

Qualification scheme for the ENACT Energy auditor

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ENACT ENERGY AUDITOR PROFILE

The *ENACT Energy Auditor* is a professional responsible for carrying out **energy audits for the residential sector**. The professional profile has been developed based on the activities and job requirements analysis and related system of knowledge, skills and competences and taking into consideration the:

- Relevant National (and where relevant Regional) qualification frameworks and repertories of each partner countries (Italy, Poland, Portugal and Spain);
- National and European standards on energy management and auditing professional profiles.

The training programme and assessment scheme has been prepared according to ECVET – European Credit System for Vocational Education and Training.

Assuming a modular approach, the *ENACT Energy Auditor* activities and competences represent bricks that can be progressively integrated within professional development paths related to the overall civil sector (including the tertiary sector and public administration in addition to the residential one), the industrial as well as the transport one.

ENACT ENERGY AUDITOR ACTIVITIES

The *ENACT Energy Auditor* covers all the processes of the residential energy audit, from the collection of data, to the data analysis and communication with the clients. Moreover, the *ENACT Energy Auditor*, in addition to the identification of energy improvement measures, provides advice and suggestions on their implementation in terms of timing and financial return as well as their implementation and monitors the achieved improvements in terms of energy consumption, production and cost reduction.

The professional profile is articulated in four main areas: Management, Auditing, Planning, and Implementing/Monitoring, each articulated in terms of activities, as illustrated in the following table.

AREA	ACTIVITIES
1. Management	<ul style="list-style-type: none"> • Planning the energy audit in terms of scope, resources and time schedule/management • Coordination • Conflicts management • Communication and reporting
2. Auditing	<ul style="list-style-type: none"> • Data collection, measurement and observations • Diagnosis of the existing building state and systems
3. Planning	<ul style="list-style-type: none"> • Definition of the measures to improve the energy performance • Economic assessment of the energy efficiency improvement opportunities proposed • Technical assessment of the energy efficiency improvement opportunities proposed • Definition and selection of the optimal range of improvements that reduce energy consumption • Elaboration of the energy action plan for the proper realisation of energy investments
4. Implementing / Monitoring	<ul style="list-style-type: none"> • Implementation of the selected energy efficient measures • Monitoring of the energy consumptions and performances • Possibly implementation of corrective actions

ENACT ENERGY AUDITOR KNOWLEDGE, SKILLS AND COMPETENCES

The *ENACT Energy Auditor* professional profile defines, per each activity, the required knowledge, skills and competences (KSC). The synthetic map of the overall ENACT profile is represented in the following table, while the complete KSC schema of the *ENACT Energy Auditor*, articulated per each learning unit, is reported in Annex 1.

Knowledge	Skills	Competences
Energy units and conversion factors	Identify physical quantities/measurements and conversion factors	Application of energy units and manage conversion factors
Energy sources and carriers	Identify energy sources and carriers involved in the energy audit	Management of energy sources and carriers
Relevant laws, policies, rules, regulations, contracts and standards on energy efficiency and renewables (at European and National level) applicable to energy audit	Perform and choose the best solution of contract and/or procedure to apply to the energy audit	Application and management of relevant laws, regulations, contracts, standards, policies, incentives
Data collection methods, performance indicators, adjustments factors and energy balance	Collect quality information useful for the scope of the energy audit. Propose and calculate suitable energy consumptions performance indicators	Assessment of energy consumption and uses in accordance to the scope of the audit. Capacity of selecting the energy performance indicators in compliance with the scope of energy audit and compare with references (benchmarks, standards). Verification and validation of the measurements of all data and test results that may affect the reliability of the energy audit findings

Physical principles related to energy (thermal, electrical, thermodynamics, heat transfer, fluid mechanics, light, etc.)	Identify the physical principles related to energy and energy fluxes	Understanding of physical and thermodynamic processes and related fluxes applied to the building energy use
Technical tools / metering, monitoring and measuring equipment to carry out an energy audit	Identify energy use profile and inefficient areas and manage the equipment to carry out an energy audit.	Elaboration of a measuring / metering plan for the data collecting activities and verification, comparison and validation of energy saving
(Fundamental of) energy market (production, distribution, transmission, supply) and market players	Evaluate energy market and actors involved	Understanding of energy market
Tariff and tariff structures	Analyze energy tariff (use rates, peak charges, usage profile ...)	Understanding and management of different tariffs
(Fundamental of) building market and building constructions models	Understand building market	Competent in identifying the different typology of buildings
Building (including its envelope, all technical building system and building services)*	Evaluate the building in terms of energy performances	Energy building assessment
Traditional and innovative technologies for energy efficiency improvement and for renewable sources	Identify proposals for improvements.	Competent in personalizing and adapting proposals for improvements, including technical and economic feasibility

