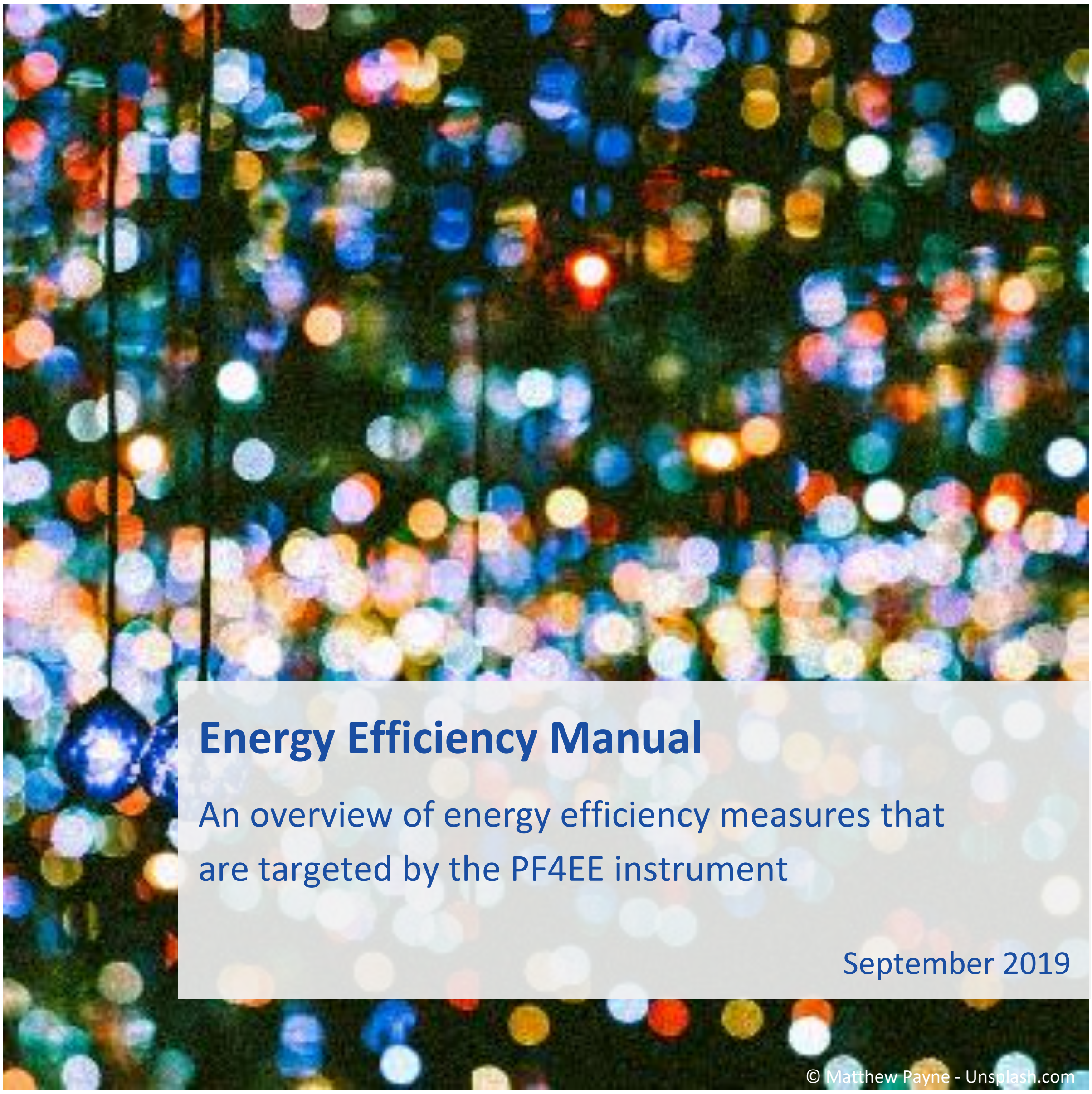

Energy Efficiency Manual

An overview of energy efficiency measures that are targeted by the PF4EE instrument

September 2019

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The „Energy Efficiency Manual“

This manual informs about energy efficiency (EE) measures that are generally eligible for financing under the European Investment Bank’s “Private Finance for Energy Efficiency” (PF4EE) instrument. The manual briefly describes these measures and highlights factors that should be kept in mind when considering financing through the PF4EE instrument.

