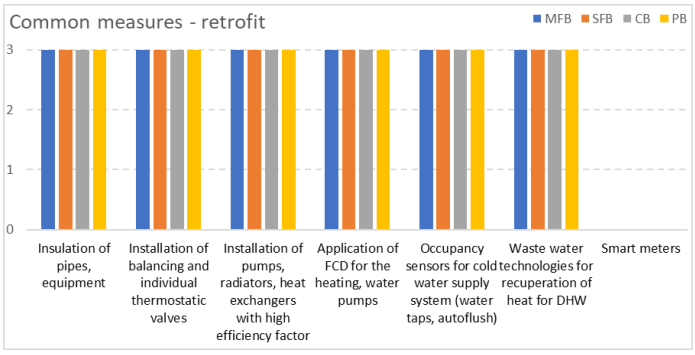
	Cyprus							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	0	3	3	3	0
Insualtion of attic/ground floor slab	3	3	3	0	3	3	3	0
Insulation of roof	3	3	3	0	3	3	3	0
Installation of new modern EE window	3	3	3	0	3	3	3	0
Arrangement of new entrance/entrance doors	3	3	3	0	3	3	3	0
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	3	3	3	3	3	3	3	3
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	3	3	3	3	3	3
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	0	0	0	0
Installation of balancing and individual thermostatic valves	3	3	3	3	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	0	0	0	0
Application of FCD for the heating, water pumps	3	3	3	3	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	3	3	3	3	0	0	0	0
Waste water technologies for recuperation of heat for DHW	3	3	3	3	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	0
Application of FCD for the pumps, fans, AHU control	3	3	3	3	0	0	0	0
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	0
Application of variable flow cooling system	3	3	3	3	0	0	0	0
Insulation of distribution pipes	3	3	3	3	0	0	0	0
Installation of balancing and individual thermostatic controls	3	3	3	3	0	0	0	0
Solar cooling systems	3	3	0	0	3	3	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	3	3	3	3	0	0	0	0
Exterior lighting control	3	3	3	3	0	0	0	0
Application of "day light" solutions in architecture	3	3	3	3	0	0	0	0

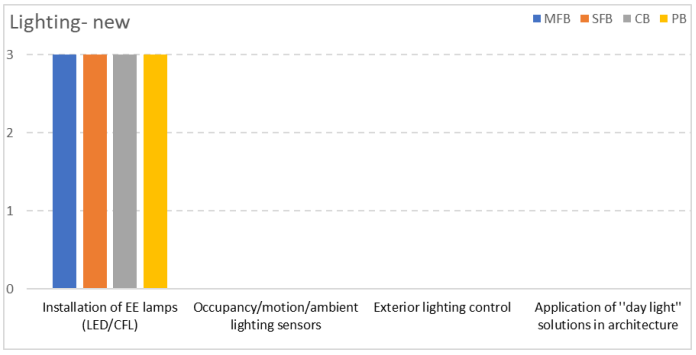

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

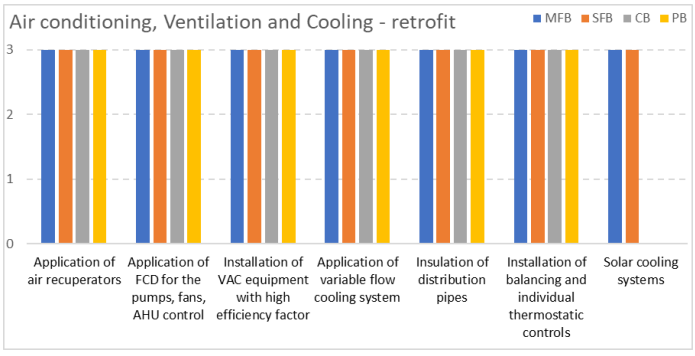

Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

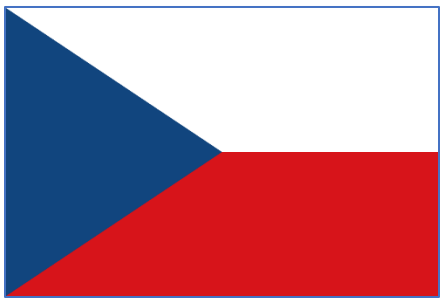

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems



CZECH REPUBLIC

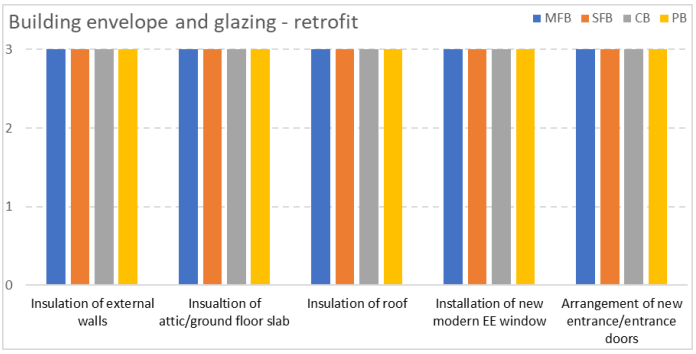
OVERVIEW

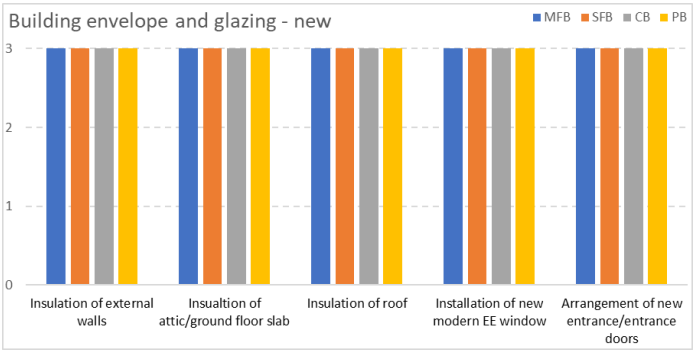
The energy consumed by services grew through 2004, largely driven by the rapid development of supermarkets and supporting infrastructure. Two noticeable trends in energy consumption of the tertiary sector, regarding energy carrier structure, were observed between 2000 and 2012: coal consumption decreased from 10 to 1 PJ, and heat consumption decreased from 26 to 18 PJ. These energy sources were predominantly replaced with electricity and gas.

In residential buildings, coal consumption decreased, remaining relatively stable after 2010. Much of this displaced coal has made way for gas. Stagnation in the downward trend in coal is mostly due to three reasons: coal-fired boilers remain the most affordable heating technology in some parts of the country, gas prices remain high, and there are still several locations lacking gas transmission pipeline. Electricity is only of limited use for heating, as it is still relatively expensive.

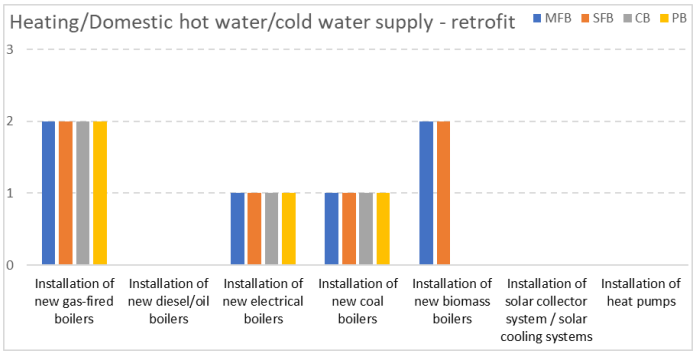
Large-scale projects for insulation of collective houses has resulted in decreased energy consumption for space heating. At the same time, a worrying trend to disconnect from district heating and install gas-fired boilers has been observed. This is a result of higher prices some households have experienced with CHP heating.

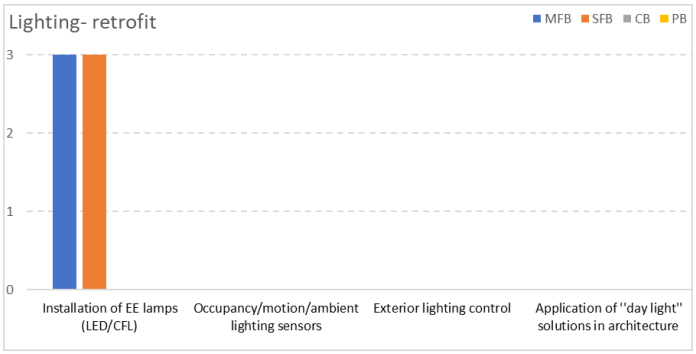
In addition, a recent trend has been observed of increased usage of wood-fired boilers in residences.





	Czech Republic							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	2	2	2	2	2	2	2	2
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	1	1	1	1	1	1	1	1
Installation of new coal boilers	1	1	1	1	1	1	1	1
Installation of new biomass boilers	2	2	0	0	2	2	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	0	0	3	3	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB SFB CB PB
3
2
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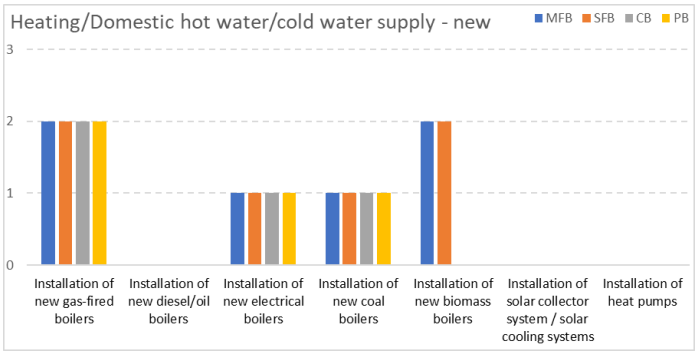
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
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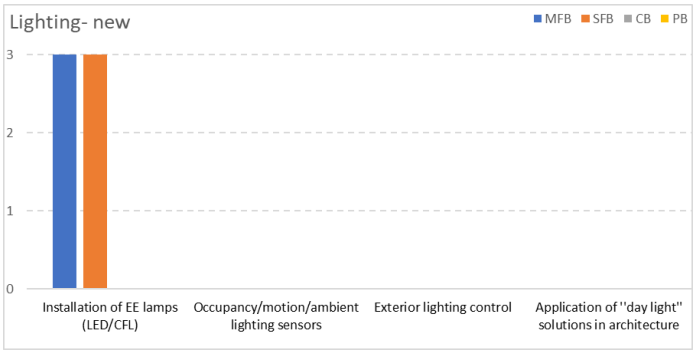
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- new
MFB SFB CB PB
3
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Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture

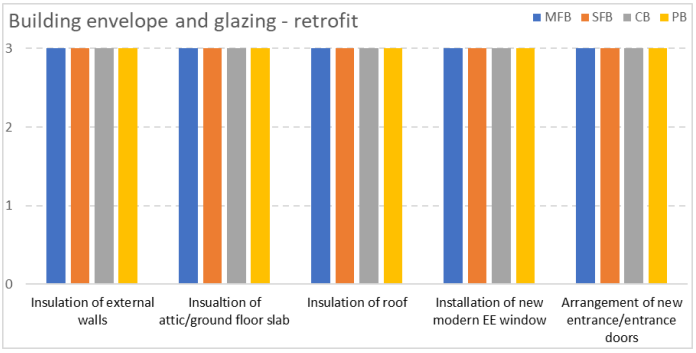
ESTONIA

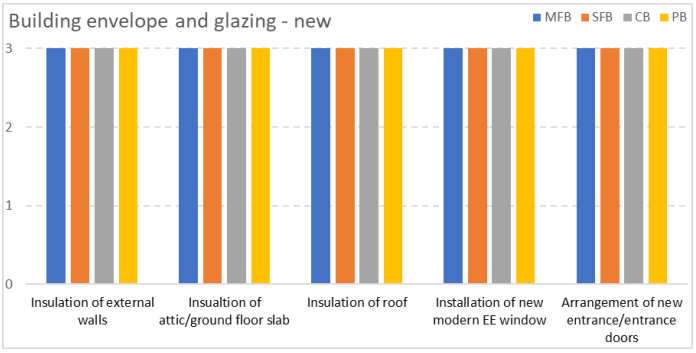
OVERVIEW

Estonia invested nearly €200 million between 2000 and 2014 to improve energy efficiency in the buildings sector, focusing on renovating existing public and multi-family buildings. Different green investment schemes were used for each type of building. Subsidies of €30 million were granted for multi-family building renovations, while subsidies for public buildings amounted to €147 million.