Techniques of achievable/ achieved energy savings	Calculate of achievable energy savings and/or energy efficiency improvements	Assessment of energy savings/ improvements and proposal of corrective actions
Ongoing financing and subsidies	Identify the financing/subsidies opportunities	Management of the procedures of financing and subsidies
Economic assessment indicators	Make suitable economic assessment of proposals	Evaluation of the economic assessment of proposals and comparison of them
Energy audit principles, methodology and deliverables as described by the EN 16247 standard	Understand the scope and the boundaries of the energy audit and relating activities	Application of principles, methodology, tasks with reference to the scope and thoroughness of the energy audit
(Fundamentals of) reporting, communication and marketing connected to energy audit	Communication skills	Presentation of comprehensive, functional and well organized results and reporting. Competent in communication and marketing.
(Fundamentals of) project management	Identify the complete energy audit process	Management of the overall energy audit process

** the services provided by the technical building systems and by appliances to condition the indoor environment (thermal comfort, air quality, visual and acoustic quality) and other services related to the use of the building*

*** technical equipment for heating, cooling, ventilation, domestic hot water, lighting and on site energy production*

ENACT ENERGY AUDITOR TRAINING PROGRAM

According to the professional profile in terms of activities and KSC schema, an 80 hours ENACT training course is foreseen. The table below shows the synthetic representation of the ENACT training program, in terms of:

- **learning outcomes structure**, articulation and timing. A more detailed ENACT training program, also reporting the learning units composing each module is reported in *Annex 2*;
- training **methodology** and **assessment** criteria;
- **ECVET points**. A total of **6 ECVET points** have been allocated to the ENACT course (80 hours). The ECVET points have been allocated to the course modules according to a multiple ponderation schema, taking into consideration **3 aspects**: duration of the module (in terms of number of hours), assessment and training methodology and level of difficulty.

Module	Hours	Methodology	Assessment Methodology	Ecvet
1. Introduction to energy auditing in residential sector	12	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
2. Legislation, regulations and contracts in residential sector	5	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
3. Building envelope	9	On line resources - Lesson (on line or in presence) - Exercises/simulations/lab - - Tutor on line	Multiple choice (10 questions)	0,5
4. Heating, ventilation, air conditioning and hot water systems in residential sector	8	On line resources - Lesson (on line or in presence) - Exercises/simulations/lab - - Tutor on line	Multiple choice (10 questions)	0,5
5. Lighting systems, domestic appliances and other energy consuming devices in residential sector	7	On line resources - Lesson (on line or in presence) - Exercises/simulations/lab - - Tutor on line	Multiple choice (10 questions)	0,5
6. Energy production from renewable energy sources in residential sector	10	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
7. Economic assessment	6	On line resources - Lesson (on line or in presence) Simulations - Tutor on line	Multiple choice (10 questions)	0,5

8. Energy audit methodology	13	On line resources - Guided simulations, exercises, project work - Tutor on line	Multiple choice (10 questions) and/or Case studies	1,5
9. Project management	4	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
10. Communication and marketing	6	On line resources - Lesson (on line or in presence) - Tutor on line Lesson - Tutor on line	Multiple choice (10 questions)	0,5
80				6

ENACT ENERGY AUDITOR QUALIFICATION REQUIREMENTS

The qualification requirements schema is articulated in three main parts:

- qualification minimum requirements, so called **entry level**, articulated in educational levels and work experience for each participating country (table below);
- attendance** (and successful achievement) of the ENACT **training course** and/or the **recognition/validation** of the professional **competences** related to each learning outcome;
- qualification exam**, carried out by certified and/or sectorial training organizations. Candidates are admitted to the final exam if they satisfy the requirements indicated in the above points (a) and (b), according to their curriculum vitae (CV) and further verified by the certified and/or sectorial training organization.



A) ENACT ENERGY AUDITOR QUALIFICATION ENTRY LEVEL

The table below reports the country-based entry level.

	Education	Specific working experience (years)
Italy	Technical degree	0
	Technical diploma	2
	Other degree	3
	Other diploma	3
Poland	Degree on engineering or architecture recognized by the respective professional association	0
	Other degree	1
Portugal	Degree on engineering or architecture recognized by the respective professional association	0
	Other degree	1
Spain	Technical degree	0
	Technical diploma	0
	Vocational educational training of 2 years	1
	none	3