The EE Manual also accompanies two online tools that have been developed in relation to PF4EE: The PF4EE Web-Check Tool and the Energy Efficiency Quick Estimator (EEQuest). These tools aim to support financial intermediaries in marketing dedicated energy efficiency finance, raise awareness and facilitate on-lending for energy efficiency. As such, the tools provide estimates on the savings potential of many of the measures described in this manual. The tools can be accessed through the PF4EE webpage as linked below.

Private Finance for Energy Efficiency (PF4EE)

The Energy Efficiency Manual has been developed as part of the Expert Support Facility of the “Private Finance for Energy Efficiency” instrument. PF4EE is a joint financial instrument of the European Investment Bank and the European Commission under the European Union’s LIFE Programme. PF4EE was launched in 2015 to provide adequate and affordable commercial financing for energy efficiency investments across Europe. The instrument leverages energy efficiency financing through PF4EE partner banks, which benefit from an EIB loan, a risk sharing facility, and dedicated expert support.

The PF4EE loan conditions and how to apply:

Who can apply? In general: SMEs, MidCaps and large enterprises (including ESCOs)

Loan size? Up to EUR 5 million, depending on company type and project

Maturity? 3-20 years

Target projects? Energy efficiency projects relating to existing buildings, industry, public lighting, district heating and cooling; as well as small renewable energy projects for self-consumption and cogeneration of heat and power.

How to apply? The energy savings potential of investment projects must be estimated and documented to qualify for PF4EE financing. Get in touch with a PF4EE partner bank to learn which documentation is required.

Download this document & find out more about PF4EE on the project webpage [pf4ee.eib.org](pf4ee.eib.org)

- ✓ Overview of and links to participating partner banks
- ✓ Links to the PF4EE Web-Check Tools and the EEQuest Tool
- ✓ Overview of pipeline development activities
- ✓ PF4EE news and success stories
- ✓ Downloadable material
- ✓ Contact information

Which are the PF4EE target measures?

This list is not exhaustive. Measures not mentioned in this list can be targeted as well.

Energy Efficiency in Existing Buildings

Measure	Description	Energy savings	Payback
Thermal insulation of roof	Better insulation of a roof can reduce energy needs due to a reduction of heat losses and heat gains.	up to 95% of heat losses/gains through roof can be avoided	5-20 years
Thermal insulation of walls	Better insulation of walls can reduce energy needs due to a reduction of heat losses and heat gains.	up to 95% of heat losses/gains through wall can be avoided	5- 20 years
Sealing and exchange of windows	A reduction of heat losses can also be achieved through better insulated windows, e.g. in the form of sealing leaks in windows or through double or triple glazing.	up to 95% of heat losses/gains through windows can be avoided	5- 20 years
Replacement of air conditioning systems	A switch to efficient air conditioning systems reduces the total energy consumption of buildings.	5-20% of energy demand for air conditioning can be saved	2- 10 years
Boiler replacement	Through replacing conventional boilers with high-efficiency models, significant reductions in fuel consumption and fuel costs can be achieved.	5-15% of fuel for boilers can be saved	5- 10 years
Building automation	Through the centralised control of a building's heating, ventilation, air conditioning and lighting system, building automation systems can allow for energy savings compared to decentralised control systems.	up to 15% of total energy demand can be saved	3- 10 years
District heating (substation rehabilitation)	Improvements of heat exchangers, pumps and control systems in district heating subsystems can reduce the local energy consumption.	5-15% can be saved	2-10 years
Heat pump replacing boiler	Through the extraction and transfer of heat from outside air, water or soil, heat pumps can meet heating, hot water and cooling objectives at lower final energy input needs as compared to conventional appliances such as boilers.	up to 70% of final energy usage for heating/cooling and hot water supply	5-15 years
Improvement of illumination	Energy efficiency improvements can be achieved through modern illumination systems due less energy needs for the same luminous	up to 80% of energy demand for illumination can be	2-8 years

