AUDIT2MEASURE

D4.2 – Training course

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Project Acronym:	AUDIT2MEASURE
Programme:	LIFE
Topic:	LIFE-2021-CET-AUDITS
Type of Action:	LIFE Project Grants
Grant Agreement number:	101075785
Start day:	01/11/2022
Duration:	36 months
Contact:	Project coordinator: Simone Maggiore (RSE)

DOCUMENT INFORMATION

Document Factsheet	
Full title	D4.2 Training course
Work package	WP4
Task(s)	T.4.2 Training courses for operational staff to implement energy audit measures
Author organization	ENVIROS
Reviewers	AEDHE, RSE
Contributors	ESCAN, IEECP, RSE
Date	March 2024

DOCUMENT DISSEMINATION LEVEL

Dissemination level	
X	PU – Public
	PP – Restricted to other programme participants (including the EC)
	RE – Restricted to a group specified by the consortium (including the EC)
	CO – Confidential, only for members of the consortium (including the EC)

DOCUMENT HISTORY

Version	Date	Main modification	Entity
V0.1	26.03.2024	Draft version for review	ENVIROS
V0.2	27.03.2024	Internal Quality review	AEDHE, IEECP, RSE
V0.3	28.03.2024	Final version ready	ENVIROS
V0.4	28.03.2024	Review by the project coordinator	RSE
V1.0	28.03.2024	Final version submitted to the EC	RSE

LEGAL NOTICE

ABOUT

Industry is a key player in energy consumption and economic impact in the European Union (EU) and energy audits represent an important tool to improve energy efficiency in the sector; despite both the spread of energy audits and the knowledge of their benefits, the actual implementation rate of the Energy Savings Measures (ESM) proposed by energy audits is relatively low. **The main aim** of the AUDIT2MEASURE (Leading businesses towards climate neutrality by speeding up the uptake of energy efficiency measures from the energy audits) project **is to support companies in the uptake of audits measures necessary to reduce the energy consumption supporting their energy transition**. AUDIT2MEASURE will develop and implement a new engagement strategy (called "Audit2Action") to put into action the opportunities emerging from energy audits.

The project has received funding from the European Union's LIFE research and innovation programme under grant agreement No 101075785.

PROJECT PARTNERS

RSE Ricerca Sistema Energetico · IEECP · adelphi · escan s.l. the energy consulting · Π.Ο.Β.Α.Σ.

EPU N·T·U·A · GRUPPO HERA · ENVIROS · AEDHE Asociación de Empresarios del Henares · ΕΠΙΜΕΛΗΤΗΡΙΟ ΚΟΡΙΝΘΙΑΣ

TABLE OF CONTENTS

ABBREVIATIONS

A2M	AUDIT2MEASURE
ESM	Energy Saving Measure(s)
EEM	Energy Efficiency Measure(s)
EnMS	Energy Management System(s)

1. INTRODUCTION

This report describes the training course developed by A2M partners, which represents the core of the planned capacity building programme within WP4. The deliverable includes the complete training slides developed within Task 4.2.

The trainings are to be developed for the following target groups in five project partners' countries (Spain, Italy, Greece, the Netherlands and the Czech Republic):

- Operational staff of companies;
- Energy auditors, energy experts and energy managers;
- Industry associations and multipliers.

WP4 objectives

The objective of WP4 is to increase knowledge and capacity of the above mentioned target groups with the aim of accelerating the uptake of energy audits outcomes. This is done through an integrated capacity building and know-how sharing programme addressing such target groups with the aim to enable a higher uptake of ESM in the industrial sectors addressed by the project.

Report structure

This report is structured as follows, first (**chapter 2**) an overview of the proposed training course is given, including:

- Selection of topics;
- Selection of target groups;
- Development of presentations;
- Slide presentation guidelines.

The training materials should provide in total up to 36-40 hours of training. This is relatively long for a face-to-face training. Therefore, it was decided that only part of training will be face-to-face (e.g. ½ day). The remainder to be self-study (4 days).

In the **third chapter**, a breakdown of the training course rationale is given, highlighting the reasons for the choice of topics and the differentiation by country (e.g. addressing country-specific topics as energy audit regulations, technical assistance financing and ESM financing).

In the **fourth chapter**, some practical arrangements are discussed, such as the organisation of training and the future use of the material.