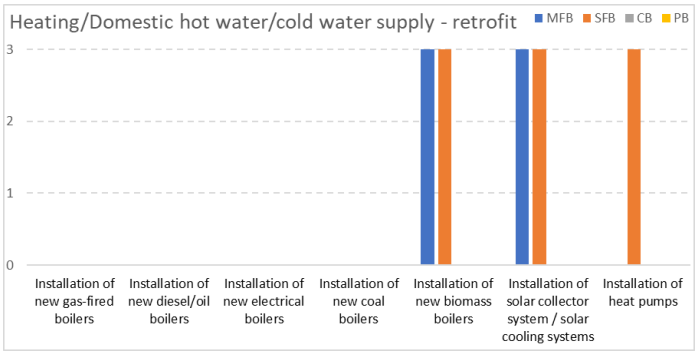
Estonia launched minimum energy performance requirements in 2007, which went into full effect at the beginning of 2008. The stated energy performance requirements are mandatory for all new buildings, as well as all existing buildings undergoing major renovation. Importantly, the regulations stipulate methodology for documenting compliance. As a result of these standards, the real estate market has adapted to use energy efficiency ratings as a differentiator for sales and rentals.

The primary energy performance requirements only apply to renovations that are categorized as major. In addition, there are no minimum requirements for the building envelope that apply to minor renovations. These system performance requirements (for DHW, cooling, ventilation, and lighting) only apply, in the case of minor renovations, when a system is replaced, or a new system is installed.





	Estonia							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	0	0	3	3	0	0
Installation of solar collector system / solar cooling systems	3	3	0	0	3	3	0	0
Installation of heat pumps	0	3	0	0	0	3	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	0	0	0	0	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	2	2	2	2	2	2	2	2
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	3	3	0	0	3	3	0	0
Installation of VAC equipment with high efficiency factor	0	0	3	3	0	0	3	3
Application of variable flow cooling system	0	0	3	3	0	0	3	3
Insulation of distribution pipes	3	3	NI	NI	3	3	NI	NI
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	2	2	2	2	2	2	2	2
Occupancy/motion/ambient lighting sensors	0	0	2	2	0	0	2	2
Exterior lighting control	0	0	2	2	0	0	2	2
Application of "day light" solutions in architecture	0	0	2	2	0	0	2	2


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
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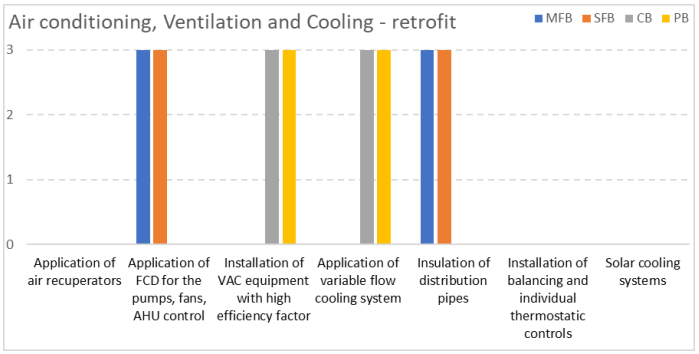
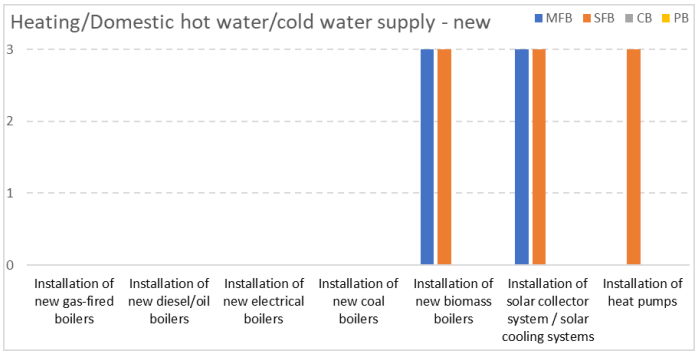
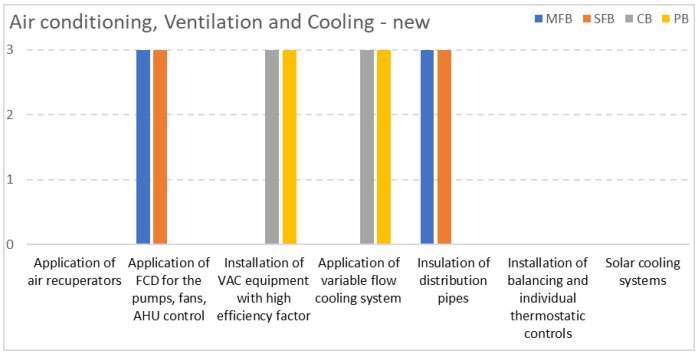
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
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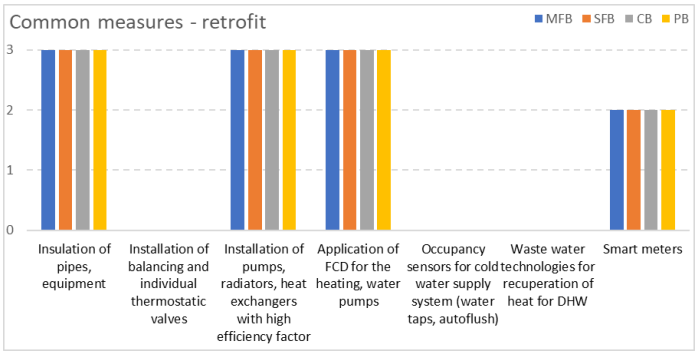
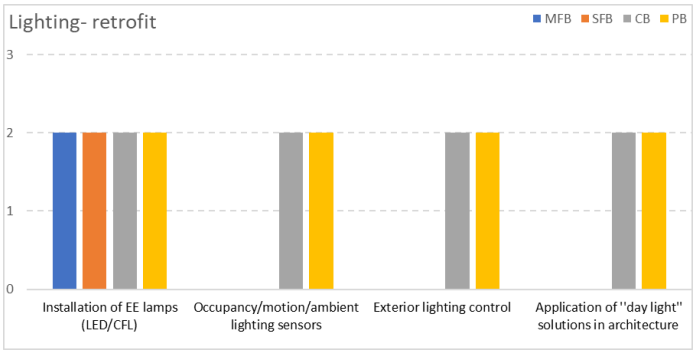
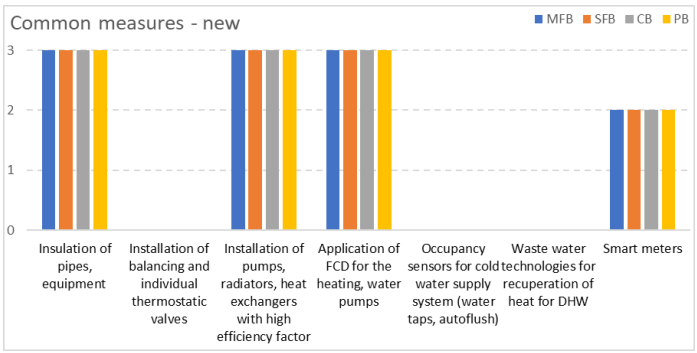
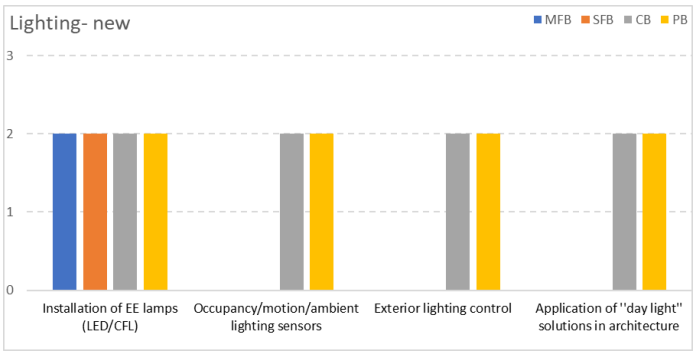
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
3
2
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0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

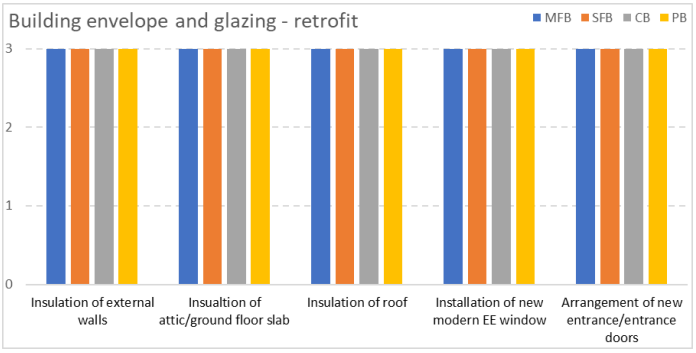
HUNGARY

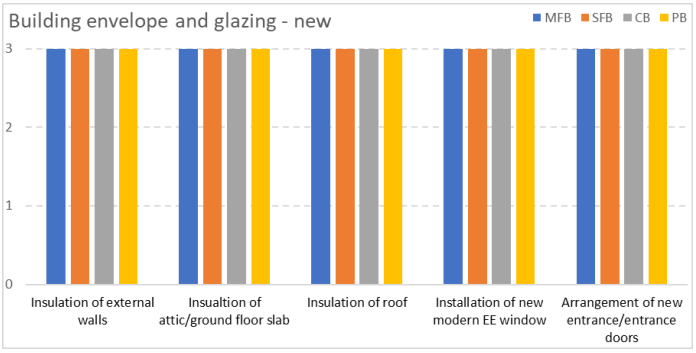
OVERVIEW

The most prevalent type of building in Hungary is a detached house. Detached residences account for nearly 95% of the total building stock, and about 60% of residential flats. In 2015, Hungary had approximately 2.5 million flats housing nearly 63% of the population. Residential buildings were the largest annual energy consumer in 2000 through to 2015, accounting for 34% of consumption. In terms of both quantity and specific energy consumption, detached homes represent the largest potential for energy savings among residential buildings.

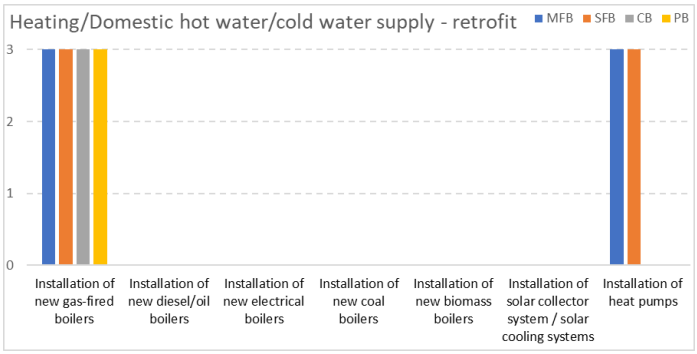
While household space heating is a particularly important consumer of energy, no clear trend of energy efficiency improvement can be observed in residential space heating. This is partially due to incomplete data. It was only recent that the amount of solid biomass energy used for heating was precisely determined, this was used to revise estimated quantities back to 2010. Between 2000 and 2015, the share of gas in total residential space heating energy use decreased from 64% to 49%, while the share of biomass increased from 8% to 40%. Since 2009 especially, substantial fuel substitution has been observed, with wood and waste biomass displacing gas, district heating, and brown coal

Major hindrances to increasing energy efficiency in the Hungarian buildings sector include high investment costs and decreasing energy prices.