	flux as well as through occupancy sensors, timeclocks, twilight switches etc.	saved	
Installation of thermostatic valves	By regulating the water flow through the radiator to which they correspond, thermostatic valves are a simple and efficient way to control a room's temperature and to improve the energy efficiency of heating.	up to 30% of heating energy demand can be saved	1-5 years
Ventilation	Through better ventilation controls, fans, motors as well as heat recovery systems, energy needs of ventilation systems can be reduced.	up to 40% of electricity demand for ventilation can be saved; heat recovery up to 30% of heating/cooling demand	2-8 years

Renewable Energy in Existing Buildings

Measure	Description	Energy savings	Payback
Photovoltaics	Photovoltaic modules generate electricity from sunlight, thus reducing the need to rely on energy from the grid.	grid energy savings depend on produced energy and self-consumption amount	8-25 years
Solar thermal heat generation	Solar thermal heat generation describes a technique where solar radiation is converted to usable heat energy which can be used for hot water generation, heating support and processes.	can economically substitute up to 70% of hot water and 30% of heating demand	3-15 years

Energy Efficiency in Industry

Measure	Description	Energy savings	Payback
Optimisation of compressed air systems	Energy efficient compressed air systems reduce energy losses resulting from conversion or leakage and thereby reduce overall energy needs.	up to 40% can be saved	1-7 years
Waste heat recovery	Through the use of "waste" heat arising from industrial processes for the purposes of space heating, air, water or load preheating and power generation, significant energy efficiency gains can be met.	depends on the demand and supply profile	5-15 years

Economizer on existing boilers	Economizers on existing boilers are one measure in the field of waste heat recovery; by capturing residual heat in the boiler system and using it to preheat the boiler input (e.g. water or air), energy which otherwise is needed to heat the input can be saved.	up to 5% can be saved	2-5 years
Electric motor replacement	As the main part of an electric motor's lifecycle cost is spent on energy, improved design, materials or manufacturing techniques can allow for energy savings when replacing conventional motors.	up to 10% can be saved	2-8 years
Variable Speed Drives	Through Variable Speed Drives (VSDs), the speed of electric motors can be controlled and higher efficiency levels can be achieved.	up to 20% can be saved	2-8 years

Cogeneration of Heat and Power

Measure	Description	Energy savings	Payback
Cogeneration	When generating heat and power simultaneously ("cogeneration"), "waste" heat resulting from electricity generation can be reused for heating purposes, which allows for considerable cost savings.	substitution of electricity consumption from the grid	depends on the project

EE in Outdoor / Public Lighting

Measure	Description	Energy savings	Payback
Outdoor / public lighting	High-efficient lighting technologies (e.g. LEDs, sensors, monitoring systems / controls) provide for reduced energy and maintenance costs.	up to 80% can be saved	2-8 years

EE in District Heating and Cooling

Measure	Description	Energy savings	Payback
District heating/cooling	By substituting the necessity of each building having its own heating/cooling system, large-scale district heating and cooling systems can achieve energy savings.	savings are highly case dependent	depends on the project

Which cost factors are eligible for PF4EE?

What can be financed by PF4EE?

In relation to the energy efficiency measures mentioned in this guide, all investment costs incurred in order to generate energy savings (or to produce energy in case of small renewables) are eligible for financing through a PF4EE loan. This includes costs for studies and engineering (e.g. costs for an Energy Audit or Energy Performance Certificate), civil works, equipment and installation, grid connection, or technical and price contingencies.

Costs that are *associated* to the energy efficiency investment can also be considered as an eligible cost position, but only if these associated costs do not exceed 50% of the total investment costs that are considered for PF4EE financing. Associated costs are costs that arise from investments which make technical or economic sense to be implemented together with the actual energy efficiency investment. An example for associated costs is the general repair of a roof at the same time at which roof insulation is conducted, or painting of the exterior wall of a building when conducting energy efficiency improvements of the building envelope.

What cannot be financed by PF4EE?