In the **Annex I** of the report, the complete training course slides (English language version) per module are included:

Module 1 – EU Energy Policy and Legislation;

Module 2 – Energy policy and energy auditing in partner countries;

Module 3 – Implementation strategy of ESM defined in the energy audits;

Module 4 – Raising awareness of ESMs in the industry sector;

Module 5 – Energy audit and technical assistance financing in partner countries;

Module 6 – ESM financing in partner countries.

The **Annex II** will include a selection of country specific slides from module 2, 5 and 6 (in national language).

2. DEVELOPMENT OF THE TRAINING COURSES

As proposed in the description of work of the AUDIT2MEASURE project, the training materials will have to provide in total up to 36 to 40 hours of training.

The project team viewed that this was a far too long for a face-to-face training, especially for employees of private companies, who would not have the opportunity to attend such a long training course.

Therefore, it was decided that only part of training will be face-to-face (up to ½ day). The remainder to be self-study (up to 4 days).

Three different target groups have been identified:

- Operational staff from companies – up to 4 hours of training – to be trained face-to-face;
- Energy auditors and/or energy managers – up to 4 hours of training – to be trained face-to-face or online;
- Representatives from industry associations and other multipliers – up to 2.5 hours of training – to be trained face-to-face or online.

In line with the identified needs for the target groups, the following six topics were proposed:

- **EU energy policy and legislation**: providing an overview of the most relevant energy and climate related policy and regulation that may impact industrial companies;
- **Energy policy and energy auditing in partner countries**: overview of energy auditing systems in the countries covered by the AUDIT2MEASURE project;
- **Implementation strategy of energy saving measures** as defined in the energy audits: describing how to create implementation strategies;
- **Raising awareness of energy saving measures** in the industry sector;
- **Energy audit and technical assistance finance**: only for those countries where this is available;
- **Energy saving measure financing** in partner countries, including an overview of national financial schemes.

3. RATIONALE OF THE TRAINING COURSES

The contents of each module were discussed with the project partners. Certain topics have been highlighted and differentiations between countries have been made in some modules (e.g. addressing country-specific topics as energy audit regulations, technical assistance financing and ESM financing).

Module 1 - EU energy policy and legislation

The first module on EU energy policy and legislation introduces the audience with EU-energy related energy/climate policy and the main energy related EU directives, with main focus on the Energy Efficiency Directive.

The list of topics of this module is the following:

1.1. EU energy-related strategy and policy documents

1.1.1 2007 Action Plan for Energy Efficiency

1.1.2 Directive 2012/27/EU on energy efficiency

1.1.3 Amended Directive 2018/2002 on energy efficiency

1.1.4 Structure and strategy of European Green Deal, RePower EU and EED 2023

1.1.5 The new Energy Efficiency Directive (2023/1791)

1.1.6 Comparison and visualization of targets evolution among the directives and plans at stake

1.2. Energy Efficiency, Renewable energy sources and greenhouse gas emission goals

1.2.1 Energy efficiency, Renewable energy and GHG targets of the Green Deal

1.2.2 Energy efficiency, Renewable energy and GHG targets of the RePower EU

1.2.3 Studies on synergy among renewable energy and energy efficiency

1.3. Role of the EU industry in EU energy-related strategy

1.3.1 Energy audits in Energy Efficiency Directives

1.3.2 Industry sector specific targets in the energy strategies discussed in previous modules

1.4. Current situation in the EU and its impact on Member States energy policies and energy auditing system

1.5. Overview EU funded projects

Module 2 - Energy policy and energy auditing in partner countries

Module 2 addresses the results of the first WPs of AUDIT2MEASURE. This includes the details of the energy audit obligations in the six countries covered by the project and the details of the e-survey carried out within A2M.

This generic part is completed with country specific slides on details of energy audit obligations in each country.

Module 3. Implementation of Energy Efficiency Measures (EEM) defined in the energy audits

This module provides information on the different factors influencing the implementation of Energy Efficiency Measures[1] (EEM) in industrial companies. The module will give an overview of the different potential motivations, mitigation of barriers and the main roles to implement the EEM. The module consists of 4 submodules:

- 3.1 Motivation of industrial companies' staff

The objective of this submodule is to explain the most common motivations that encourage the companies to implement EEM.

- 3.2 Roles and responsibilities of stakeholders to implement EEM

The objective of this submodule is to explain the different stakeholders involved in the implementation of EEM and their respective roles and responsibilities.