	Hungary							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	3	3	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	4	4	4	4	4	4	4	4
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	0	0	0	0	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB
SFB
CB
PB
3
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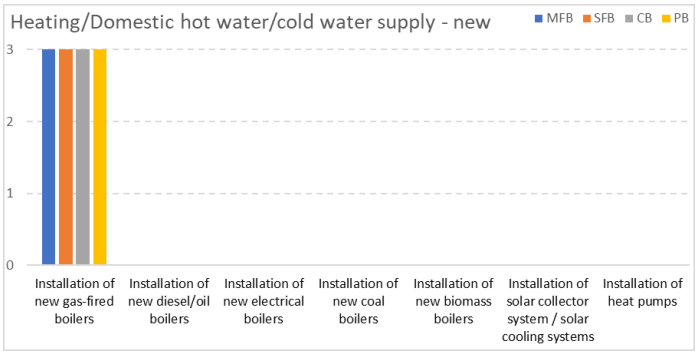
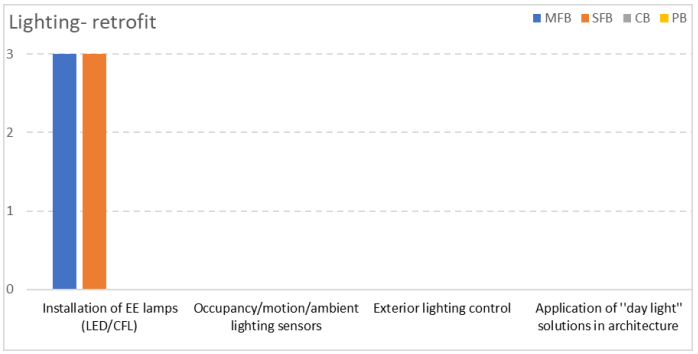
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB
SFB
CB
PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
MFB
SFB
CB
PB
3
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0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture

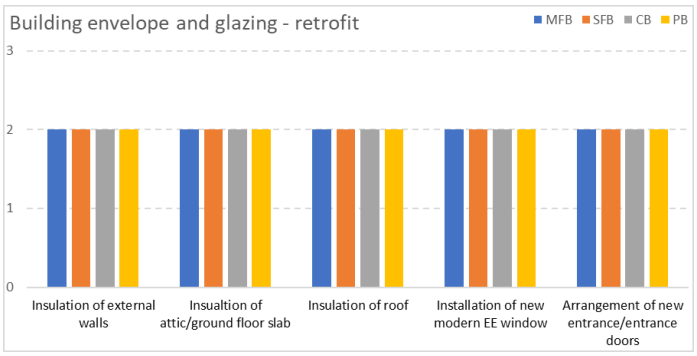
LATVIA

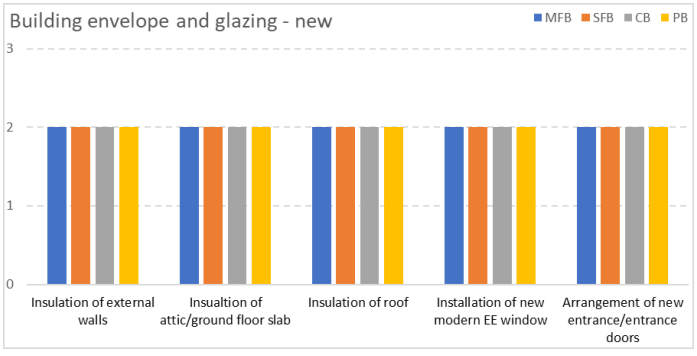
OVERVIEW

The vast majority of residential buildings in Latvia were constructed in the latter half of the 20th century. Success in improving building sector energy efficiency will rely on substantial upgraded in terms of materials, utilities, and ownership modes. There are several EU-funded programmes designed to meet the growing demand for energy efficiency renovations. However, these have tended to be limited in scope and slowly implemented. A large proportion of buildings are in very poor condition, yet are overlooked by these programmes.

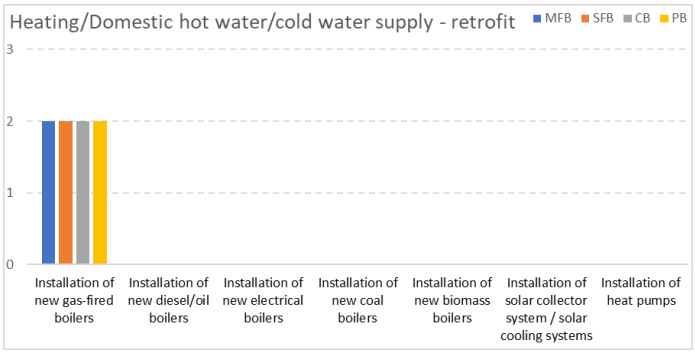
Wood-burning was the principal source of residential final energy consumption in 2012, at 48%, despite the fact that the share of wood fell by over 8% between 1995 and 2012. In the same period, heat declined in proportion from 37% to 28%, ranking second. Altogether, oil, gas, and coal represented 13% of total final consumption in 2012, with an 11% share coming from electricity.

Approximately two thirds of energy consumed in residential buildings is used for space heating. Water heating accounts for about 18%; cooking and electricity for appliances and lighting consumes around 7%. Latvian residences tend to consume about 1% of energy for air cooling.





	Latvia							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	2	2	2	2	2	2	2	2
Insualtion of attic/ground floor slab	2	2	2	2	2	2	2	2
Insulation of roof	2	2	2	2	2	2	2	2
Installation of new modern EE window	2	2	2	2	2	2	2	2
Arrangement of new entrance/entrance doors	2	2	2	2	2	2	2	2
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	2	2	2	2	2	2	2	2
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	0	0	0	0	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	1	1	1	1	1	1	1	1
3.5 Lighting								
Installation of EE lamps (LED/CFL)	1	1	1	1	1	1	1	1
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
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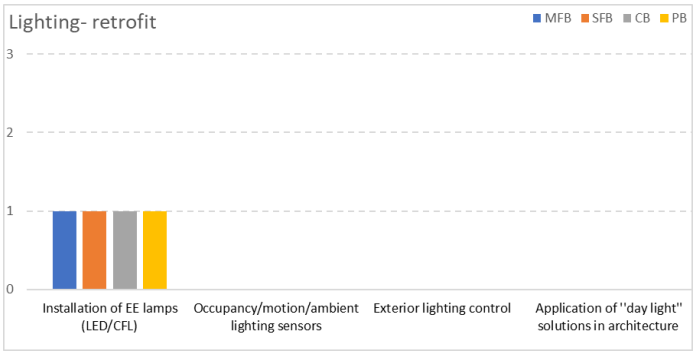
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- retrofit
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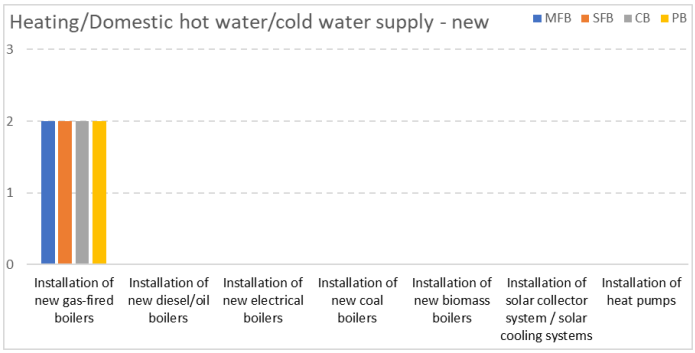
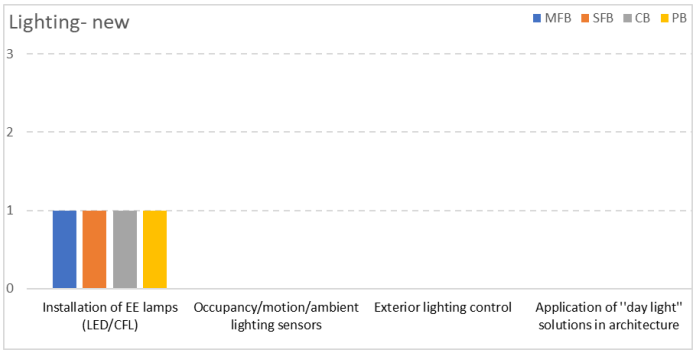
Exterior lighting control
Application of ''day light'' solutions in architecture


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Lighting- new
MFB SFB CB PB
3
2
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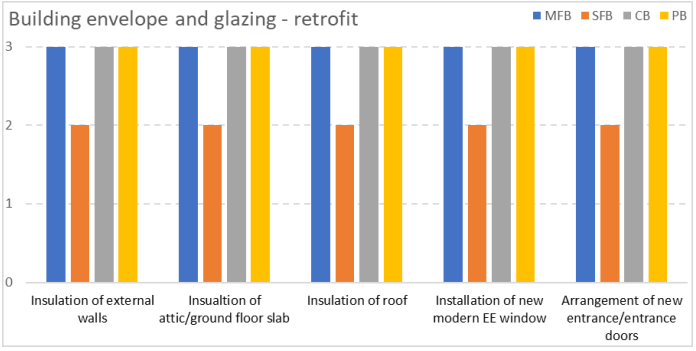
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture

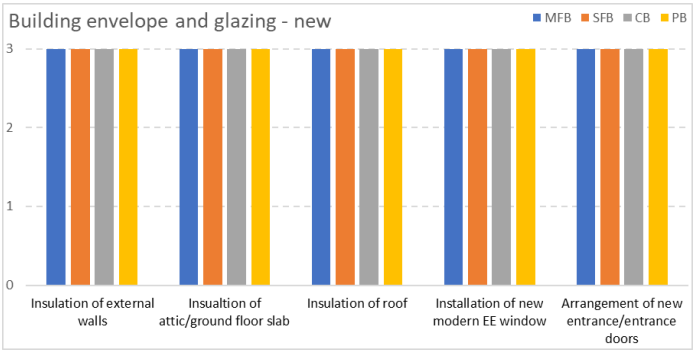
LITHUANIA

OVERVIEW

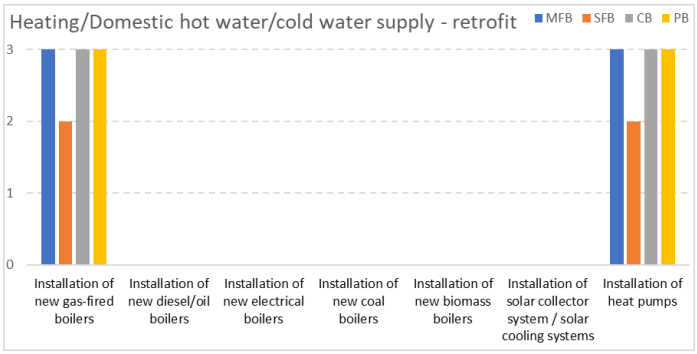
Lithuania has placed a lot of importance on a holistic and comprehensive approach to redevelop neighborhoods in a way that increases building energy efficiency and simultaneously provides social benefits. This topic has been high on the political agenda. One recent example of this focus is the Lithuanian-German project entitled "Energy-efficient redevelopment of urban areas in Lithuania". With financial support of the German Federal Environment Ministry's Advisory Assistance Programme, the project was inaugurated in 2015, and successfully completed with a high-level Closing Conference held at the National Library in Vilnius in June 2017.

This project laid major foundations for ongoing cooperation and collaboration in the three fields of housing, urban area (re)development, and energy efficiency. Project activities included assisted development of pilot urban area concepts in three separate municipalities. There was also an emphasis on informational events to communicate project results and lessons learned.





	Lithuania							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	2	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	2	3	3	3	3	3	3
Insulation of roof	3	2	3	3	3	3	3	3
Installation of new modern EE window	3	2	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	2	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	2	3	3	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	0	0	0	0	0	0	0	0
Installation of heat pumps	3	2	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	2	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	3	3	3	3
Installation of balancing and individual thermostatic valves	0	0	0	0	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	3	3	3	3
Application of FCD for the heating, water pumps	0	0	0	0	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	3	3	3	3
Waste water technologies for recuperation of heat for DHW	0	0	0	0	3	3	3	3
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	0	0	0	0	0	0	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB
SFB
CB
PB
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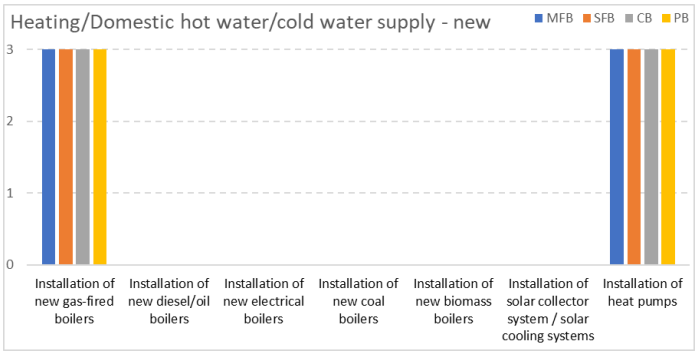
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB
SFB
CB
PB
3
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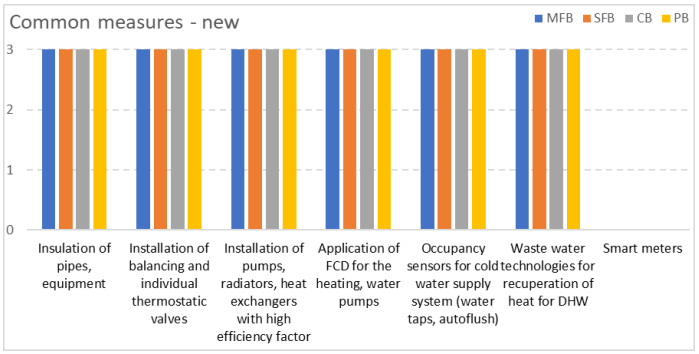
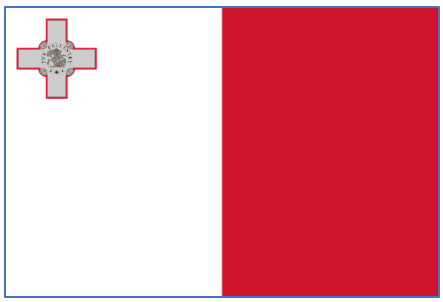
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Common measures - new
MFB
SFB
CB
PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters

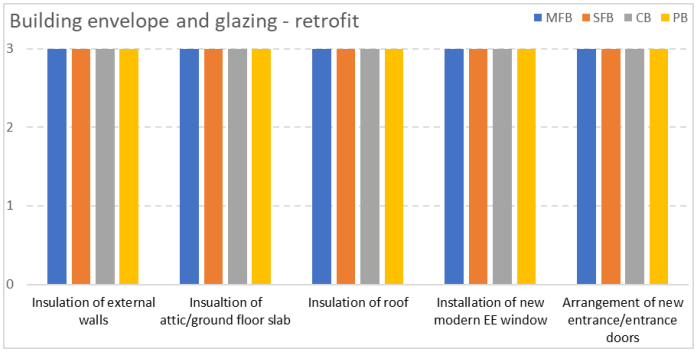


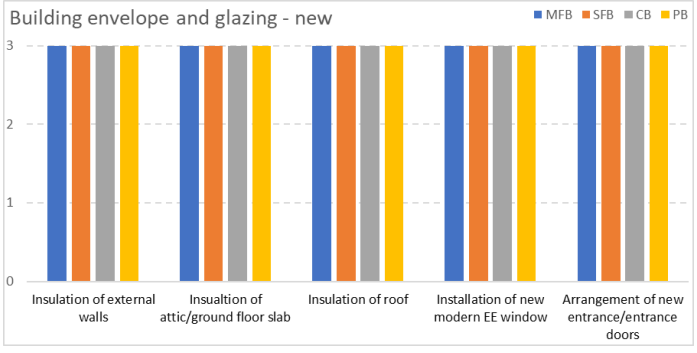
MALTA

OVERVIEW

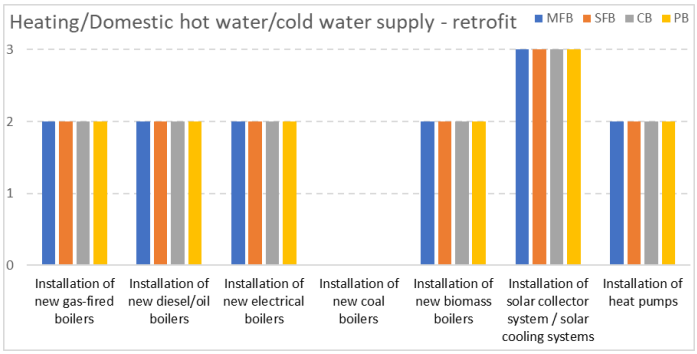
According to the 2011 Census undertaken by the Maltese National Statistics Office, terraced houses are the most common type of fully-occupied residential building. Out of the vacation residences, nearly 20% are holiday homes which are occupied seasonally; these are generally short-term lets which are occupied during the summer. The remainder are unoccupied. Energy consumption is not an immediate focus or investment priority for the latter class of buildings.

In 2015, the government of Malta introduced two new major activities to encourage improvement of energy efficiency in residential buildings. The first measure involved free household energy audits on both a walk-in and appointment basis. These audits culminated in general and specific informational tips to increasing energy efficiency. In addition, a new scheme to increase installation of photovoltaic panels was introduced in July of 2015. This program continues to encourage residents to install renewable energy systems in their homes.





	Malta							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	2	2	2	2	2	2	2	2
Installation of new diesel/oil boilers	2	2	2	2	2	2	2	2
Installation of new electrical boilers	2	2	2	2	2	2	2	2
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	2	2	2	2	2	2	2	2
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	2	2	2	2	2	2	2	2
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	3	3	3	3	3	3	3	3
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	3	3	3	3	3	3	3	3
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
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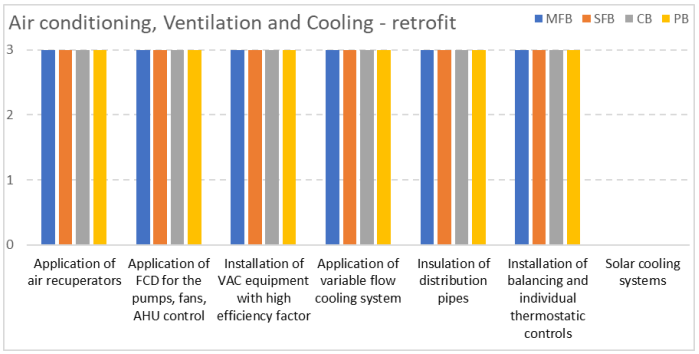
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
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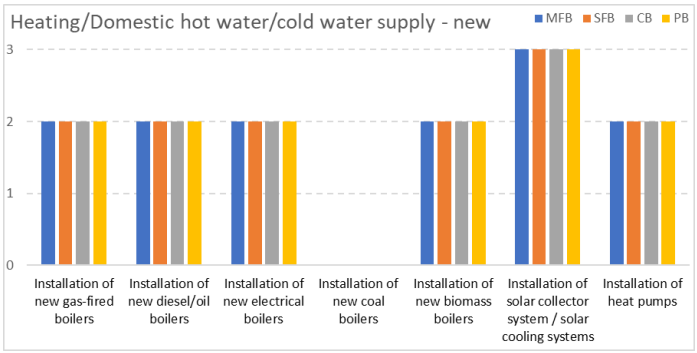
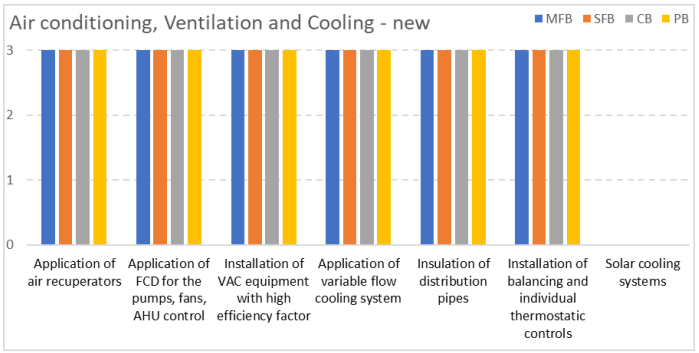
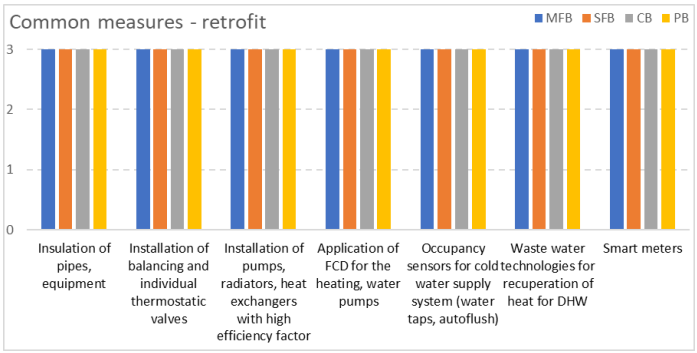
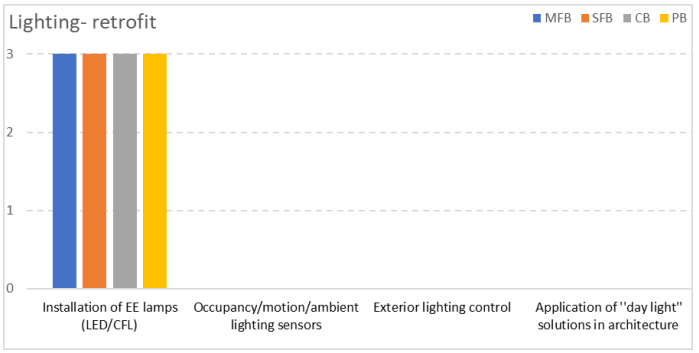
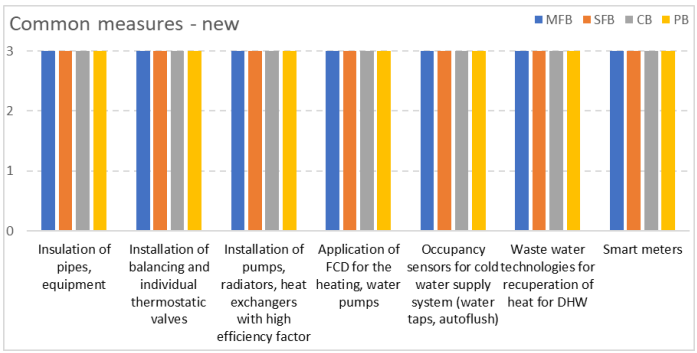
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems

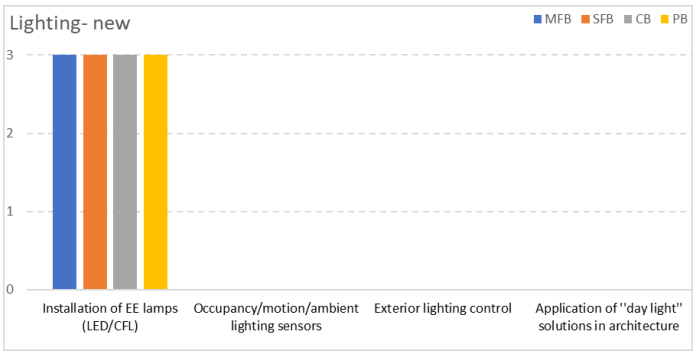

Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

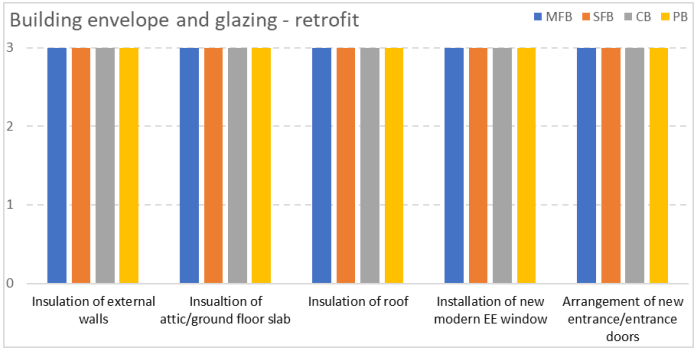

Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters

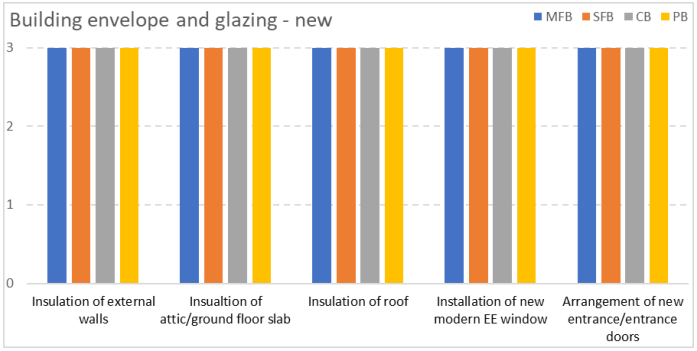

Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

POLAND

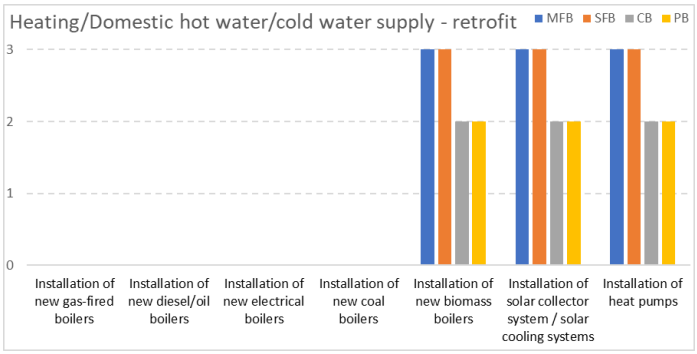
OVERVIEW

Poland already had effective mandatory energy performance requirements for new buildings before introduction of the EPBD. These requirements targeted building net energy demand and thermal insulation of transparent building envelope elements for multi-family residences and collective buildings. Mandatory requirements for single-family buildings were more flexible, setting constraints on either net energy demand or building envelope insulation – one or the other. In Poland, the majority of energy consumed by residential buildings is for space heating, followed by water heating.