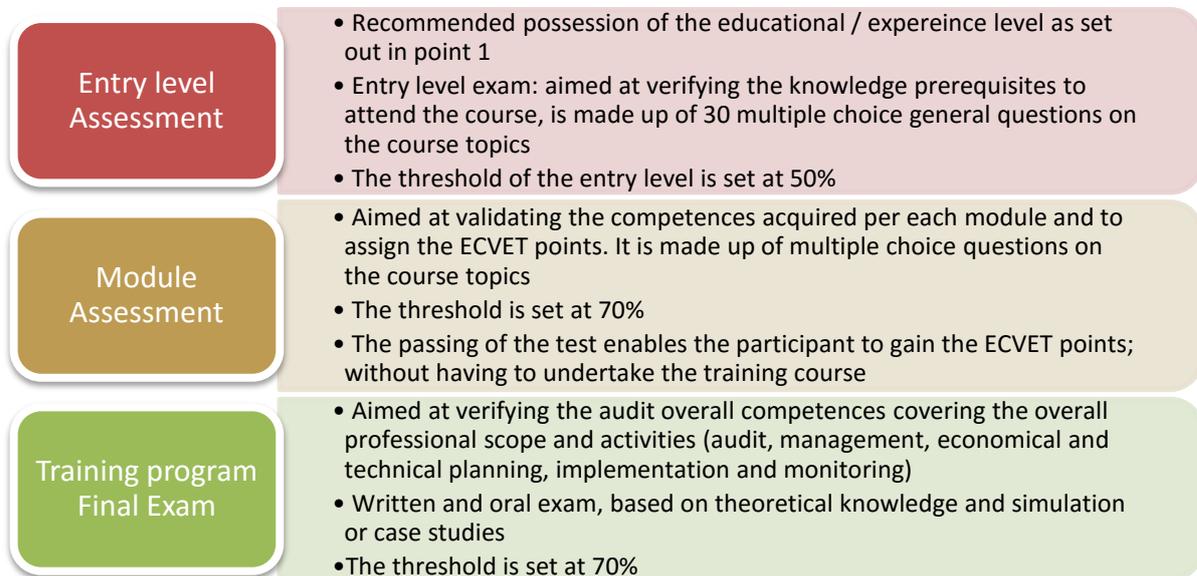
B) ENACT ENERGY AUDITOR TRAINING COURSE ATTENDANCE AND/OR COMPETENCES VALIDATION

As mentioned, the qualification schema requires the:

- **attendance and successful achievement** (including the final exam) of the ENACT **training course** or, in the last 2 years, other similar training course(s) covering all the professional profile's areas of competence delivered by certified and/or sectorial training organizations and / or
- **professional competences** validated by certified and / or sectorial training organizations / associations / employers.

In order to attend the ENACT training course, it is recommended to have the requirements (education and specific working experience) illustrated in the previous table, however it is necessary to pass an entry exam (minimum 50% of 30 multiple choices general questions on course contents). Moreover, to successful pass the training course, it is necessary to pass the tests at the end of each module and to pass the final exam of the course.

The ENACT assessment is articulated in the following 3 levels: entry assessment, module assessment, final assessment.



The assessment frame also constitutes an integral part of the **ECVET Memorandum of Understanding** among the training organizations reciprocally recognizing the ENACT competences developments and validation.

C) ENACT ENERGY AUDITOR QUALIFICATION EXAM

The *ENACT Energy Auditor* qualification exam is carried out by certified and/or sectorial training organizations.

Candidates are admitted to the final exam if possessing requirements (a) and (b), according to their Curriculum Vitae (CV) and further verified by the certified and/or sectorial training organizations.

The ENACT qualification exam is articulated in the following way (also taking into account the UNI CEI EN 16247/5 norm):

- 1) **curriculum vitae** verification;
- 2) **multiple choice** test, made of 20 questions concerning energy audit, management, economical and technical planning, implementation and monitoring in the residential sector;
- 3) **written** test based on a residential sector management and auditing case study;
- 4) **oral** test based on both the case study and all relevant competence areas.

The final qualification exam threshold is set at 70% for each of the three tests.

The final qualification exam is carried out by Examining board, composed by at least two members with specific technical skills in the field of energy audit for the residential/civil sector, including management, economical and technical planning, implementation and monitoring.

The technical competences of the members of the examining board can be demonstrated by:

- Expertise in energy management, economical and technical planning, implementation and monitoring
- Expertise in energy audit for residential/civil sector, documented by accredited certification for energy management expert / energy auditor according to the national and European standards;
- Professional credentials for residential/civil sector;
- Participation in conferences or seminars;
- Knowledge of the standard UNI CEI EN 16247 and other relevant technical standards / laws and regulations applicable to the energy auditing activities.

ENACT ENERGY AUDITOR QUALIFICATION MAINTENANCE

The *ENACT Energy Auditor* qualification is valid for 5 years. *ENACT Energy auditor* shall maintain his qualification through the update and improvement of the necessary technical knowledge and skills to carry out an energy audit. The verification of the qualification requirements will be carried on through curriculum analysis, participation in conferences/seminars and participation in energy audits, including technical and economical planning of the interventions and monitoring.

