

Schema di qualifica per l'Energy Auditor ENACT

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PROFILO DELL'ENACT ENERGY AUDITOR

L'*ENACT Energy Auditor* è un professionista specializzato nell'attuazione di **audit energetici** nel **settore residenziale**. Il profilo professionale è stato sviluppato sulla base dell'analisi del sistema di attività e dei fabbisogni professionali (e del relativo sistema di conoscenze, abilità e competenze). A tal fine sono stati presi in considerazione:

- i repertori nazionali delle qualifiche (e dove rilevanti quelli regionali) di ciascuno dei paesi partecipanti (Italia, Polonia, Portogallo e Spagna);
- i profili professionali definiti dagli standard nazionali ed europei sulla gestione dell'energia e dell'auditing energetico.

Assumendo un approccio modulare, le attività e le competenze dell'*ENACT Energy auditor* rappresentano "blocchi" che possono essere progressivamente integrati all'interno di percorsi di sviluppo professionale, quali il settore civile (compreso il settore terziario e della pubblica amministrazione, oltre a quella residenziale), quello industriale e dei trasporti.

ATTIVITÀ DELL'ENACT ENERGY AUDITOR

L'*ENACT Energy Auditor* copre tutte le attività dell'audit energetico: dalla raccolta dei dati, all'attività sul campo, all'analisi dei dati e alla comunicazione con il cliente. Il professionista ENACT, oltre ad identificare le misure di miglioramento dell'efficienza energetica nel settore residenziale, fornisce indicazioni sull'implementazione in termini di tempistiche e ritorno economico oltre a implementare e monitorare i risultati ottenuti, in termini di risparmio energetico, produzione e riduzione dei costi.

Il profilo professionale dell'*ENACT Energy Auditor* può essere ricondotto ai quattro processi principali tipici del ciclo gestionale (pianificazione, implementazione e monitoraggio, gestione, auditing,); a ciascuno corrispondono specifiche attività, come illustrato nella tabella seguente.

AREA	ATTIVITA'
1. Management (dimensione verticale e trasversale)	Pianificazione dell'audit energetico in termini di scopo, risorse e tempistiche Coordinamento Gestione dei conflitti Comunicazione e reporting
2. Auditing	Raccolta dei dati storici di consumo e delle condizioni esterne Rappresentazione della situazione energetica e di performance del sistema edificio-impianto
3. Pianificazione	Definizione delle misure per il miglioramento della performance energetica Valutazione economica degli interventi di efficientamento energetico proposti Valutazione tecnica degli interventi di efficientamento energetico proposti Elaborazione di un programma energetico
4. Implementazione/ Monitoraggio	Implementazione delle misure di efficienza proposte Monitoraggio dei consumi energetici e delle performance Eventuale implementazione di azioni correttive

CONOSCENZE, ABILITÀ E COMPETENZE DELL'ENACT ENERGY AUDITOR

Il profilo professionale dell'*ENACT Energy auditor* definisce, per ogni attività, le necessarie conoscenze, abilità e competenze (KSC). La mappa sintetica del profilo complessivo ENACT è rappresentata nella tabella successiva, mentre lo schema completo delle KSC dell'*ENACT Energy Auditor*, articolato per ogni unità di apprendimento è riportato nell'Allegato 1.

Conoscenze	Abilità	Competenze
Unità di misure energetiche e fattori di conversione	Comprensione delle quantità fisiche e dei fattori di conversione	Capacità di utilizzare le unità di misure energetiche e applicare i fattori di conversione
Fonti e vettori energetici	Comprensione delle fonti e vettori energetici coinvolti nella diagnosi energetica	Capacità di comprensione delle fonti e dei vettori energetici
Leggi, politiche energetiche, regolamenti, procedure contrattuali, normative tecniche (a livello europeo e nazionale) applicabili all'audit energetico	Scelta della miglior procedura contrattuale da applicare all'audit energetico	Capacità di applicare e gestire leggi, politiche energetiche, regolamenti, procedure contrattuali, normative tecniche
Metodologie per la raccolta dei dati, indicatori di performance, fattori di aggiustamento e bilancio energetico	Raccolta dei dati funzionali per lo scopo dell'energy audit. Proposta e calcolo di indicatori di performance energetica	Capacità di individuare gli usi significativi dell'energia in funzione dello scopo della diagnosi energetica. Capacità di selezionare gli indicatori di performance in funzione dello scopo della diagnosi energetica e confrontarli con indicatori di riferimento. Capacità di verifica e validazione delle misure ed individuazione dei fattori che possono influenzare l'esito della diagnosi energetica.
Principi fisici relativi ai flussi energetici (termica, elettrica, termodinamica, scambio termico, meccanica dei fluidi, illuminazione , ecc.)	Comprensione dei processi e dei flussi energetici	Capacità di comprensione dei processi fisici legati ai flussi energetici
Strumenti tecnici e strumenti di misura, di contabilizzazione e di monitoraggio per l'esecuzione di una diagnosi energetica	Identificazione del profilo di consumo energetico e delle aree inefficienti mediante la gestione di strumenti per effettuare un audit energetico	Capacità di organizzare un piano di misura e contabilizzazione dei dati e verifica e validazione degli stessi
Caratteristiche del mercato dell'energia (produzione, distribuzione, trasmissione, fornitura) e soggetti coinvolti	Comprensione del mercato dell'energia e degli attori coinvolti	Capacità di analizzare il mercato dell'energia
Tariffe energetiche e loro struttura	Analisi della tariffa energetica (fattore di utilizzo,	Capacità di valutazione e gestione delle diverse