	Poland							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	2	2	3	3	2	2
Installation of solar collector system / solar cooling systems	3	3	2	2	3	3	2	2
Installation of heat pumps	3	3	2	2	3	3	2	2
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	3	3	2	2	3	3	2	2
Installation of balancing and individual thermostatic valves	3	3	2	2	3	3	2	2
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	2	2	3	3	2	2
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
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Installation of new gas-fired boilers
Installation of new diesel/oil boilers
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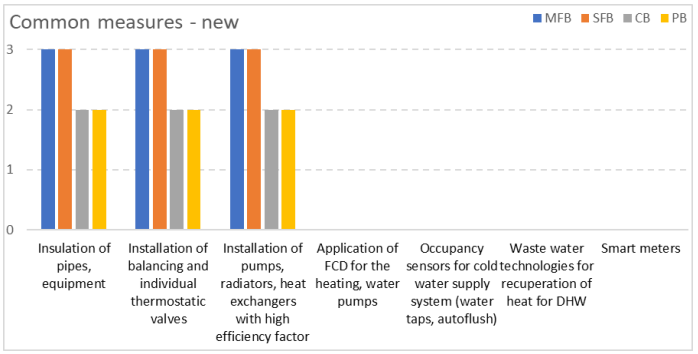
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Common measures - new
MFB SFB CB PB
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Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
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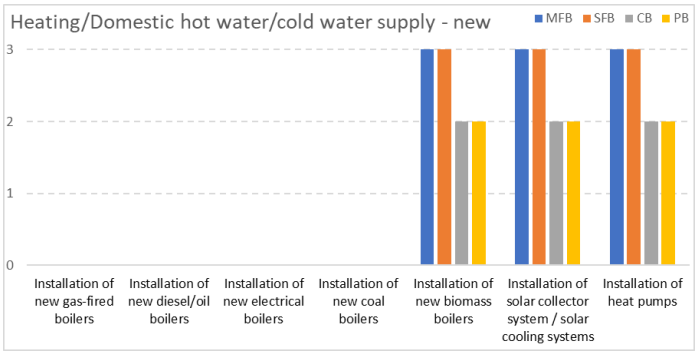
Heating/Domestic hot water/cold water supply - new
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Installation of new gas-fired boilers
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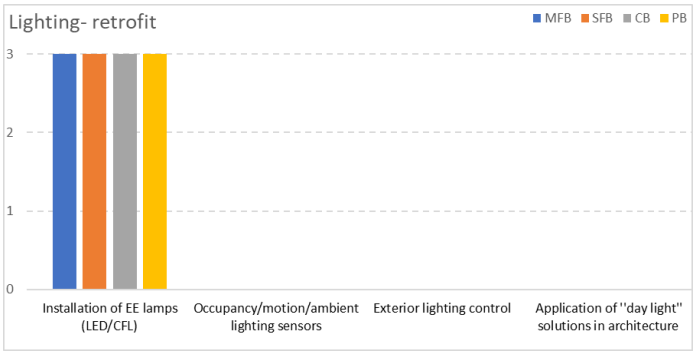
Lighting- retrofit
MFB SFB CB PB
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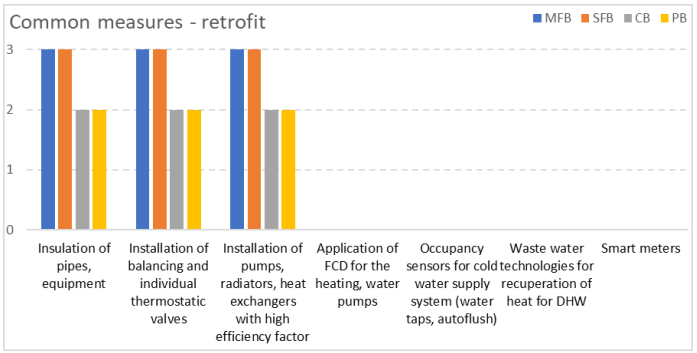
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture


Common measures - retrofit
MFB SFB CB PB
3
2
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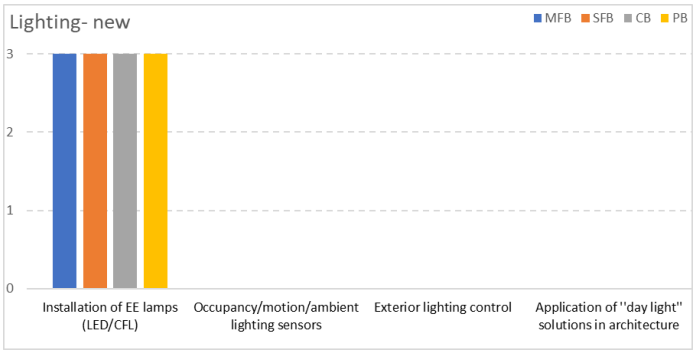
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
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Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture

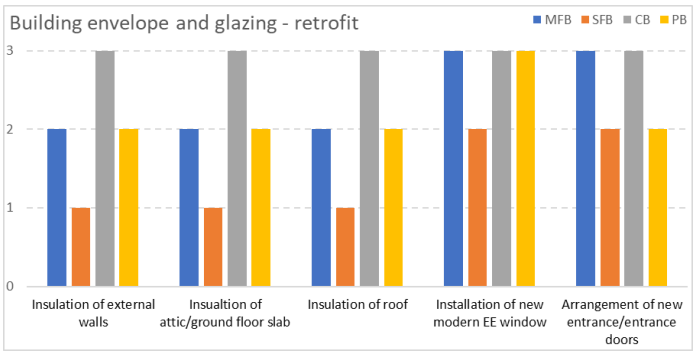
ROMANIA

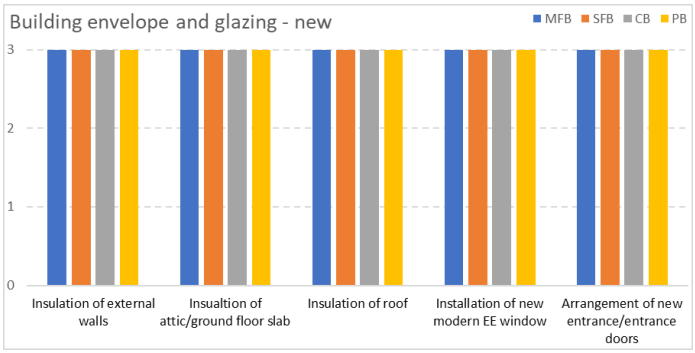
OVERVIEW

In Romania, 55% of the total fuel used for centralized heating is natural gas. In the region, Romania is the largest consumer of gas; in 2014, the country imported about 7% of its gas needs. Buildings are heavily reliant on natural gas, and 44% of the population is connected to the gas distribution grid. 50% of residential buildings burn wood for heating. Targeting energy efficiency measures at decreasing residential gas consumption would have a considerable impact.

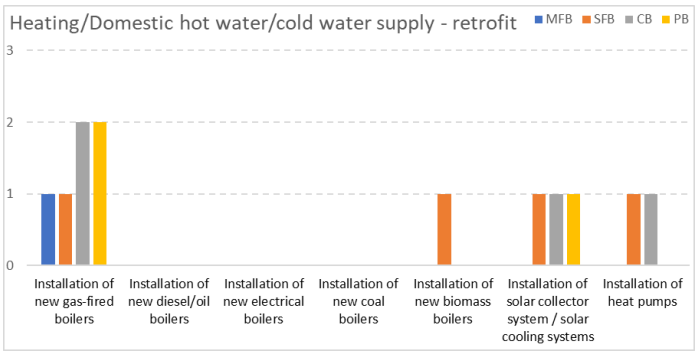
Considering the dedicated line in EU budgets to assist the energy efficiency endeavors of EU member States, investments in thermal rehabilitation of residential buildings become even more worthwhile. Romania has focused on renovating older residential buildings to increase energy efficiency in the buildings sector

Between 2000 and 2015, residential energy consumption per dwelling decreased an average of almost 2% a year, with a precipitous 16% decline in the first year. The year-on-year declines may largely be attributed to increased sales of energy efficient equipment, as well as an increase in residential dwellings. Between 2000 and 2011, space heating energy consumption per m^2 decreased by nearly 41%. This reduction is attributed to both the increase in seasonally-occupied holiday homes, and renovation of existing residences.





	Romania							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	2	1	3	2	3	3	3	3
Insualtion of attic/ground floor slab	2	1	3	2	3	3	3	3
Insulation of roof	2	1	3	2	3	3	3	3
Installation of new modern EE window	3	2	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	2	3	2	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	1	1	2	2	3	3	3	3
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	1	0	0	0	1	0	0
Installation of solar collector system / solar cooling systems	0	1	1	1	1	1	1	1
Installation of heat pumps	0	1	1	0	0	1	1	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	1	0	0	2	0	0	0	0
3.2.c Common measures								
Insulation of pipes, equipment	0	1	3	1	3	3	3	3
Installation of balancing and individual thermostatic valves	0	1	3	1	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	3	3	1	3	3	3	3
Application of FCD for the heating, water pumps	0	1	3	2	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	0	1	2	1	3	3	3	3
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	1	0	0	0	2	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	1	2	1	0	1	3	3
Installation of VAC equipment with high efficiency factor	0	0	2	0	0	1	3	2
Application of variable flow cooling system	2	2	2	1	2	2	3	2
Insulation of distribution pipes	0	1	2	0	3	3	3	3
Installation of balancing and individual thermostatic controls	1	1	2	0	2	2	2	2
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	2	2	3	1	3	3	3	3
Occupancy/motion/ambient lighting sensors	2	1	2	0	2	1	3	1
Exterior lighting control	0	1	2	0	0	1	3	1
Application of "day light" solutions in architecture	0	0	0	0	0	1	1	0


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
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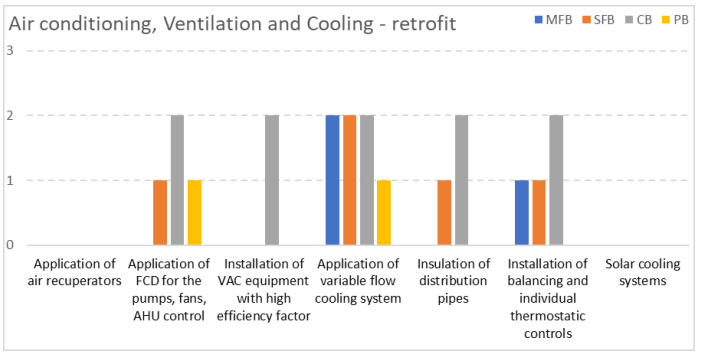
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
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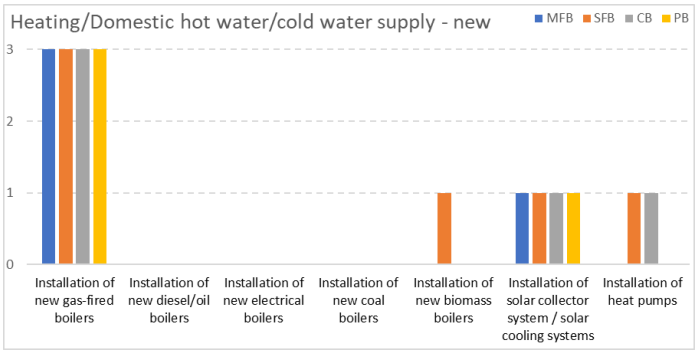
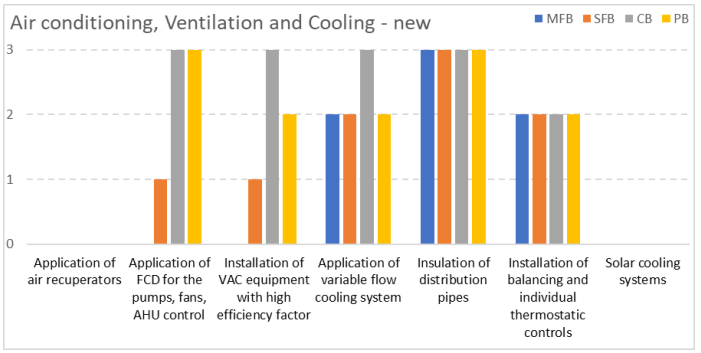
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
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Application of air recuperators
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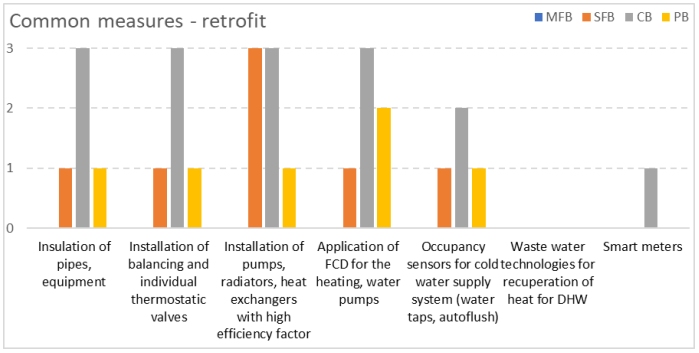
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
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Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
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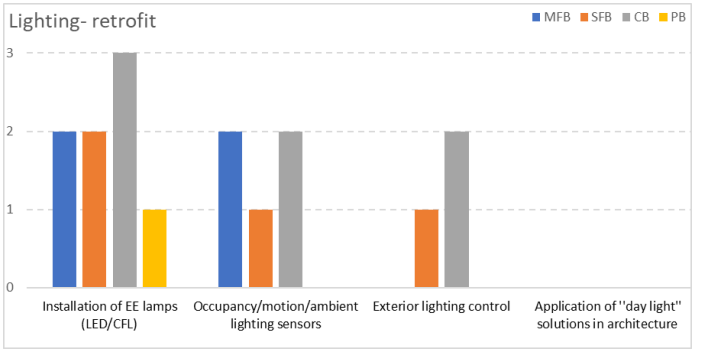
Lighting- retrofit
MFB SFB CB PB
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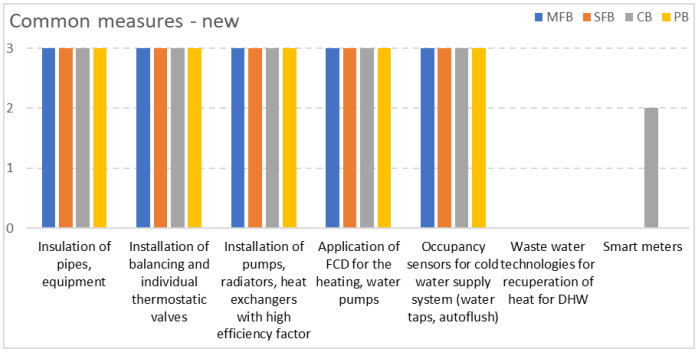
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture


Common measures - new
MFB SFB CB PB
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Insulation of pipes, equipment
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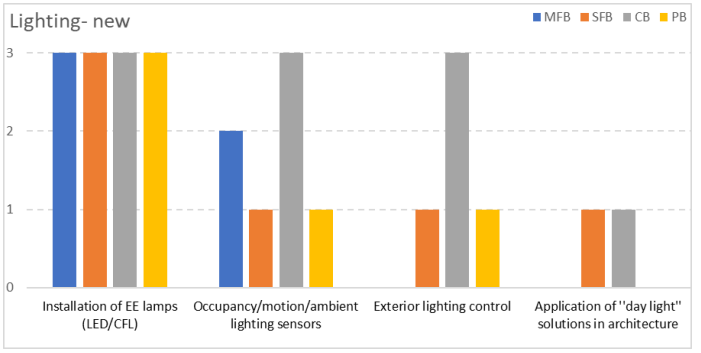
Lighting- new
MFB SFB CB PB
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Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of ''day light'' solutions in architecture

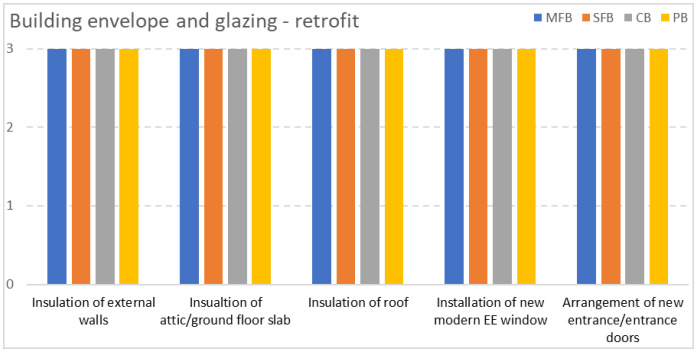
SLOVAKIA

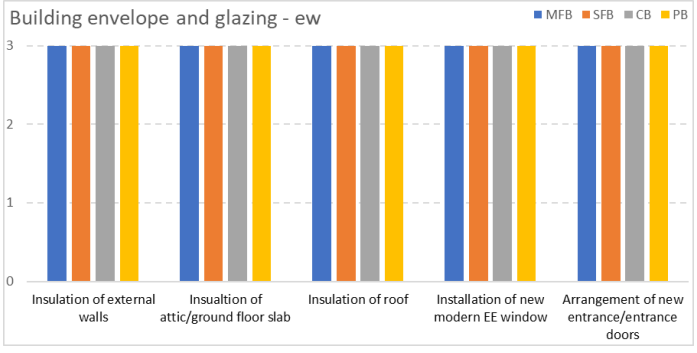
OVERVIEW

Residential buildings in Slovakia are divided into multi-family buildings and single-family buildings. Their design and technical solutions are different. As a matter of principle, they differ in size, number of stories, and number of individual dwellings.

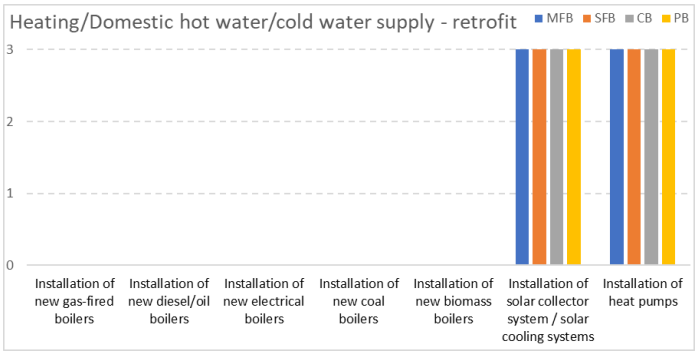
Slovakia has officially recognized the challenges connected to climate change and is researching how to optimally transform its energy economy to increase sustainability and decrease impacts on climate, environment, and society. These actions are not only driven by the dire need to reduce our impact on the climate and the environment, but also by clearly distinguishable potential for sustainable energy investments.

The overall potential for energy savings in the buildings sector is estimated to be 19,792,764 MWh, with public buildings representing 3,806,946 MWh of potential. The potential for cost savings is also significant. In this vein, an important investments theme is energy retrofits of public and residential buildings to minimise consumption of heat and power.





	Slovakia							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	3	3	3	3	3	3	3	3
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	0	0	0	0	0	0	0	0
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
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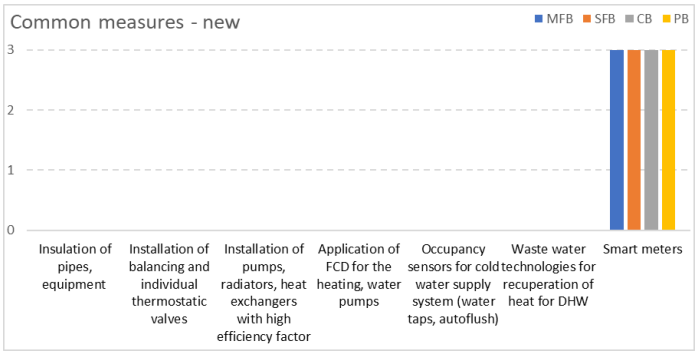
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Common measures - new
MFB SFB CB PB
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Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
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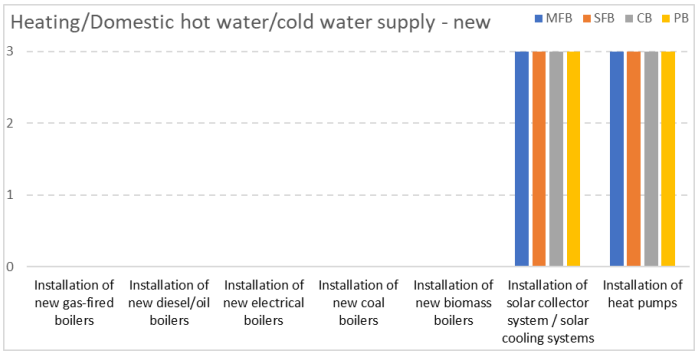
Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
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Installation of new gas-fired boilers
Installation of new diesel/oil boilers
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Installation of new biomass boilers
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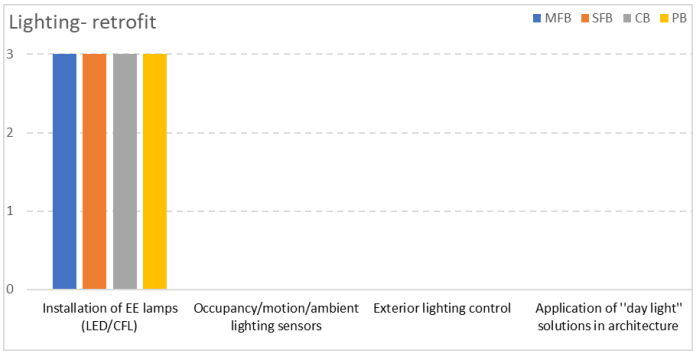
Lighting- retrofit
MFB SFB CB PB
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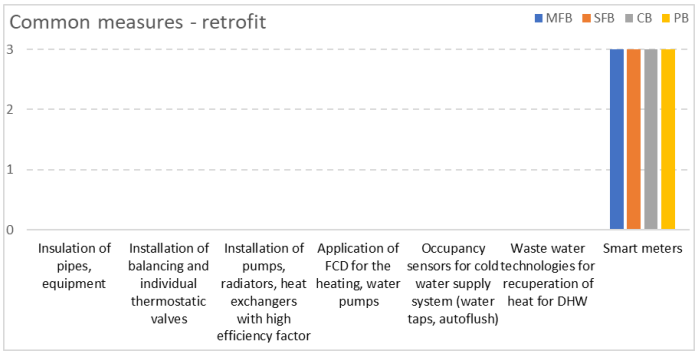
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - retrofit
MFB SFB CB PB
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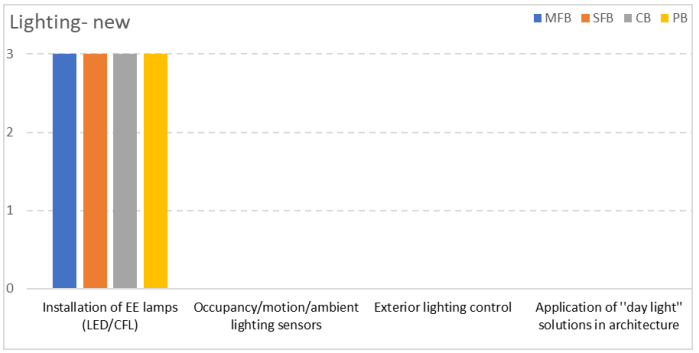
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- new
MFB SFB CB PB
3
2
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0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

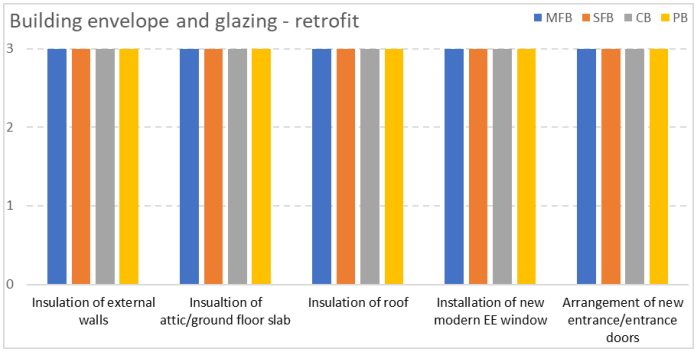
SLOVENIA

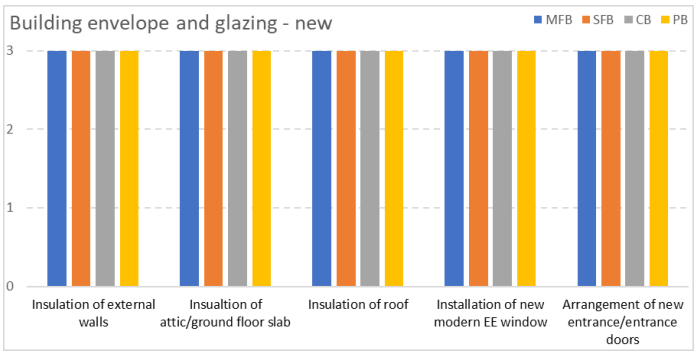
OVERVIEW

Energy production from non-renewable sources represents three-quarters of the final energy consumption in Slovenia, dominated by oil, coal, and natural gas. Most of the electricity is generated by nuclear and thermal power plants. In 2015, renewable energy sources in Slovenia generated 23% of final energy consumed; this fell a mere 2% short of the 2020 goal of 25%.

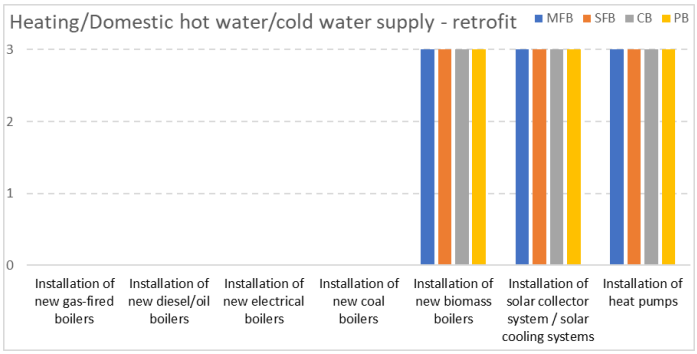
The structure of the use of renewable energy sources in Slovenia is currently dominated by the use of wood biomass and hydropower, which together accounted for nearly 90% of the total use of renewable energy sources in 2010. Other renewable sources, such as solar, wind, and geothermal, remain relatively untapped.