ANNEX 1 – THE KSC SCHEMA PER LEARNING OUTCOME AND LEARNING UNIT

Module	LEARNING UNIT	h	Description	Knowledge	Skills	Competencies
1. Introduction to energy auditing in residential sector	1	1	The Unit aims to provide basic information concerning the energy sources and the energy unit conversion factors. Energy conversion is a main aspect of energy management. The energy auditor constantly uses these concepts. Therefore it is essential that the energy auditor is familiar with them.	Knowledge of energy sources (primary and secondary; conventional and renewables); energy unit definition and conversion factors; GHG emission factors; GHG effect; forms of energy; European and National scenario.	Ability to manage perfectly the physical quantities and conversion factors in order to verify and validate the measurements, make comparisons and have a good background for drawing up the energy audit.	Competent in understanding and applying energy units, conversion factors, identifying and managing energy sources.
	2	1	The Unit aims to provide fundamental concepts of thermodynamic and physics of the building that are crucial for the following more specialized modules. The energy auditor constantly uses these concepts in order to understand energy processes.	Knowledge of physical and thermodynamic principles related to energy (e.g. thermal, electrical, heat transfer, fluid mechanics, theoretical basis of lighting, etc.).	Ability to understand the physical and thermodynamic principles, underlying energy conversion processes also dynamic and static energy management aspects as applied in buildings.	Competent in understanding the physical and thermodynamic processes linked to the building energy use and related fluxes.
	3	2	The Unit aims to provide the general information to conduct an energy audit and guidance on how to carry out energy audits in accordance to the European standard 16247 or similar standards.	Knowledge of energy auditing principles, methodology and deliverables as described by EN 16247 (parts 1, 2) standard or similar standards.	Ability to apply energy audit principles and methodology	Competent in understanding and applying principles and methodologies of energy audit described in EN 16247 standard or similar .
	4	1	The Unit aims to provide the requirements, tasks and activities of auditor in residential sector. It specifies the necessary competencies in order to effectively implement the requirements of EN 16247/1, which may be supplemented by the specific part EN 16247/2.	Knowledge of the core activities he may performs.	Ability to understand the scope and the boundaries of the energy audit and relating activities	Competent in applying the EA tasks with reference to the scope and thoroughness of the energy audit
	5	2	The Unit aims to provide information on the energy market and actors involved. In particular, the energy auditor constantly	Knowledge of the energy market (energy production, distribution, transmission,	Ability to understand the energy market context, proposing options and	Competent in finding market opportunities for energy efficiency investments and

			uses concepts and solutions involving energy market from the production to the distribution, transmission, and supply of energy sectors. Therefore it is essential that the energy audits were updated based on the main feature of the European and National Market (i.e. market size, offer and demand; market players; market infrastructure); the wholesale market; the retail market; margins and market prices in order to make suitable assessment energy efficiency proposals.	supply) and market players (i.e. Energy Manager, Energy management expert, ESCO, energy suppliers).	make comparisons.	cost savings.
6	Charges and tariff structuring	1	The Unit aims to provide information about reading and interpreting the energy invoices, considering the electricity, gas and other energy sources tariff structures. The energy auditor tasks include a review of contracts for the supply of energy. It is therefore essential that the energy auditor acquires knowledge that will allow to evaluate the tariffs and their structure and eventually switch the energy supplier.	Knowledge of metering equipment, tariffs and tariff structures.	Ability to read the utility tariff, bearing in mind the time of use rates, the peak charges, the usage profile, the demand charges, green power offerings and contractual obligations in order to propose suitable solutions to reduce the energy expenses.	Competent in understanding of the various energy tariffs and making a metering plan for the data collection and analysis and to reduce energy supply costs
7	Data analysis	2	The Unit aims to provide information on methodology of the data collection, analysis of energy consumptions and costs. The energy auditor shall collect and analyze all data concerning energy, including energy carriers, adjustment factors affecting energy consumption, information concerning the building.	Knowledge of data collection methods useful for the energy audit and method of analysis.	Ability to collect information through effective interviewing, listening, observing, measuring, reviewing documents, records and data. Ability to assess and act on the quality of the data provided by the customer.	Competent in verifying and validating the collected data and competent in assessing factors that may affect the reliability of the energy audit findings.
8	Developing a building energy balance	1	The Unit aims to provide the knowledge about methodology to develop an energy balance. One of the first steps of the energy auditor is to create an energy balance that represents the energy flows. This allows to locate critical energy consuming sectors of the building and at the same time identifies the energy losses areas. The capacity to create an energy balance is an essential skill of energy	Knowledge of baseline consumptions; direct consumer impact; end users consumptions (heating, hot domestic water, lighting ...) and the adjustment factors in order to establish an energy balance.	Ability to quantify and analyze energy consumption, energy consumption breakdown. The energy auditor shall be able how to use metering models or calculations to determine the actual energy use profile and primary energy demand.	Competent in explaining the energy balance supported by reliable calculations