Costs that cannot be considered for PF4EE financing include all investment costs that can neither be classified as investments inducing energy savings (or production of energy for small renewables), nor as investments that are *associated* to an energy efficiency project. Further, the following investment components cannot be considered for PF4EE financing: Normal maintenance activity, recoverable costs such as VAT (non-recoverable VAT can be financed), pure financial transactions not directly linked to the financing of new assets, purchase of land or real-estate investment, construction of new buildings.

What are these EE measures really?

Energy Efficiency in Existing Buildings

Description: Energy efficiency measures in existing buildings can be classified in two groups: 1) Measures which concern the building envelope, such as the insulation of walls, and 2) projects that concern the technical system of a building. For the first group, energy savings are achieved when unwanted heat losses / gains and ventilation losses are reduced. For the second group, energy savings arise when the efficiency of technical equipment, such as boilers or lighting, is improved. Oftentimes, energy efficiency measures in buildings are accompanied by considerable co-benefits. Energy-efficient ventilation systems, for example, can improve the level of comfort in existing buildings, and insulation measures can impede unpleasant interior draughts.

Keep in mind: Only energy efficiency measures in existing buildings are eligible for PF4EE financing – the construction of new buildings is generally excluded. Further, be aware that the energy efficiency measure must relate to the building envelope or to the technical facilities in the building – financing of energy efficient appliances, such as TVs or fridges, is not eligible under PF4EE.

Thermal Insulation of Roof

Description: An average building loses about 10-20% of heating and cooling energy due to heat transfer through the roof. Thermal insulation of the roof can reduce such losses. Glass and mineral wool are materials commonly used for such insulation purposes. Cellulose fibre, wood or plant fibres are alternative materials that are characterized by a higher degree of sustainability. When combined with other retrofitting measures on the building envelope, roof insulation is relatively cheap and has medium-length payback periods. Note that in many European countries, minimal requirements for insulation have to be met when buildings are refurbished.

Factors influencing the energy savings potential: Thickness of the insulation, roof construction → age of the building, area of the roof in relation to other envelope area → type of the building, heating and cooling energy demand, etc.

Keep in mind: New roof covering or new roof windows cannot be considered as an energy efficiency investment. When conducted at the same time as roof insulation however, such expenditures could be considered as associated costs.

Thermal Insulation of Walls

Description: Similar to heat loss through roofing, an average building loses about 30-50% of heating and cooling energy due to heat transfer through the walls. Thermal insulation of walls is thus a key measure to reduce heating costs. It can be achieved using a variety of materials which differ in performance, thickness and price. Insulation materials can be applied on the exterior or on the interior side of the wall. Some materials require an additional moisture barrier to prevent damages on the building structure.

Through wall insulation measures, energy savings of up to 40% can be realised. Potential extra costs can occur due to constructive and architectural impacts.

Factors influencing the energy savings potential: Thickness of the insulation, wall construction and conditions → age of the building, area of the walls in relation to other envelope areas → type of the building, heating and cooling energy demand, type of heating fuel, etc.

Sealing and Exchange of Windows

Description: In an average building, roughly 20% of heating and cooling energy is lost through air exchange. If windows are in a poor condition, they allow for a substantial airflow between the inside and the outside. This results in significant heating or cooling losses, and thus in wasting energy. By sealing leaks in windows and by exchanging old windows for new windows with double or triple glazing, the respective losses can be reduced. In addition to reduced heating and cooling costs, thermal insulation of the windows also serves as acoustic insulation and helps to avoid thermal discomfort associated with large windows.

Factors influencing the energy savings potential: Condition and type of the current windows (single/double glazed), area of the windows in relation to other envelope area → type of the building, type of the new window, heating and cooling energy demand, type of heating fuel, etc.

Replacement of Air Conditioning Systems

Description: Replacing inefficient air conditioning (AC) systems by more efficient ones will reduce the total energy consumption of a building. There are different methods to describe the efficiency of air conditioning units. Seasonal energy efficiency ratios (SEER) provide a meaningful indication on the efficiency of AC units, since they, in contrast to other ratios, consider the unit's efficiency in view of different exterior temperatures. Energy efficiency labels rating AC units should thus always be based on SEER. If it is intended to coordinate the upgrading of the AC system with building insulation, the cooling demand of the newly insulated building should be considered when purchasing and installing new air conditioning systems.