	picco, addebiti, profilo di utilizzo ...)	opzioni tariffarie
Caratteristiche del mercato edilizio e modelli costruttivi	Comprensione del mercato edilizio	Capacità di individuare le diverse tipologie costruttive degli edifici
Edificio (incluso l'involucro, i sistemi tecnici * e gli altri servizi**)	Comprensione l'edificio in termini di performance energetica	Capacità di valutazione energetica dell'edificio
Tecnologie tradizionali ed innovative per il miglioramento dell'efficienza energetica e l'utilizzo delle fonti rinnovabili	Identificazione delle possibilità di intervento.	Capacità di personalizzare e adattare le soluzioni di miglioramento, includendo la loro verifica di fattibilità tecnico ed economica
Metodi di quantificazione dei risparmi energetici conseguibili/conseguiti	Calcolo del risparmio energetico e del miglioramento dell'efficienza energetica	Capacità di valutazione dei risparmi energetici e capacità di proporre soluzioni di miglioramento
Opportunità di finanziamento ed incentivi	Identificazione delle opportunità di finanziamenti e incentivi	Capacità di accesso alle procedure e gestione degli incentivi
Indicatori di valutazione economica	Valutazione economica delle proposte di intervento	Capacità di valutazione economica delle proposte e confronto
Principi, metodologia e prodotti della diagnosi energetica secondo lo standard 16247	Comprensione dello scopo e del confine dell'energy audit	Capacità di condurre una diagnosi energetica in riferimento allo scopo, alla finalità ed accuratezza della stessa
Principi di comunicazione, reporting e marketing nella diagnosi energetica	Abilità comunicative	Capacità di presentare i risultati della diagnosi in maniera comprensibile, ben organizzata e funzionale. Capacità comunicative e di reporting.
Fondamenti di project management	Identificazione del processo completo dell'energy audit	Capacità di gestione dell'intero processo di audit

* *Apparati tecnici per riscaldamento, raffrescamento, ventilazione, acqua calda sanitaria, illuminazione e produzione locale di energia*

** *servizi forniti dai sistemi tecnici di edificio e da apparati ai fini di condizionare l'ambiente interno (comfort termico, qualità dell'aria, qualità visuale o acustica) ed altri servizi connessi all'uso dell'edificio*

PROGRAMMA DI FORMAZIONE PER L' ENACT ENERGY AUDITOR

Il programma formativo ENACT, della durata complessiva di 80 ore, è stato definito a partire dal profilo professionale e dal relativo sistema di attività, conoscenze, abilità e competenze. La tabella seguente mostra la rappresentazione sintetica del programma di formazione ENACT, in termini di:

- **risultati di apprendimento**, articolazione e tempistica. Nell'Allegato 2 è riportato il programma di formazione ENACT più dettagliato con le relative unità di apprendimento;
- **metodologie** di formazione e criteri di **valutazione**;
- **punti ECVET**. Sono previsti in totale 6 punti ECVET per il corso ENACT (80 ore). I punti ECVET sono stati assegnati ai moduli del corso secondo uno schema di ponderazione multipla, prendendo in considerazione 3 aspetti: la durata del modulo (numero di ore); la metodologia di valutazione e formazione; il livello di difficoltà.