			auditor.				
	9	Energy performance indicators	1	The Unit aims to provide information on calculation for the Energy Performance Indicators in accordance with the National Standards. Identifying the key energy performance indicators is vital for the planning process, as it provides energy auditors a clear overview of how their client uses energy and can highlight ways to manage resources better.	Knowledge of reference indicators (benchmarks and standards) and current energy performance indicators.	Ability to identify and reviewing one or more energy performance indicators and identification of factors that may affect them. The energy auditor should be able to propose and calculate suitable energy performance indicators to quantify the energy performance and compare it to existing references (benchmarks, standards). Ability to use correctly ready-available energy performance indicators.	Competent in understanding if the energy performance indicators are in line with the scope of the audit. Competent in measuring the effectiveness of the energy management efforts and to identify inefficient areas with low energy performances.
			12				
2. Legislation, regulations and contracts in residential sector	1	Regulations and procedures for procurement, tenders, working contracts, energy supply contracts - financial instruments	2	The Unit aims to provide information on relevant regulations and procedures for procurement and tenders, working contracts and energy supply contracts, financial instruments at European and National level. The energy auditor constantly analyze and use updated regulation and procedures recognized in this sector. It is essential and in some case compulsory that energy auditor uses the schemes and produce documents according to law both for quality of documents and for legal requirements.	Knowledge of existing regulations and procedures for procurement and tenders, working contracts and energy supply contracts, financial instruments. For each regulation and procedure knows the field of application, information and competitive conditions, transparency of award procedures, definition of technical specifications.	Skills to perform and to choose the best solution of contract and or procedure to improve the energy performance of the buildings. The choices have to be done considering the actions plan, the amount of the cost, the payback period and other economical and financial aspects, the technological reliability, the know-how and the availability of key actors.	Competent in implementing procurement and tenders, working contracts, energy supply contracts and financial instruments according to different regulations, laws and procedures. It is important that auditor implements procurement and tenders also considering best practice (available on websites or other sources), adaptation for the specific action plan.
	2	European and National legislation concerning energy efficiency, renewables	2	The Unit aims to provide the basis on the relevant European and National legislation concerning energy efficiency and renewables. The Energy auditor has to check the compliance of the energy audit to the regulations. It is therefore essential that energy auditor	Knowledge of existing relevant laws, policies, rules, regulations and directives at European and national level concerning energy efficiency and renewables.	Ability to understand the relationships among the different laws, policies, rules, regulations and shall be able to apply them related to energy audit.	Competent in applying of regulations, directives, etc, related to energy efficiency and renewables.

			uses the schemes and produce documents according to law both for quality of documents and for legal requirements.				
	3	European and National standards	1	The Unit aims to provide information on the European and National standards, that can be useful to carry out an energy audit. The Energy auditor needs to have the tools to carry out the audit, ensuring the compliance with the relevant standards. It is therefore essential that energy auditor uses the schemes and produce documents according to standards both for quality of documents and for legal requirements.	Knowledge of existent European and national standards concerning energy auditing for building sector.	Skills to check if the auditing and the proposed improvement of the building energy performance are according to standards. The selection have to be done considering all the compulsory aspects and also other features aspects such as technical implementation, methodology and templates included in standards.	Competent in finding the proper standards applicable to energy audit and in verifying if documentation and indentified action plan are in accordance with them.
			5				
3. Building envelope	1	General information on the building market and the main elements of the construction process	2	The Unit aims to provide knowledge that energy auditor must obtain regarding the main types of buildings and their value in the market. The objective will be to supply relevant information related with the built environment and real estate market, including the status of the building (new, rehabilitated, under renovation, etc.).	Knowledge and relevant information about the building market and the methodologies associated to the buildings construction (new and existing).	Skills to evaluate the building market and identification of methodology of construction for each type of building, in accordance with the norms and regulations.	Competent in working with the different typology of buildings, identification of construction techniques and their accomplishment with the norms and regulations.
	2	Building evaluation in terms of: windows, roofs, doors, walls, air exchanges	3	The Unit aims to provide the essentials of passive components of the buildings. The objective will be to supply relevant information related to identifying the components of the buildings, namely walls, roof, windows, floors, etc.	Knowledge of the passive components of the buildings, the materials used and the energy characterization of opaque and transparent building envelope elements	Ability to evaluate a building in terms of passive components and their impact in the building energy efficiency.	Competent in assessing the thermal behaviour of the buildings and the expected energy efficiency and thermal comfort.
	3	Techniques, tools and calculation to improve energy efficiency	4	The Unit aims to provide knowledge about thermal behaviour of the buildings, taking in account their insulation, shading devices and other relevant passive component and provide solutions for the improvement of the energy efficiency.	Knowledge of the thermal components of the building, namely the calculation of the thermal transmission ratios, plain and linear thermal bridges, and the identification of thermal comfort areas and spaces without air conditioning. Knowledge of energy efficient improvement opportunities and possible different solution for	Ability to perform and develop projects of thermal behaviour of buildings. Ability to calculate energy savings and energy efficiency improvements. Ability to recommend energy efficiency improvement opportunities and possible different solutions for	Competent in the calculation of thermal behaviour of buildings, identification of passive solutions and energy efficiency, aiming to improve the thermal comfort of the building.