Factors influencing the energy savings potential: Type of building, chilled surface area in the building, energy efficiency rating of currently used units, energy efficiency rating of new units, usage of the AC for heating purposes, etc.

Boiler Replacement


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Description: Boilers are used for heating purposes and hot water generation. Over the past decades, boiler efficiency has improved considerably. Depending on the type, age and condition of the old boiler, a replacement of the boiler unit can reduce final energy usage by 5-15%. Energy savings can also be achieved if the heating system (for which the boiler pre-heats the input) is adapted to operate at lower temperatures. Such an adaptation of the heating system consists, for example, in the exchange of small radiators that work on high temperature inputs, for bigger radiators such as underfloor heating. The increased area of the bigger radiator implies that the same room temperature can be achieved with a lower initial temperature of the heating system input. The lower temperature of the system input in turn can induce energy savings of up to 30% at the boiler level. Boilers are used for heating purposes and hot water generation. Over the past decades, boiler efficiency has improved considerably. Depending on the type, age and condition of the old boiler, a replacement of the boiler unit can reduce final energy usage by 5-15%. Energy savings can also be achieved if the heating system (for which the boiler pre-heats the input) is adapted to operate at lower temperatures. Such an adaptation of the heating system consists, for example, in the exchange of small radiators that work on high temperature inputs, for bigger radiators such as underfloor heating. The increased area of the bigger radiator implies that the same room temperature can be achieved with a lower initial temperature of the heating system input. The lower temperature of the system input in turn can induce energy savings of up to 30% at the boiler level.

Factors influencing the energy savings potential: Type and age of the boiler to be replaced, heating energy demand, type of new boiler to be installed, supply temperature, etc.

Keep in mind: Boilers which use fuel oil or coal as input fuel are not eligible under PF4EE.

Building Automation

Description: Building Automation Systems are installed to provide for a centralised control of a building's heating, ventilation, air conditioning and lighting system. These systems can keep building temperatures within a desired range, light rooms with respect to an occupancy schedule or detect device failures within the building. Thus, Building Automation Systems can lead to additional savings in comparison to decentralised control systems. Most commercial and industrial buildings include a Building Automation System – such buildings are often referred to as "intelligent building" or "smart homes".

Factors influencing the energy savings potential: Energy consumption in the building, load patterns and behaviour, features of the BAS (such as energy controlling, automated control of technical equipment, integrated weather forecast control), etc.

District Heating (Substation Rehabilitation)

Description: Substations connect the heating network of a building with the district heating network. Measures to upgrade a district heating substation include the improvement of the heat exchanger, pumps and control systems. This can result in reducing energy consumption in the building's heating network by 5-15%.

Factors influencing the energy savings potential: Energy demand on the respective substation, usage of properly dimensioned and efficient heat exchangers, valves and controls, etc.

Keep in mind: Under PF4EE, only the improvement of existing sub-stations should be considered. Financing of new infrastructure/machinery for district heating is not eligible.

Heat Pump Replacing Boiler

Description: Heat pumps are devices that transfer heat energy from a source of heat to a destination called a „heat sink". Such pumps can be used for heating, hot water and cooling purposes. Heat pumps can be distinguished by the heat source on which they draw – they can extract and transfer heat from outside air, water or soil into a building. The smaller the temperature difference between the heat source and the heat sink is, the better the performance of the heat pump. In heating systems with low heating supply temperatures, 1 kWh of electricity can result in 3 kW or more useable heat energy. The technology is well-known, requires little space and has low maintenance costs. However, the investment costs can be quite high.

Factors influencing the energy savings potential: Type of boiler to be replaced by the heat pump, construction year of the boiler, heating energy demand, type of heat pump to be installed, etc.