Modulo	Ore	Metodologia	Metodo di valutazione	Punti Ecvet
1. Introduzione all'audit energetico in ambito residenziale	12	Materiale On line - Lezioni (on line o in presenza) - Tutor on line	Risposta multipla (10 domande)	0,5
2. Legislazione, normativa e contratti nel settore residenziale	5	Materiale On line - Lezioni (on line o in presenza) - Tutor on line	Risposta multipla (10 domande)	0,5
3. Involucro edilizio	8	Materiale On line - Lezioni (on line o in presenza) - Tutor on line	Risposta multipla (10 domande)	0,5
4. Riscaldamento, Ventilazione, raffrescamento ed acqua calda nel settore residenziale	8	Materiale On line - Lezioni (on line o in presenza) - Tutor on line - Esercizi/simulazioni/laboratorio	Risposta multipla (10 domande)	0,5
5. Sistemi di illuminazione, elettrodomestici ed altri dispositivi elettronici nel settore residenziale	7	Materiale On line - Lezioni (on line o in presenza) - Tutor on line - Esercizi/simulazioni/laboratorio	Risposta multipla (10 domande)	0,5
6. Fonti energetiche rinnovabili nel settore residenziale	1	Materiale On line - Lezioni (on line o in presenza) - Tutor on line	Risposta multipla (10 domande)	0,5
7. Valutazione economica	6	Materiale On line - Lezioni (on line o in presenza) Simulazioni - Tutor on line	Risposta multipla (10 domande)	0,5
8. Metodologie per l'energy	13	Materiale on line -	Risposta	1,5

audit		Casi studio, esercizi, lavori di progetto - Tutor on line	multipla (10 domande) e Caso studio	
9. Project management	4	Materiale on line - Lezioni (on line o in presenza) - Tutor on line	Risposta multipla (10 domande)	0,5
10. Comunicazione e marketing	6	Materiale on line - Casi studio, esercizi, lavori di progetto - Tutor on line	Risposta multipla (10 domande)	0,5
Totale punti ECVET				6

REQUISITI DI QUALIFICA PER L'ENACT ENERGY AUDITOR

Lo schema dei requisiti di qualifica si articola in tre parti principali:

- requisiti minimi di qualifica o **entry level**, suddivisi in livelli di istruzione e di esperienza lavorativa per ogni paese partecipante (tabella seguente);
- la **frequenza** (ed il superamento positivo) del **corso di formazione** ENACT e/o il **riconoscimento/validazione** delle **competenze** professionali legate ad ogni risultato di apprendimento;
- esame di qualifica**, condotta da un Ente certificato e/o di formazione professionale. I candidati sono ammessi a sostenere l'esame finale, se in possesso dei requisiti (a) e (b), come indicati nel Curriculum Vitae e verificati dall'Ente.



a) ENTRY LEVEL

La seguente tabella riporta i livelli di ingresso per Nazione.

Educazione		Esperienza specifica nel settore (anni)
Italia	Laurea tecnica	0
	Diploma tecnico	2
	Altre lauree	3
	Altri diploma	3
Polonia	Laurea in Ingegneria o architettura riconosciuta dal rispettivo ordine professionale	0
	Altre lauree	1
Portogallo	Laurea in Ingegneria o architettura riconosciuta dal rispettivo ordine professionale	0
	Altre lauree	1
Spagna	Diploma / laurea tecnica	0
	Formazione professionale di 2 anni	1
		3

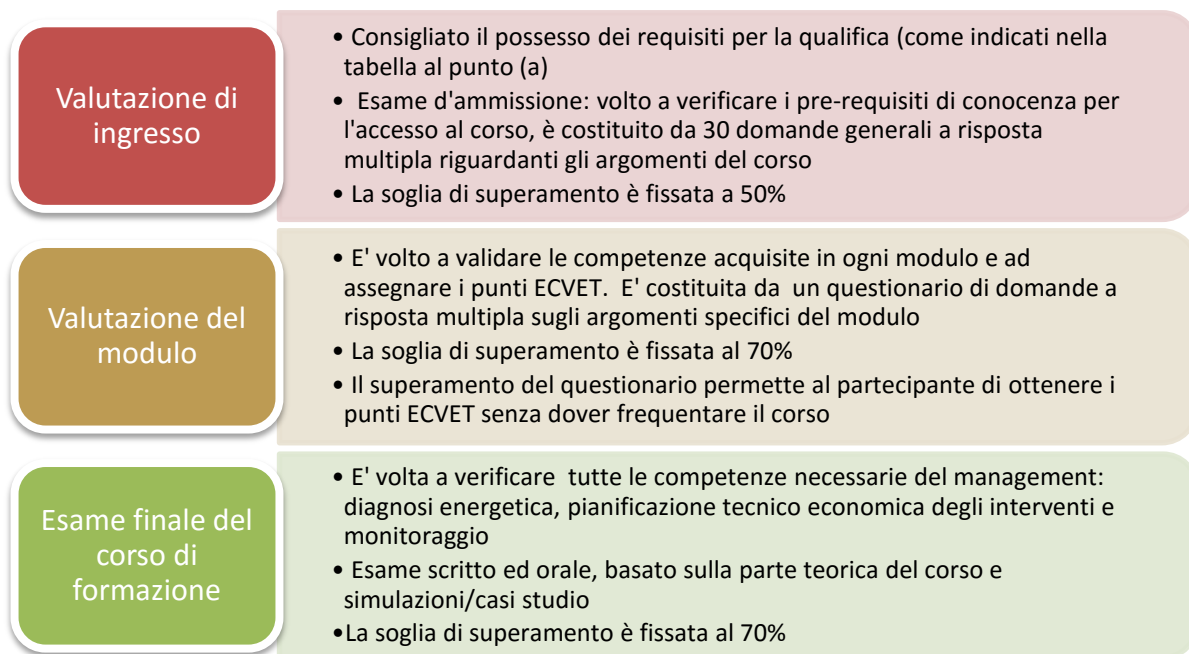
b) CORSO DI FORMAZIONE E FREQUENZA E/O VALIDAZIONE DELLE COMPETENZE DELL'ENERGY AUDITOR ENACT