			implementation.	implementation.			
					9		
4. Heating, ventilation, air conditioning and hot water systems in residential sector	1	Building systems evaluation	2	The Unit aims to provide the essentials which energy auditor must obtain in the active components of the buildings. The auditor should be able to identify the equipment or systems and associated performance in terms of energy efficiency.	Knowledge of the main equipment of heating, ventilation and air conditioning (HVAC) systems and equipment for water heating, as well as associated technical features, assessment and verification of the accomplishment of regulations and energy efficient construction in the design of HVAC systems in the buildings of the residential sector.	Ability to identify the different equipment and systems in terms of energy efficiency and other technical data.	Competent in the verification and accomplishment of the different active equipment and systems.
	2	Techniques and tools to improve energy efficiency in the residential sector	3	The Unit aims to provide the Knowledge that energy auditor must obtain regarding the features of the active components of the buildings and their application in order to reduce the energy needs and to improve the energy efficiency of the building.	Knowledge of the active components of the building (systems and equipment), their performance and utilization aiming to reduce energy consumption and/or to increase the energy efficiency of the building.	Ability to perform, develop and assess the HVAC projects and to identify measures to improve the energy efficiency of HVAC systems.	Competent regarding the energy optimization of HVAC systems for the buildings, including gas boilers, heat pumps and equipment for water heating
	3	Calculation of energy savings and energy efficiency modernizations	3	The Unit aims to provide the knowledge that energy auditor must obtain regarding application and calculation of energy savings of active components of the buildings. The auditor should be able to interpret and to apply the calculation methodologies for HVAC systems in the building in order to reduce the energy needs and to improve the energy efficiency of the building.	Knowledge of methodology of calculation aiming to improve energy efficiency and to evaluate the measures to obtain energy savings in the projects of active systems and equipment of buildings of the residential sector.	Skills to identify measures and associated calculation to improve the energy efficiency of the active components of the buildings of the residential sector.	Competent regarding verification of calculation for the energy optimization of the active components of the buildings, including gas boilers, heat pumps and equipment for water heating.
					8		
5. Lighting systems, domestic appliances and other energy consuming devices in residential sector	4	Basics of lighting and current lighting technologies	1	The Unit aims to provide the general and basic information that energy auditor must obtain in the area of lighting	Knowledge of basic theory (light, output, intensity, density, lighting intensity, equipment to measure light parameters, colour temperature, colour rendering index), Luminous efficiency of different light sources, kind of lighting (indoor and outdoor lighting - with	Ability to understand the information and technical data in lighting area	Competent in understanding among the different lighting technologies which is the most appropriate for each purpose

				applicable standards and the EU Directives).			
		Efficient artificial lighting systems, optimization and controlling lighting systems	2	The Unit aims to provide the general solutions for optimization and control of lighting equipment and systems.	Knowledge of different solutions for reducing the intensity of light flux, optimization of natural and artificial lighting systems. Advantages and disadvantages of control systems and their basic properties. Preparation of preliminary lighting modernization project	Skills in understanding when is possible to use available technologies. Ability to collect data, calculate lighting performance and understand advantages of controlling systems, propose suitable improvements	Competent in analyzing the electricity consumption (real and theoretical) from lighting in the residential building, provide suitable energy efficiency improvements and calculate energy saving.
		Economic evaluation of lighting improvements	2	The Unit aims to provide the general and basic information that energy auditor must obtain for economic evaluation of lighting improvements.	Knowledge in collecting data collection and types of indicators (usage time of light source, installed power and new installation power) Simplified methods of energy and cost saving calculation Best practice - example of calculation	Skills in collecting comprehensive data and preparing preliminary economic lighting modernization proposition. Skills in using the simplified methods of calculations	Competent in analyzing the electricity consumption and cost from lighting in the residential building-and provide lighting improvements information of investment and energy saving cost.
		Domestic appliances and other energy consuming devices	2	The Unit aims to provide the general knowledge that energy auditor must obtain in the area of domestic appliances and other energy consuming devices	Knowledge of electricity consumption in residential sector - potential cost savings and energy efficiency of domestic appliances and devices, energy efficiency labelling other labelling (energy star)	Skills in understanding the information and technical data in the area of domestic appliance and in collecting data and use them for calculations	Competencies in analyzing the electricity consumption from domestic appliances and devices in the residential building and propose suitable energy efficiency improvements.
			7				
6. Energy production from renewable energy sources in residential sector	1	PV systems	2	The Unit aims to provide knowledge on techniques and tools of PV systems. Energy auditor should be able to provide suitable propositions of energy improvements in the residential sector.	Knowledge of types of modules and inverters of PV systems as well as their detailed technical data (power, efficiency) availability of solar radiation and methods of estimation of energy income good and bad practices of installation PV systems in buildings	Ability to estimate the size of PV system considering energy income from installation, energy need of residential building and installation capacity (i.e. roof space...)	Competent in selecting the appropriate PV system for the building in the residential sector according to its demands and conditions.
	2	Solar thermal systems	2	The Unit aims to provide knowledge on techniques and tools of solar systems.	Knowledge of types of solar thermal systems as well as their	Ability to propose the best type of solar system	Competent in selecting the appropriate solar system for