- 3.3 Mitigation of perceived risks and barriers' removing

The objective of this submodule is to identify the most common barriers on the implementation of EEM and mitigate the risk perception.

- 3.4 Implementation plan for EEM identified in the energy audit

The objective of this submodule is to establish an implementation plan for the identified EEM.

Module 4. Raising awareness of ESM in the industry sector

The aim of the 4th module is to present the business case for ESM and discuss the details of specific ESM.

This module addresses the benefits of Energy Saving Measures and how to present these to e.g. top management. The module consists of 8 submodules:

1. Raising awareness: describing the business case for Energy Saving Measures for industrial companies (beyond only the cost savings);
2. Indicators of economic assessment: overview of the main financial indicators, such as payback period, IRR and NPV, that are important to take into account when calculating the financial attractiveness of ESM;
3. Most common ESM in selected industry sectors: overview of typical ESM on energy efficiency with description, typical usage, etc.;
4. Most common RES installations in selected industry sectors: overview of individual RES with description, typical usage, etc.;
5. Assessment of measures and their risks: what are the major risks and their solutions when implementing/investing in Energy Saving Measures;
6. Energy efficiency organizational measures: the module will focus on the implementation of EnMS in the industry sector, energy policy, energy review, EnPI (Energy Performance Indicator), energy saving potential;

[1] The terms "Energy Efficiency Measure(s)" (EEM) and "Energy Saving Measure" (ESM) are used interchangeably during the course of the project.

7. Carbon footprint calculation in the industrial sector: basic methodology of carbon footprint calculation (i.e. what emissions are included);
8. Practical examples of ESM: presentation of (country specific) practical examples with typical energy saving, payback period, lifetime period, etc.

Module 5. Audit and Technical Assistance Financing

Module 5 on Audit and Technical Assistance Financing includes country specific submodules, as the way technical assistance and energy audits are financed differs strongly per country.

Module 6. Financial Mechanisms – Public and Private

Part of the module on financial mechanisms is generic for all countries, including descriptions on more innovative financial mechanisms like energy performance contracting, while part of this module includes country specific information on national financial mechanisms.

4. ORGANIZATION OF THE TRAINING COURSES

By the end of 2023, the English versions of the training slides were completed. After that, the partners translated the slides in their national language. The full training programme for the 4- and 2.5-hour training programme are presented below.

Proposed training programme for 4-hour (240 min) face-to-face session

No.	Title (duration)	Description
0	Introduction to the trainings (10 min)	-
1	EU Energy Policy and Objectives (30 min)	EU energy policy documents, energy efficiency and RES policy and legislation and relevance for industrial companies (incl. new Energy Efficiency Directive – EED)
2	Energy policy and energy auditing in partner countries (30 min)	Relevant energy policy and legislation for companies in the partner country – incl. details of energy audit regulations
3	Implementation strategy of ESM defined in the energy audits (45 min)	Motivation towards ESM and roles and responsibilities
4	Raising awareness of ESM in the industry sector (45 min)	The business case for ESM – examples of successful ESM projects
5	Energy audit and technical assistance financing (0 – 30 min)	Only for those countries where such schemes exist
6	ESM financing (30 min)	Overview of financing possibilities in partner country, addressing: - grant funding & private funding and alternative forms like EPC
	Discussion and Q&A (20 min)	

Proposed training programme for 2 ½ hour (150 min) face-to-face session

No.	Title (duration)	Description
0	Introduction to the trainings (10 min)	
1	EU Energy Policy and Objectives (10 min)	EU energy policy documents, energy efficiency and RES policy and legislation and relevance for industrial companies (incl. new Energy Efficiency Directive – EED)
2	Energy policy and energy auditing in partner countries (20 min)	Relevant energy policy and legislation for companies in the partner country – incl. details of energy audit regulations
3	Implementation strategy of ESM defined in the energy audits (20 min)	Motivation towards ESM and roles and responsibilities
4	Raising awareness of ESM in the industry sector (30 min)	The business case for ESM – examples of successful ESM projects
5	Energy audit and technical assistance financing (0 – 20 min)	Only for those countries where such schemes exist
6	ESM financing (20 min)	Overview of financing possibilities in partner country, addressing: - grant funding & private funding as well as alternative forms like EPC
	Discussion and Q&A (20 min)	

Training organisation

Trainings are going to take place during 2024, basically between April and October 2024.