Improvement of Illumination

Description: Significant energy efficiency improvements can be achieved through modern illumination systems. LED (Light Emitting Diode) lamps are most efficient (energy class up to A++) and have a very long lifetime (> 15,000 hours). Note that traditional incandescent light bulbs, considered as least energy efficient type of lighting, have an average rated lifetime of 1,000 hours and require about 90% more energy for the same luminous flux. LED lamps can be purchased as interchangeable lamps or directly integrated in the luminaire. The technology is under continuous development and allows not only for better efficiency levels, but also for a range of colours, light levels, dimming options. Illumination investments are attractive due to the low financial input and short payback periods. The longer durability of modern lamps also reduces the amount of maintenance required. Energy consumption for illumination can be further reduced with controls based on occupancy sensors, timeclocks, twilight switches or motion detectors.

Factors influencing the energy savings potential: Type of illuminant to be replaced, power rating of old illuminants, number of lamps/illuminants to be replaced, operation time of lighting, replacement of the whole lamp or only the illuminant, installation of lighting control system, etc.

Keep in mind: For PF4EE, the measure must concern the replacement of existing inefficient illumination, rather than the extension of existing lighting systems or the development of new lighting infrastructure.

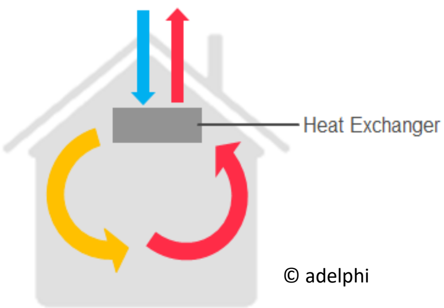
Installation of Thermostatic Valves

Description: Thermostatic radiator valves are a means to control the temperature of the room: The valves sense the air temperature surrounding them and regulate the water flow through the radiator to which they correspond. They are a simple and efficient way to avoid overheating, improve the energy efficiency of heating and allow for an individual temperature control when there is no other temperature regulation system in place. Thermostatic valves are an attractive investment due to rather low investment costs and short payback periods.

Factors influencing the energy savings potential: Heating energy source, heating energy demand, type of radiator valve used before, type of thermostatic radiator valve that will be used, etc.

Improvement of Ventilation Systems

Description: Mechanical ventilation systems are used to provide for a controlled and pleasant/suitable air quality for people and processes. Furthermore, ventilation systems can be used for heating and cooling. The replacement of fans, motors and controls can reduce the electricity demand in ventilation systems by up to 40%.



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Additional savings can be achieved through heat recovery systems. Oftentimes, ventilation systems can significantly increase a building’s heating (or cooling) needs since incoming air needs to be cooled in summer or heated in winter in order to provide comfort. A ventilation system involving heat recovery uses the outgoing warm (or cool) air to pre-heat (or pre-cool) the incoming air before entering the building. Through the use of heat (or cold) from outgoing air that is otherwise wasted, energy savings can be achieved. The system also ensures an appropriate level of humidity for incoming air and further guarantees a good quality of inside air by removing unpleasant odours and gases.

Factors influencing the energy savings potential: Power rating of current system, annual working hours of the system, type of ventilation control and type of motor control currently used, type of ventilation control that will be used, kind of motor control that will be used, replacement of fan and/or motor with a high quality substitute, implementation/improvement of heat recovery, etc.

Renewable Energy in Existing Buildings

Description: Renewable energy is generated from resources which are available in unlimited quantities with respect to human time dimensions or which can be reproduced or regenerated quickly. Examples are sunlight, wind, hydro power, geothermal heat and biomass. The CO2eq emissions that arise from using these resources are negligible compared to the emissions that arise from fossil fuel usage. Increasing energy prices, decreasing technology costs over the last decade, and generally low costs for operations and maintenance have rendered the application of such renewable energies in buildings financially attractive.

Keep in mind: Note that PF4EE is a financing mechanism that is intended predominantly to foster energy efficiency measures. For this reason, only renewable energy technologies that reduce an agent's energy consumption from the grid are eligible for PF4EE financing. Renewable energy technologies that are considered for PF4EE financing should thus be realised specifically for self-consumption purposes, and should be linked to an existing building, such as Photovoltaic modules or a solar water heater on the roof.