Compared to other EU countries, Slovenia is progressing slowly in adopting EU directives for building regulations, such as EPC certificates. However, it is mandatory to display energy performance certificates in all buildings frequently visited by the public.





	Slovenia							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	0	0	0	0	0	0	0	0
Installation of new diesel/oil boilers	0	0	0	0	0	0	0	0
Installation of new electrical boilers	0	0	0	0	0	0	0	0
Installation of new coal boilers	0	0	0	0	0	0	0	0
Installation of new biomass boilers	3	3	3	3	3	3	3	3
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic valves	0	0	0	0	0	0	0	0
Installation of pumps, radiators, heat exchangers with high efficiency factor	0	0	0	0	0	0	0	0
Application of FCD for the heating, water pumps	0	0	0	0	0	0	0	0
Occupancy sensors for cold water supply system (water taps, autoflush)	0	0	0	0	0	0	0	0
Waste water technologies for recuperation of heat for DHW	0	0	0	0	0	0	0	0
Smart meters	0	0	0	0	0	0	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	0	0	0	0	0	0	0	0
Application of FCD for the pumps, fans, AHU control	0	0	0	0	0	0	0	0
Installation of VAC equipment with high efficiency factor	0	0	0	0	0	0	0	0
Application of variable flow cooling system	0	0	0	0	0	0	0	0
Insulation of distribution pipes	0	0	0	0	0	0	0	0
Installation of balancing and individual thermostatic controls	0	0	0	0	0	0	0	0
Solar cooling systems	0	0	0	0	0	0	0	0
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	0	0	0	0	0	0	0	0
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0


Heating/Domestic hot water/cold water supply - retrofit
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Installation of new gas-fired boilers
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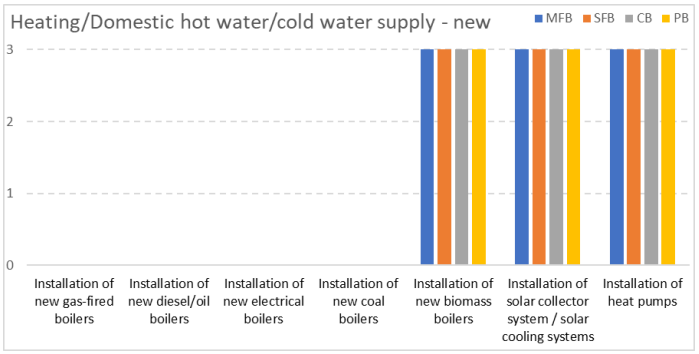
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Heating/Domestic hot water/cold water supply - new
MFB
SFB
CB
PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

SUBREGION D

Canada

United States of America

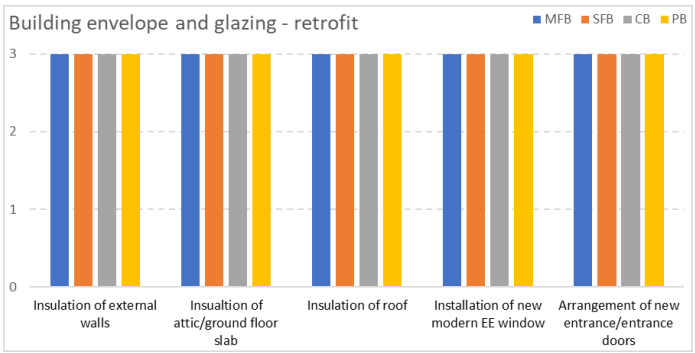
CANADA

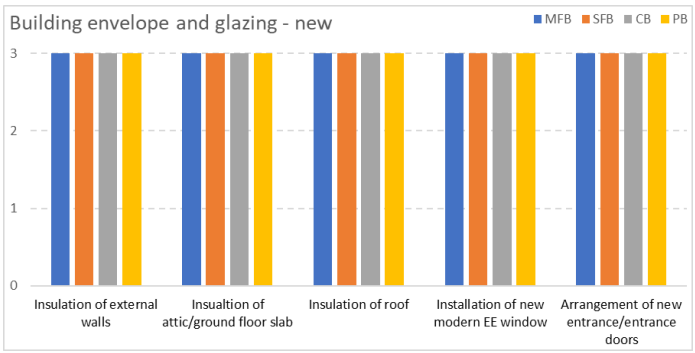
OVERVIEW

Most dwellings in Canada are single detached houses, followed by apartments, single attached houses, and mobile homes. There are four major uses of commercial buildings in Canada: offices or commercial floor space, retail trade, educational service, and health care and social assistance.

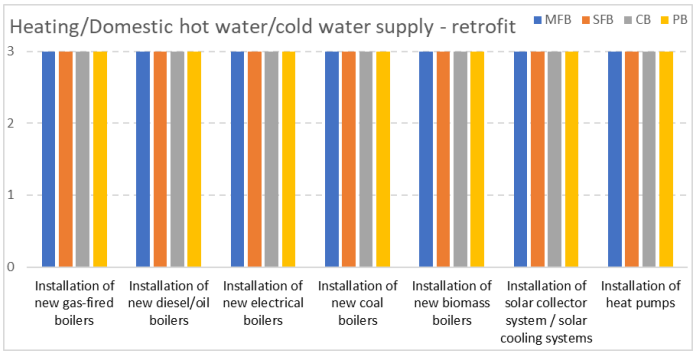
Under Canada's Constitution Act, building regulation is the responsibility of provincial and territorial governments. The provinces and territories each devise their own programs to implement building codes. Currently, provincial and territorial governments and industry associations employ other regulatory and non-regulatory standards to design energy-efficient buildings, and the standards may differ by province.

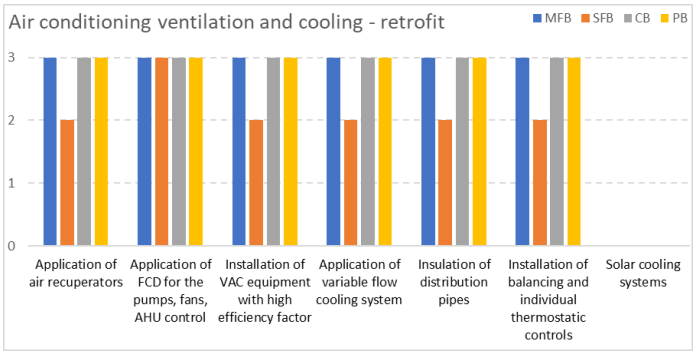
To allow flexibility in achieving the minimum required level of energy efficiency, three compliance approaches are employed: a prescriptive path, a tradeoff path (covering the building envelope only) and a performance path. The building envelope must comply with both the mandatory provisions. It must also comply with the prescriptive criteria unless it complies with the code through the tradeoffs or the building energy performance method. These provisions apply to buildings and residences with conditioned space.

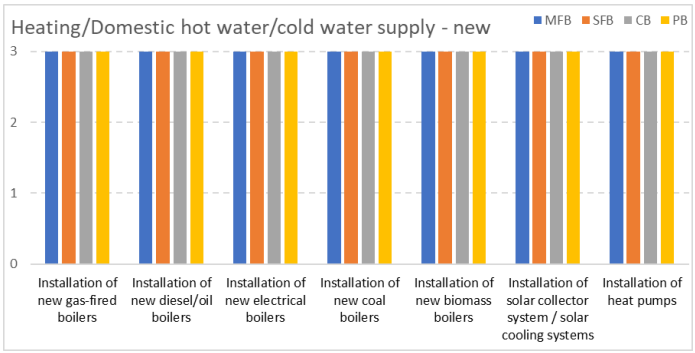


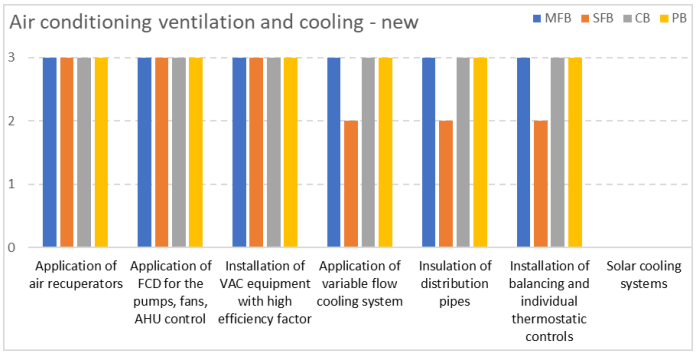


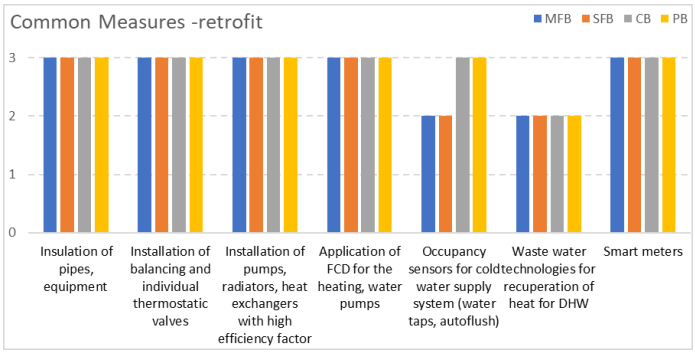
	Canada							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	3	3	3	3	3	3	3	3
Installation of new electrical boilers	3	3	3	3	3	3	3	3
Installation of new coal boilers	3	3	3	3	3	3	3	3
Installation of new biomass boilers	3	3	3	3	3	3	3	3
Installation of solar collector system / solar cooling systems	3	3	3	3	3	3	3	3
Installation of heat pumps	3	3	3	3	3	3	3	3
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	3	3	3	3	3	3	3	3
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	2	2	3	3	2	2	3	3
Waste water technologies for recuperation of heat for DHW	2	2	2	2	2	2	2	2
Smart meters	3	3	3	3	3	3	3	3
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	2	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	2	3	3	3	3	3	3
Application of variable flow cooling system	3	2	3	3	3	2	3	3
Insulation of distribution pipes	3	2	3	3	3	2	3	3
Installation of balancing and individual thermostatic controls	3	2	3	3	3	2	3	3
Solar cooling systems	NI	NI	NI	NI	NI	NI	NI	NI
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	3	3	3	3	3	3	3	3
Occupancy/motion/ambient lighting sensors	2	2	3	3	2	2	3	3
Exterior lighting control	2	2	3	3	2	2	3	3
Application of "day light" solutions in architecture	3	3	3	3	3	3	3	3

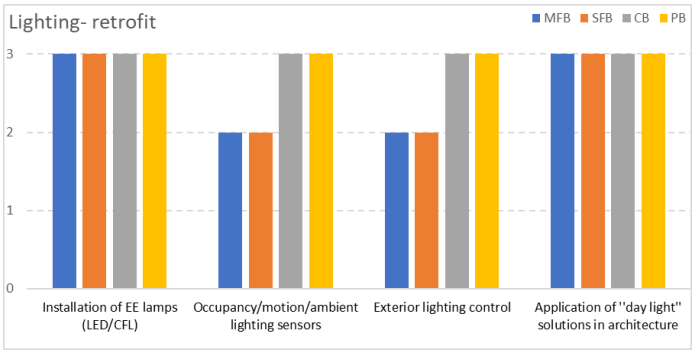

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

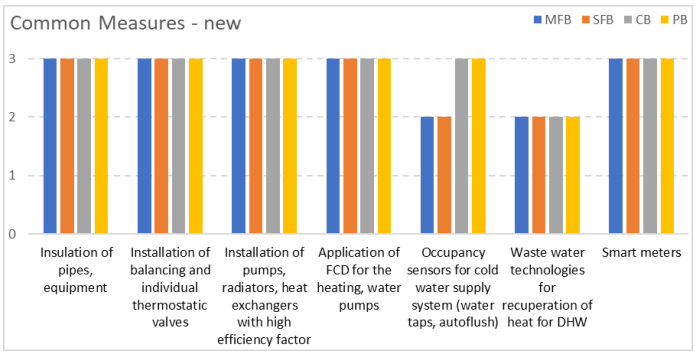

Air conditioning ventilation and cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning ventilation and cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common Measures -retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common Measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
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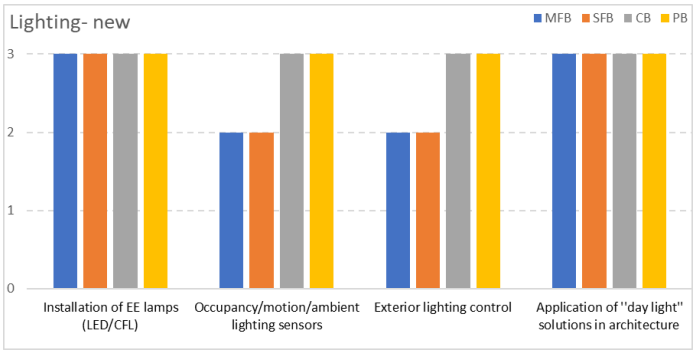
Smart meters