ENVIROS as lead partner will keep track of all trainings and provide an overview of the number of trainings held in each country as well as the number and type of participants attending.

The participants will also be asked to fill in an evaluation form at the end of the training. The evaluation of the training courses will be included in Deliverable 4.3, due by the end of 2024.

ANNEX I – TRAINING COURSE SLIDES IN ENGLISH

This Annex includes all the training slides in English as well as a selection of the country specific training slides for module 5 and 6.

The following training slides are listed here – generic modules:

- Module 1 – EU Energy Policy and Legislation (120 slides);
- Module 2 – Energy policy and energy auditing in partner countries (35 slides);
- Module 3 – Implementation of Energy Efficiency Measures (EEM) defined in the energy audits (47 slides);
- Module 4 – Raising awareness of ESM in the industry sector (88 slides);
- Module 5 - Audit and Technical Assistance Financing with examples from the Netherlands (EN version) (30 slides);
- Module 6 - ESM Financing in Partner Countries with examples from the Netherlands (EN version) (48 slides).

ANNEX II – COUNTRY SPECIFIC SLIDES

a) Module 2 – Audit regulations in the Czech Republic (Czech version) – 10 slides;
b) Module 5 – Audit and Technical Assistance Financing;
   - Italian version with examples from Italy (7 slides);
   - Spanish version with examples from Spain (29 slides).
c) Module 6 – ESM financing:
   - Italian version with examples from Italy (23 slides);
   - Spanish version with examples from Spain (62 slides).

ANNEX I – TRAINING SLIDES IN ENGLISH

This Annex includes all the training slides in English as well as a selection of the country specific training slides for module 5 and 6.

The following training slides are listed here – generic modules:

- Module 1 – EU Energy Policy and Legislation (120 slides)
- Module 2 – Energy policy and energy auditing in partner countries (35 slides)
- Module 3 – Implementation of Energy Efficiency Measures (EEM) defined in the energy audits (47 slides)
- Module 4 – Raising awareness of ESMs in the industry sector (88 slides)
- Module 5 - Audit and Technical Assistance Financing with examples from the Netherlands (EN version) – 30 slides
- Module 6 - ESM Financing in Partner Countries with examples from the Netherlands (EN version) – 48 slides

AUDIT2MEASURE

Module 1 - EU Energy Policy and Legislation

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Module 1 - EU energy policies and legislation – Index

2

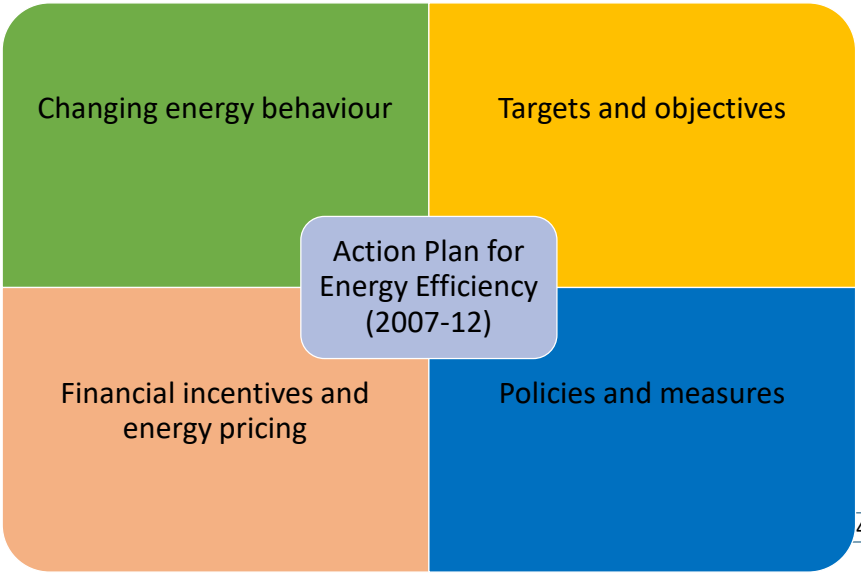
2

1.1 ENERGY RELATED STRATEGY AND POLICY DOCUMENTS

3

3

1.1.1 – 2007 Action Plan for Energy Efficiency: Realising the Potential



4

4

1.1.1 – 2007 Action Plan for Energy Efficiency: Targets and objectives

20% of primary energy savings by 2020

- Sector-specific target savings:
  Residential: 27%
  Commercial buildings: 30%
  Manufacturing: 25%
  Transport: 26%
- Savings:
  390 Mtoe/year of primary energy
  100 bilion Euros/year up to 2020
  780 milion tonnes/year of CO2 emissions reduction
- Expected structural changes, effects on primary energy f previous policy and autonomous changes: 1.8% additional savings, corresponding to 470 Mtoe/year