Photovoltaics

Description: Photovoltaic (PV) modules, often installed on the rooftop of a building, generate electricity from sunlight. The electricity produced can then be used for own consumption, and the excess production can be sold to the power grid. PV modules are especially attractive in regions with strong solar radiation.

Factors influencing the energy savings potential: Region, net area that is covered by PV modules or the rated panel power, etc.

Keep in mind: To qualify for PF4EE financing, the energy produced by the PV modules must mainly be intended for self-consumption (more than 50% should be self-consumed.). Further, the PV modules should be placed in relation to the building (e.g. on the roof).

Solar Thermal Heat Generation

Description: Solar thermal heat generation describes a technique where solar radiation is used to produce hot water. Solar thermal energy can be used for domestic hot water heating, space heating support, pool heating, or for commercial or industrial process heating purposes. The potential savings and payback times depend on the solar radiation, the load profile and the dimensioning of collector area and storage. The payback period ranges between 3 and 15 years.

Factors influencing the energy savings potential: Region, heating energy source that is substituted by solar energy, size of the absorber, usage of the solar energy for hot water and heating or solely for hot water.

Energy Efficiency in Industry

Description: Energy efficiency improvements in industrial production processes can be achieved by change of behaviour, process modifications, digitalisation or the replacement of inefficient equipment. In addition to direct cost savings, energy efficiency measures can also improve performance in industrial processes, for instance through speed control of electric motors.

Keep in mind: While industrial modernisation measures usually go hand-in-hand with energy efficiency improvements in relative terms, they can also imply significant capacity increases, thus eventually increasing a facility's or a process' overall consumption of energy. However, the ultimate goal of the financing mechanism PF4EE is to reduce primary energy consumption – therefore, energy efficiency measures that benefit from PF4EE financing should increase capacity only up to 30% while keeping the ex-post energy consumption lower than the previous consumption.

Optimisation of Compressed Air Systems

Description: Compressed air is, simply put, air that is kept under pressure. Air compressors have a wide variety of industrial applications, for instance in food and beverage processing (cleaning of containers, packaging, etc.), or in relation to air brakes and air-start systems in engines. For many production processes, compressed air systems are a vital input. Although the system operates "only with air", compressed air is quite expensive. Due to energy losses through conversion or leakage, only 5 to 20% of the electric energy input reaches the point of end-use. Thus, energy-efficient air compressors can reduce energy costs considerably.

Factors influencing the energy savings potential: Power rating of the current system, annual operating hours of the system, replacement of the compressor, improvement of controls and compressed air storage systems, improvements in the distribution network, etc.

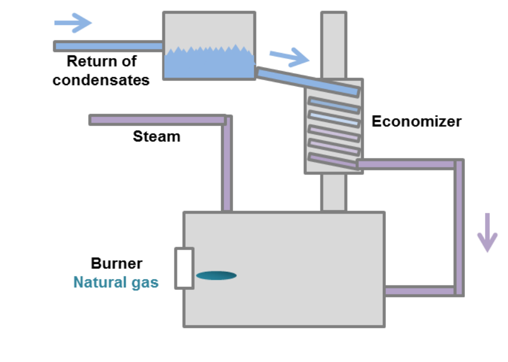
Waste Heat Recovery

Description: In industrial processes, significant amounts of energy are discharged as "waste" heat. Waste heat sources include combustion exhausts, cooling water, and losses that occur in relation to heated equipment surfaces or heated products exiting industrial processes. Depending on temperature and potential use, waste heat can be recovered for space heating; air, water or fuel preheating; and power generation. Thus, significant energy efficiency gains can be realized when recovering the industrial by-product "heat".

Factors influencing the energy savings potential: Energy source for heat production, energy demand of the system for which a heat recovery will be installed, average thermal recovery, annual operating hours of the heat recovery, etc.

Economizer on Existing Boilers

Description: Economisers are placed around the flue of existing boilers to recover waste heat. They work as follows: First, the economiser captures residual heat which is contained in exhaust gases that leave the boiler through the flue. Second, the boiler input (e.g. water that will be heated by the boiler) is passed through the economiser before entering the boiler. Thus, the boiler input is pre-heated before it enters the boiler and hence efficiency gains can be achieved since less fuel (e.g. natural gas) is needed to heat the boiler input. Note that economisers require proper dimensioning and should be designed by professionals.