Lighting- new
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture

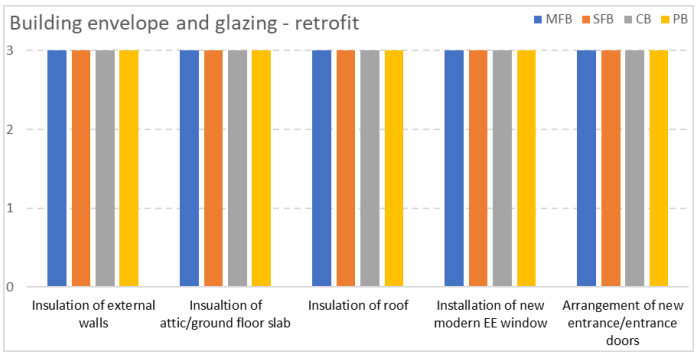
UNITED STATES

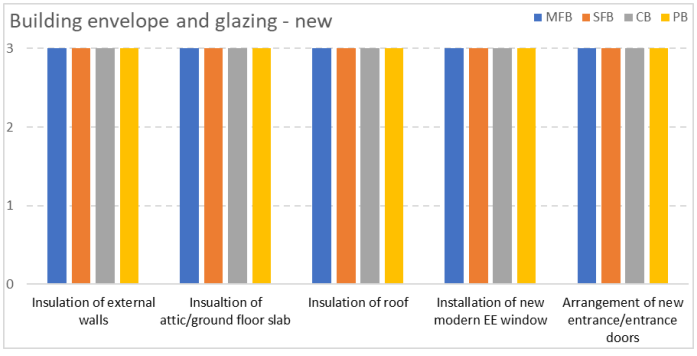
OVERVIEW

Given the vast landscape of the country, its climatic conditions vary dramatically, ranging from very cold to quite warm. Most areas of the country have substantial heating demand in the winter and substantial cooling demand in the summer. Energy prices in the U.S. are low, particularly relative to income levels. Economic incentives for energy efficiency are therefore relatively low. However, several cost-effective energy efficiency options are available for building occupants in the U.S. Buildings in the U.S. derive a smaller share of energy from the direct combustion of fossil fuels and biomass, and a greater share from electricity.

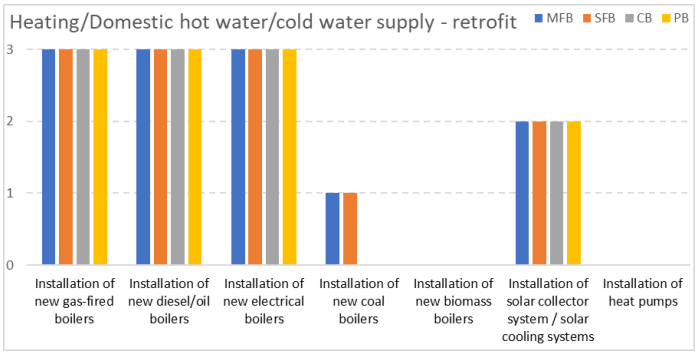
The U.S. uses codes and standards primarily to govern the efficiency of new products, including buildings themselves (building energy codes) and appliances (appliance standards). Most appliance standards are adopted at the federal level, while building codes are adopted by individual states. These codes primarily regulate building envelopes, though many of them bear on the efficiency of heating, cooling, water heating, and lighting devices as well. Most, if not all state codes, also regulate significant building renovations.

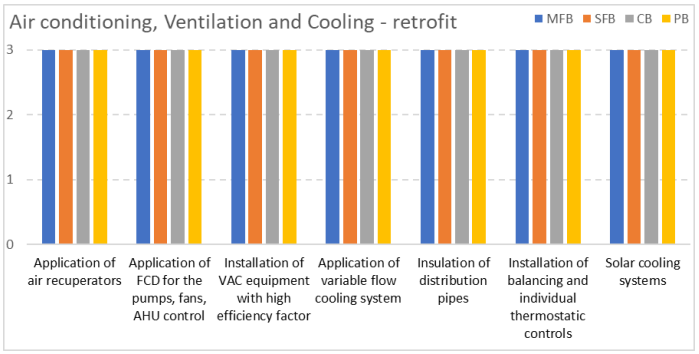
The U.S. devotes significant resources to R&D of efficient technologies and building control systems.

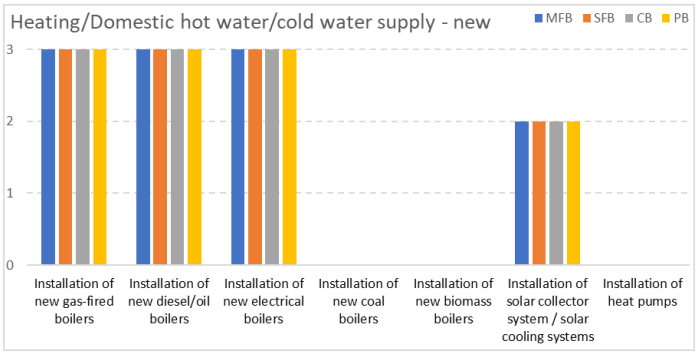


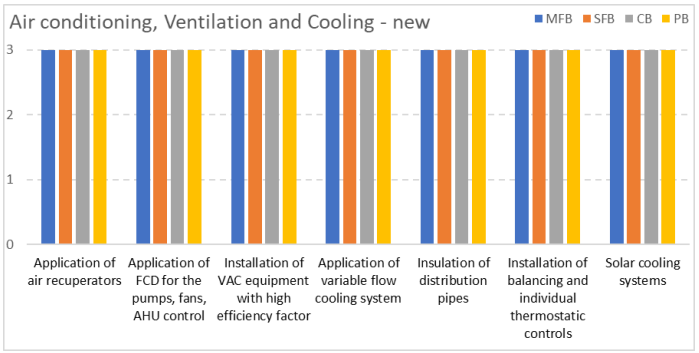


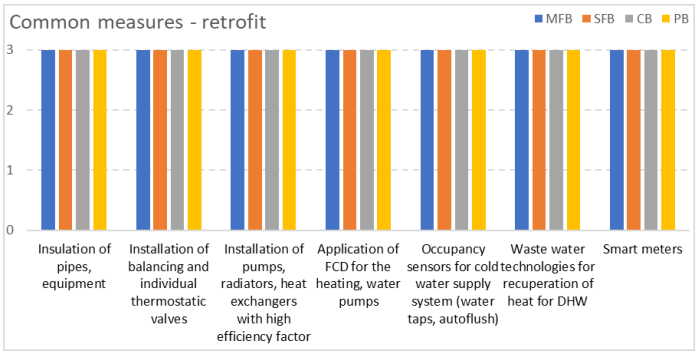
	United States of America							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insualtion of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	3	3	3	3	3	3	3	3
Installation of new diesel/oil boilers	3	3	3	3	3	3	3	3
Installation of new electrical boilers	3	3	3	3	3	3	3	3
Installation of new coal boilers	1	1	0	0	0	0	0	0
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of solar collector system / solar cooling systems	2	2	2	2	2	2	2	2
Installation of heat pumps	0	0	0	0	0	0	0	0
3.2.b Improvement of centralized heating source								
Improvement of Centralized Heating Source	1	1	1	1	1	1	1	1
3.2.c Common measures								
Insulation of pipes, equipment	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic valves	3	3	3	3	3	3	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	3	3	3	3	3	3	3
Application of FCD for the heating, water pumps	3	3	3	3	3	3	3	3
Occupancy sensors for cold water supply system (water taps, autoflush)	3	3	3	3	3	3	3	3
Waste water technologies for recuperation of heat for DHW	3	3	3	3	3	3	3	3
Smart meters	3	3	3	3	3	3	3	3
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	3	3	3	3	3	3	3	3
Application of FCD for the pumps, fans, AHU control	3	3	3	3	3	3	3	3
Installation of VAC equipment with high efficiency factor	3	3	3	3	3	3	3	3
Application of variable flow cooling system	3	3	3	3	3	3	3	3
Insulation of distribution pipes	3	3	3	3	3	3	3	3
Installation of balancing and individual thermostatic controls	3	3	3	3	3	3	3	3
Solar cooling systems	3	3	3	3	3	3	3	3
3.4 Appliance								
EE appliance (labelling)	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of EE lamps (LED/CFL)	2	2	2	2	2	2	2	2
Occupancy/motion/ambient lighting sensors	0	0	0	0	0	0	0	0
Exterior lighting control	0	0	0	0	0	0	0	0
Application of "day light" solutions in architecture	0	0	0	0	0	0	0	0

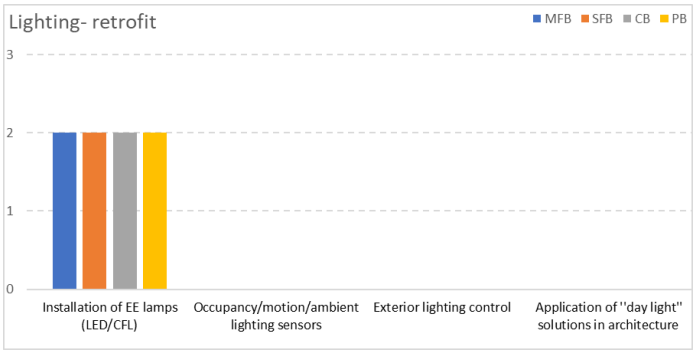

Heating/Domestic hot water/cold water supply - retrofit
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps

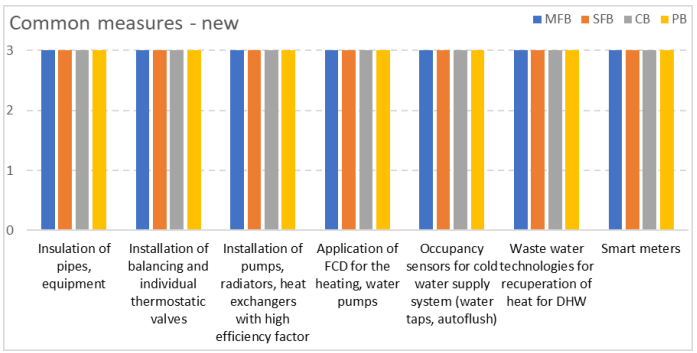

Air conditioning, Ventilation and Cooling - retrofit
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Heating/Domestic hot water/cold water supply - new
MFB SFB CB PB
3
2
1
0
Installation of new gas-fired boilers
Installation of new diesel/oil boilers
Installation of new electrical boilers
Installation of new coal boilers
Installation of new biomass boilers
Installation of solar collector system / solar cooling systems
Installation of heat pumps


Air conditioning, Ventilation and Cooling - new
MFB SFB CB PB
3
2
1
0
Application of air recuperators
Application of FCD for the pumps, fans, AHU control
Installation of VAC equipment with high efficiency factor
Application of variable flow cooling system
Insulation of distribution pipes
Installation of balancing and individual thermostatic controls
Solar cooling systems


Common measures - retrofit
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
Application of FCD for the heating, water pumps
Occupancy sensors for cold water supply system (water taps, autoflush)
Waste water technologies for recuperation of heat for DHW
Smart meters


Lighting- retrofit
MFB SFB CB PB
3
2
1
0
Installation of EE lamps (LED/CFL)
Occupancy/motion/ambient lighting sensors
Exterior lighting control
Application of "day light" solutions in architecture


Common measures - new
MFB SFB CB PB
3
2
1
0
Insulation of pipes, equipment
Installation of balancing and individual thermostatic valves
Installation of pumps, radiators, heat exchangers with high efficiency factor
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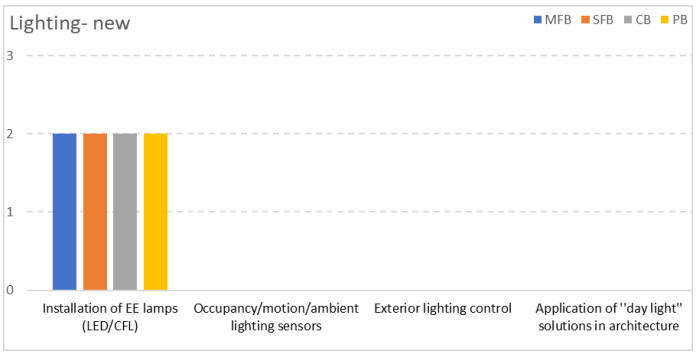
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