Come indicato, lo schema di qualifica richiede:

- La **frequenza** (e il raggiungimento con successo, compreso l'esame finale) del **corso di formazione** ENACT o partecipazione negli ultimi due anni ad un altro programma che copre tutte le aree di competenza di ENACT, erogato da un Ente certificato e/o di formazione professionale o in alternativa,
- La validazione delle **competenze professionali** da parte di un Ente certificato e/o di formazione professionale del settore/associazioni/datori di lavoro.

Per la partecipazione al corso di formazione di ENACT è consigliato avere i requisiti di studio / esperienza indicati nella tabella al punto (a) ed è necessario superare la prova d'ammissione prevista (30 domande a risposta multipla su temi generali a cui è necessario rispondere correttamente al 50%). Inoltre per superare con successo il corso di formazione è necessario superare i test alla fine dei moduli e l'esame finale del corso.

La valutazione ENACT è articolata nei seguenti tre diversi livelli: valutazione di entrata, valutazione del modulo e valutazione finale.



La valutazione costituisce una parte integrante del **Protocollo di intesa ECVET** fra gli organismi di formazione, che hanno riconosciuto reciprocamente lo sviluppo e la validazione delle competenze dell'*ENACT Energy Auditor*.

c) ESAME DI QUALIFICA ENACT

L'esame di qualifica ENACT è condotto da un Ente certificato e/o di formazione professionale.

I candidati sono ammessi alla prova finale se possiedono i requisiti nel Curriculum Vitae ufficialmente approvato dagli Enti certificati e/o di formazione professionale, oltre ai requisiti (a) e (b).

L'esame di qualifica ENACT è articolato come segue (tenendo conto anche della norma UNI CEI EN 16247/5):

- 1) verifica del Curriculum Vitae
- 2) test a risposta multipla, fatta di 20 domande relative al management: diagnosi energetica nel settore residenziale, pianificazione tecnica/economica degli interventi e monitoraggio
- 3) prova scritta basata su un caso studio di management, inclusa la diagnosi energetica del settore residenziale;
- 4) prova orale basata sia su un caso studio sia su tutte le pertinenti competenze.

La soglia per il superamento dell'esame per ottenere la qualifica finale è stato fissato al 70% per ciascuno dei test/prove.

L'esame di qualifica finale è condotto da una Commissione di Valutazione, formata da almeno due soggetti con specifiche competenze tecniche nel management (diagnosi energetiche nel settore residenziale/ civile, pianificazione tecnica/economica degli interventi e monitoraggio).

Le competenze tecniche dei membri della Commissione devono essere verificate tramite:

- esperienza nell'energy management, inclusa la diagnosi energetica, la pianificazione tecnica/economica degli interventi e monitoraggio;
- esperienza specifica nelle diagnosi energetiche per il settore civile/residenziale, documentata dal possesso di una certificazione accreditata per esperto in gestione dell'energia/auditor energetico in accordo con gli standard nazionali e/o europei;
- referenze professionali per il settore residenziale/civile;
- partecipazione in conferenze e seminari;
- conoscenza della norma UNI CEI EN 16247 e di altre rilevanti norme tecniche / leggi e regolamenti applicabili alle attività dell'*energy auditor*.