Source: compiled by adelphi, based on www.energir.com/en/business/equipment/process/boiler-stack-economizer/

Factors influencing the energy savings potential: Energy consumption of the boiler, temperature level of flue gas, supply temperature, size of the boiler, etc.

Electric Motor Replacement

Description: Electric motors are used in a variety of industrial processes. A lot of them are working at low-efficiency levels, resulting from wrong dimensioning and outdated technology. Through improved design, materials or manufacturing techniques, motors have become more energy-efficient: They are able to accomplish the same work with less power consumption. As more than 80% of an electric motor's lifecycle cost is spent on energy, the replacement of conventional electric motors by energy-efficient models can allow for considerable energy savings.

Factors influencing the energy savings potential: Rated power of the motor to be replaced, age of the motor, annual working hours of the motor, motor efficiency type (IE4 or better), etc.

Variable Speed Drives

Description: Variable Speed Drives (VSDs; also named variable frequency drives (VFD) for AC motors) are equipment used to control the speed of electric motors. Through these controllers, electric motors run at high efficiency levels also at part load conditions.

Factors influencing the energy savings potential: Type of motor for which a Variable Speed Drive will be installed, number of motors to be equipped with Variable Speed Drive, electric power rating, annual working hours, etc.

Cogeneration of Heat and Power

Description: Cogeneration (or combined heat and power, CHP) describes the simultaneous generation of electricity and heat by means of an integrated energy system (in tri-generation, cooling is produced in addition to heat and electricity). While in regular power plants, the heat (which is produced as sort of by-product from electricity generation) is lost, cogeneration plants allow for a recovery of this heat which can be used for heating purposes in buildings and industry. Through the use of otherwise „wasted“ heat, considerable energy savings can be achieved.

Factors influencing the energy savings potential: Current heating energy source, heating energy demand, energy source that will be used for the combined heat and power (CHP) unit, electrical power rating of CHP, thermal power rating of CHP, share of the total heating demand that the plant will provide.

Keep in mind: Note that fuel oil or coal fired cogeneration units are not eligible for PF4EE financing. Further, the cogeneration unit must induce primary energy savings. Also note that large cogeneration units (>1MWel) must comply with additional eligibility criteria which are not mentioned here.

Energy Efficiency in Outdoor/Public Lighting

Description: Lighting in public spaces, buildings and streets is one of the essential services provided by the public sector. Lighting technologies have improved significantly over the past years, hence making high performance and efficiency affordable for large scale use. Highly efficient technologies include LEDs, sensors, monitoring systems and controls. Such technologies are typically associated with higher up-front costs, but offer reduced energy and maintenance costs in turn. In particular, LEDs last much longer than traditional lighting technologies and provide a variety of co-benefits, such as more customizable light. The installation of smart systems, including sensors or other technologies, allow for data-based adjustments of lighting to particular on-site needs. Thanks to these improvements in the lighting system, public electricity consumption can be reduced.

Keep in mind: PF4EE aims to reduce absolute energy consumption – hence only upgrades that target existing public lighting infrastructure are eligible. The installation of new infrastructure, which would induce an increase in energy consumption, is not eligible.

District Heating and Cooling

Description: District heating and cooling means that centralised networks substitute the necessity of each building having its own heating or cooling system. District heating networks distribute heat through hot water from one or more heat generating unit to a wider community area. District cooling networks distribute chilled water in order to feed individual cooling systems. Through this centralised approach, district heating and cooling networks allow for the utilisation of significant volumes of waste heat (a typical by-product of power plants), and hence enable the efficient creation of heated or chilled water for heating and cooling purposes.

Keep in mind: To be eligible for PF4EE financing, investments in district heating and cooling systems must concern the improvement of the efficiency of existing systems, where heat/cold must mainly be produced from waste energy, from highly efficient cogeneration (CHP) systems, or from renewable energy sources. Further, to be economically reasonable, long-term heat/cold supply costs implied by the system must be competitive against individual heating/cooling systems in buildings.

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