			Energy auditor should be able to provide suitable propositions of energy improvements in the residential sector.	detailed characteristic and measures (power, efficiency), availability of solar radiation and methods of estimation of energy income good and bad practices of installation solar thermal systems in buildings	(natural or forced circulation - flat panels or vacuum tube ...).Ability to estimate the size of solar thermal system considering the energy income from installation, energy need of residential building and installation capacity (i.e. roof space...)	the building in the residential sector according to its demands and conditions.	
	3	Heat pumps	The Unit aims to provide knowledge on techniques and tools of heat pumps installations. Energy auditor should be able to provide suitable variants of energy improvements in the residential sector	Knowledge of types of heat pumps and their principle of operation as well as detailed characteristic and measures (energy efficiency indicators – SPC/COP) Knowledge in characteristic of lower energy source and methods of power installation estimation and calculation of energy balance of heat pump. Good and bad practices of usage heat pumps in buildings.	Ability to propose the appropriate type of heat pump, specify power installation and calculation of energy balance of heat pump in order to select and size the installation for specific residential building	Competent in selecting the appropriate heat pump to the building in the residential sector according to its demands and conditions.	
	4	Biomass (solid biofuels)	The Unit aims to provide knowledge on techniques and tools of biomass boilers installations to be able to provide suitable propositions of energy improvements in the residential sector	Knowledge of characterization of solid biofuels and emission of pollutants technology, types of boilers and systems using solid biofuel as well as their parameters and specification value chain for biomass and conditions of fuel storage good practices of usage solid biofuels in buildings.	Ability to specify power installation and conditions for biomass logistic. Ability to select and size the installation for specific residential building.	Competent in selecting the appropriate biomass installation for the building in the residential sector according to its demands and conditions	
	5	Procedures for integrating renewable energy systems	The Unit aims to provide basilar information on integration of renewable energy systems, including hybrid solutions.	Knowledge of useful hybrid / integrated systems including innovative solutions	Ability to adopt solutions relating integrated systems or hybrid installations taking into consideration the peculiarities of the building.	Competent in applying the procedures for integrating renewable energy systems, taking care of technical and economic feasibility.	
			10				
7. Economic	1	Financing and	2	The Unit aims to provide knowledge	Knowledge about all the	Skills to detect and control	Competent in understanding

assessment		subsidies	related to all the possibilities of public or private support (in terms of incentives and funding). It is therefore necessary for the energy auditor to identify available financial resources, as well as the schemes and mechanisms for getting hold of these resources in order to help to finance the energy efficiency actions.	different possibilities of public/private financial incentive measures, but also about the accessing procedures.	all the possible public/private incentives, manage them properly and process the ones that could be appropriate depending on the customer or the solution presented.	and applying incentives.
	2	Economic assessment	4 The Unit aims to provide knowledge in the financial area and economic assessment. The energy auditor constantly uses concepts, tools and solutions involving economic elements and aspects. It is therefore essential that the energy auditor acquires knowledge that will allow him/her to evaluate and defend any situation in which economic aspects are relevant for the development of his/her business or service.	Knowledge of financial terminology as economic rates of return (payback), investment formulas, calculation of depreciation and amortization, financial projections, deviations, risk analysis, estimates of cost saving.	Ability to make suitable economic assessment take into account the lifetime equipment, the related costs and the financial measures	Competent in developing economic and financial analysis and defend any kind of technical project against third parties, guaranteeing the result of energy saving, economic and investment.
		Total	6			
8. Energy audit methodology	1	Measuring and metering equipment	3 The Unit aims to provide information on the main metering and measuring equipment and provide skills to manage the equipment necessary to conduct an energy audit and to understand the measurements results.	Knowledge of metering and measurement equipment (i.e. steam analyzers, thermographic cameras, loggers, manometers, thermometers, laser measurement equipment)	Ability to identify and manage the equipment to carry out an energy audit as well as correct interpretation of obtained results	Competent in understanding and validating the results of measurements with measuring and metering equipment.
	2	Good practices and case studies	6 The Unit aims to provide examples of best practices of residential buildings energy audits, in order to allow energy auditor to be familiar with different solutions. I also aims to show and practice methodology of preparing energy audit overview (case studies).	Knowledge about energy audits applied to residential buildings aiming to improve their energy efficiency, reduce their energy consumption and bring related economic and environmental benefits.	Ability to adapt to encountered situations and to make feasible proposals for improvements. Identification in the best way any possible failures, and the improvement possibilities as well as being able to evaluate and determine the behavior of the solutions to solve the existent failures.	Competent in identifying quickly any possible problem or failure and develop the sustainable strategies that lead to an improvement of the initial situation.
	3	Monitoring, control and adjustment of	4 The Unit aims to provide information on building energy management system as	Knowledge of common practice in measuring, computing and	Ability to make a monitoring plan within the	Competent in assessing energy savings and making