MANTENIMENTO DELLA QUALIFICA DELL'ENACT ENERGY AUDITOR

La qualifica dell'*ENACT Energy Auditor* ha una validità di 5 anni. L'*ENACT Energy Auditor* deve mantenere la sua qualifica attraverso l'aggiornamento delle competenze necessarie per svolgere un audit energetico e tutti gli aspetti di management. La verifica di mantenimento e di aggiornamento della qualifica verrà effettuata attraverso l'analisi del curriculum, la partecipazione a conferenze o seminari, lo svolgimento di audit energetici inclusi la pianificazione tecnico economica degli interventi e il monitoraggio.

ALLEGATO 1 – SCHEMA DI KSC PER I RISULTATI DI APPRENDIMENTO E UNITÀ DI APPRENDIMENTO

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	Knowledge of the energy market (energy production,	Ability to understand the energy market context,	Competent in finding market opportunities for energy

			particular, the energy auditor constantly 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.	distribution, transmission, supply) and market players (i.e. Energy Manager, Energy management expert, ESCO, energy suppliers, ...).	proposing options and make comparisons.	efficiency investments and 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 auditors 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	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	Competent in explaining the energy balance supported by reliable calculations

			balance is an essential skill of energy auditor.		primary energy demand.	
	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 clients 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	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.

			regulations. It is therefore essential that energy auditor 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.	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	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.

					Knowledge of energy efficient improvement opportunities and possible different solution for implementation.	improvement opportunities and possible different solutions for 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	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	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

in residential sector				rendering index), Luminous efficiency of different light sources, kind of lighting (indoor and outdoor lighting - with 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) Short information about planning software e.g. DIALux and online database of lighting sources 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.
6. Energy production from renewable energy sources in	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	Knowledge of types of modules and inverters of PV systems as well as their detailed technical data (power, efficiency)	Ability to estimate the size of PV system considering energy income from installation, energy need of	Competent in selecting the appropriate PV system for the building in the residential sector according to its

residential sector			improvements in the residential sector.	availability of solar radiation and methods of estimation of energy income good and bad practices of installation PV systems in buildings	residential building and installation capacity (i.e. roof space...)	demands and conditions.
	2	Solar thermal systems	The Unit aims to provide knowledge on techniques and tools of solar systems. Energy auditor should be able to provide suitable propositions of energy improvements in the residential sector.	Knowledge of types of solar thermal systems as well as their 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	Ability to propose the best type of solar system (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...)	Competent in selecting the appropriate solar system for 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	He knows 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	2	The Unit aims to provide basilar	Knowledge of useful hybrid /	Ability to adopt solutions

	integrating renewable energy systems		information on integration of renewable energy systems, including hybrid solutions.	integrated systems including innovative solutions	relating integrated systems or hybrid installations taking into consideration the peculiarities of the building.	procedures for integrating renewable energy systems, taking care of technical and economic feasibility.
		10				
7. Economic assessment	1	Financing and subsidies	2 The Unit aims to provide knowledge 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.	Knowledge about all the different possibilities of public/private financial incentive measures, but also about the accessing procedures.	Skills to detect and control 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.	Competent in understanding 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 analysers, 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	Knowledge about energy audits applied to residential buildings aiming to improve their energy efficiency, reduce their energy consumption and bring related economic and environmental	Ability to adapt to encountered situations and to make feasible proposals for improvements. Identification in the best way any possible failures,	Competent in identifying quickly any possible problem or failure and develop the sustainable strategies that lead to an improvement of the initial situation.

			overview (case studies).	benefits.	and the improvement possibilities as well as being able to evaluate and determine the behaviour of the solutions to solve the existent failures.	
	3	Monitoring, control and adjustment of energy consumption parameters	4 The Unit aims to provide information on building energy management system as 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.	Knowledge of common practice in measuring, computing and reporting savings achieved by energy efficiency projects at end user facilities. Knowledge of building automation and mechanisms of regulation and control.	Ability to make a monitoring plan within the scope of the energy audit and to calculate the energy savings.	Competent in assessing energy savings and making 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. 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	<p>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 technical/financial aspects, useful for understanding the baseline energy consumption and for a fast implementation of the energy action plan.</p>	<p>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 adapt and/or to modify templates considering available assessment data and results.</p>	<p>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, 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>Competent in using and filling templates for the best communication and marketing of energy audit results. Competence in producing comprehensive, functional and well organized documents within the purpose.</p>
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ALLEGATO 2 – IL PROGRAMMA DI FORMAZIONE ENACT

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