		energy consumption parameters		support, to control energy-consuming devices, monitor and report their performance. Moreover, this learning unit presents the fundamental principles of International Performance Measurement and Verification Protocol, the process of using measurement for determining actual savings.	reporting savings achieved by energy efficiency projects at end user facilities. Knowledge of building automation and mechanisms of regulation and control.	scope of the energy audit and to calculate the energy savings.	corrective actions.
			13				
9. Project management	1	Basics of project management	4	The Unit aims to prepare the energy auditor to manage and coordinate his own work, starting from the preparation of offers, through the development of energy efficiency improvements, ending with monitoring the energy efficiency and evaluation of his work.	Basic knowledge of management and project management	Project management and methodology skills. Organisational skills.	Competent in managing the complete energy audit process from the planning of energy audit, to the implementation and monitoring of energy efficiency results, to the preventing and resolving conflicts.
			4				
10. Communication and marketing	1	Communication techniques concerning energy audits	3	The Unit aims to provide information concerning principles of communication and communication techniques for energy auditors. The energy auditor have to use a good communication techniques to allow building owners and other stakeholders (technicians, ESCo) a comprehensive understanding of energy consumption, energy action plan and other technical and financial aspects.	Knowledge of principles of communication (including principles of interpersonal communications, the effective communication, the business communication, the technical and financial communication, the marketing concepts and theoretical structures, the strategic marketing, the operational marketing) Communication techniques to advise technical and non technical end users in an adequate manner on all aspects of the energy audit.	Good communication skills to be able to articulate and well communicate concepts and ideas with technical and non-technical persons.	Competent in communicating and marketing in relation to all the aspects connected to the energy audit process. Competent in understanding the customer's goals, needs and expectations concerning the energy audit.
	2	Presentation of results and reporting	3	The Unit aims to provide the principles of presentation of results and reporting. The energy auditor constantly uses updated and proper templates for reporting results. The presentation of the results has to be comprehensive for the end users and other technicians, complete for all	Knowledge of presenting energy audits results and reporting considering available existing templates (including checklist) according to standards (EN16247 and similar) and in the methodology/techniques to	Ability to use/modify available templates or to create new ones for presentation of results and reporting, adapting to the scope of the audit. All aspects (e.g. the end users,	Competent in using and filling templates for the best communication and marketing of energy audit results. Competence in producing comprehensive, functional and well organized

			<p>technical/financial aspects, useful for understanding the baseline energy consumption and for a fast implementation of the energy action plan.</p>	<p>adapt and/or to modify templates considering available assessment data and results.</p>	<p>the energy and environmental assessment of building envelope and technological systems, the financial aspects, the energy saving within the action plan, the compulsory and the optional aspects of the legislation and standards)</p>	<p>documents within the purpose.</p>
		6				

ANNEX 2 – THE ENACT TRAINING PROGRAM

Module	Description	Training methodology	Assessment methodology	ECVET
1. Introduction to energy auditing in residential sector (12 hours)	The module aims at providing the general information to conduct an energy audit (data collection, field work, analysis) and guidance on how to carry out energy audits in accordance to the European standard 16247.	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
2. Legislation, regulations and contracts in residential sector (5 hours)	The module provides an overview of relevant European and national legislation, regulations and contracts applicable to energy audit	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
3. Building envelope (9 hours)	The module describes the most common information about building envelope (walls, roofs, doors, windows ...) and includes information and calculation of energy efficient interventions applicable to the different building elements.	On line resources - Lesson (on line or in presence) - Exercises/simulations/lab - - Tutor on line	Multiple choice (10 questions)	0,5
4. Heating, ventilation, air conditioning and hot water systems in residential sector (8 hours)	The module contains technical information on heating, ventilation, air conditioning and hot water systems. It also includes a series of interventions and calculation for improving the energy performance of the systems	On line resources - Lesson (on line or in presence) - Exercises/simulations/lab - - Tutor on line	Multiple choice (10 questions)	0,5
5. Lighting systems, domestic appliances and other energy consuming devices in residential sector (7 hours)	The module informs about technical data especially on energy aspects of lighting systems, domestic appliances and other energy consuming devices in residential sector. It includes interventions to improve the efficiency of the lighting system and to monitor the energy consumption of domestic appliances.	On line resources - Lesson (on line or in presence) - Exercises/simulations/lab - - Tutor on line	Multiple choice (10 questions)	0,5
6. Energy production from renewable energy sources in residential sector (10 hours)	The module presents technological solutions to produce clean and renewable energy for the building. It includes the most used energy renewable sources in residential sector: photovoltaic, solar thermal, heat pump and biomass and the way to integrate them.	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
7. Economic assessment (6 hours)	The module presents economic assessment of energy efficiency improvements considering energy savings, funding opportunities, investment costs.	On line resources - Lesson (on line or in presence) Simulations - Tutor on line	Multiple choice (10 questions)	0,5
8. Energy audit methodology (13 hours)	The aim of the module is to acquire the methodology to manage residential building energy audit, through the presentation of different case studies and practical application.	On line resources - Guided simulations, exercises, project work - Tutor on line	2 case studies (mono & multifamily building)	1,5
9. Project management (4 hours)	The module aims to manage the complete energy audit process from the planning to the development of energy efficiency improvements, ending with monitoring the energy efficiency results and documenting energy audit findings.	On line resources - Lesson (on line or in presence) - Tutor on line	Multiple choice (10 questions)	0,5
10. Communication and marketing (6 hours)	The module aims to provide information concerning principles of communication and communication techniques for energy auditors to be able to communicate with technical and not-technical people at various levels on all aspects concerning technical and economical aspects of the energy audit.	On line resources - Lesson (on line or in presence) - Tutor on line Lesson - Tutor on line	Multiple choice (10 questions)	0,5