5

5

1.1.1 – 2007 Action Plan for Energy Efficiency: Targets and objectives

20% of primary energy savings by 2020

Sector-specific target savings:
Residential: 27%
Commercial buildings: 30%
Manufacturing: 25%
Transport: 26%

Sector	Energy Consumption (Mtoe) 2005	Energy Consumption (Mtoe) 2020 (Business as usual)	Energy Saving Potential 2020 (Mtoe)	Full Energy Saving Potential 2020 (%)
Households (residential)	280	338	91	27%
Commercial Building (Tertiary)	157	211	63	30%
Transport	332	405	105	26%
Manufacturing Industry	297	382	95	25%

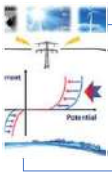
6

Commission of the European Communities, *Communication from the Commission. Action Plan for Energy Efficiency: Realising the Potential*, **COM(2006)545 Final**

6

1.1.1 – 2007 Action Plan for Energy Efficiency: Policies and Measures

Improving energy performance



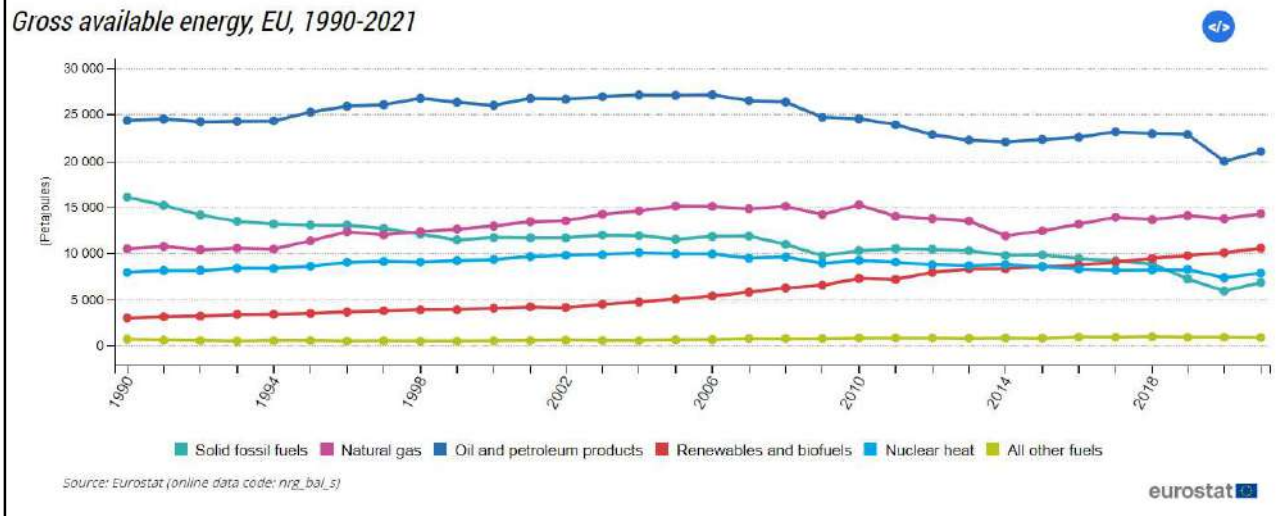
Improving energy transformation

Limiting the costs linked to transport

7

7

1.1 Gross available energy in Europe

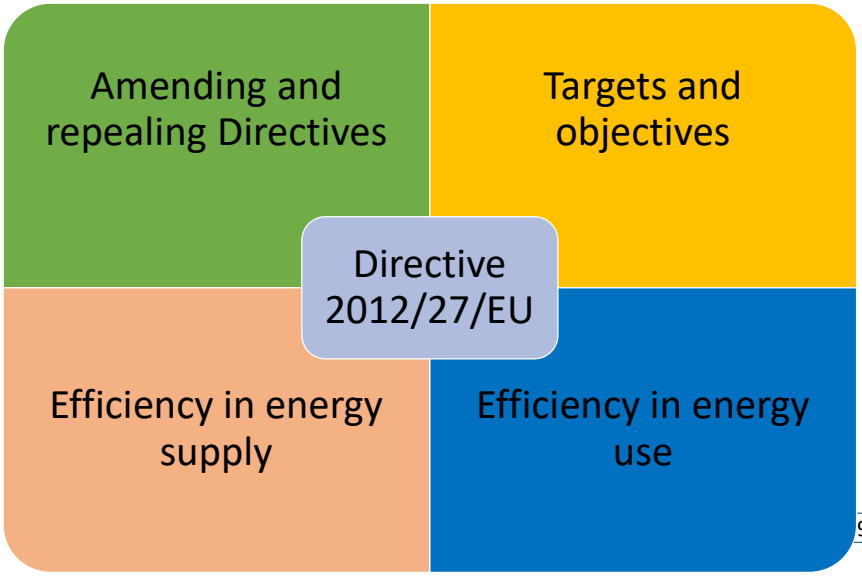


8

Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview

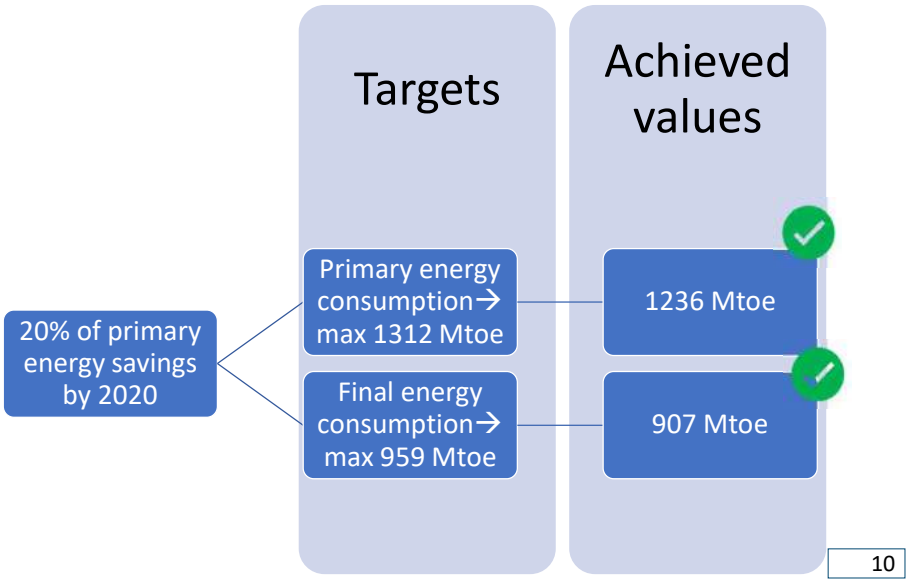
8

1.1.2 – Directive 2012/27/EU on energy efficiency



9

1.1.2 – Directive 2012/27/EU: Targets and objectives



10

1.1.2 – Directive 2012/27/EU: Efficiency in energy use

- Article 4 • Building renovation
- Article 5 • Exemplary role of public bodies' building
- Article 6 • Purchasing by public bodies
- Article 7 • Energy efficiency obligation schemes
- Article 8 • Energy audits and energy management systems
- Article 9 • Metering
- Article 10 • Building information
- Article 11 • Cost of access to metering building information
- Article 12 • Consumer information and empowering programme
- Article 13 • Penalties

11

L_2012315EN.01000101.xml (europa.eu)

11

1.1.2 – Directive 2012/27/EU: Efficiency in energy use

Article 4 • Building renovation

5 Pillars of the long-term strategy which aims at mobilising investment in the renovation of the national stock of residential and commercial buildings both public and private

Identification of **cost-effective approaches to renovations relevant to the building type** and climatic zone

An **overview of the national building stock** based, as appropriate, on statistical sampling

Policies and measures to **stimulate cost-effective deep renovations of buildings**, including staged deep renovations

An **evidence-based estimate of expected energy savings** and wider benefits

A forward-looking **perspective to guide investment** decisions of individuals, the construction industry and financial institutions

12

12

1.1.2 – Directive 2012/27/EU: Efficiency in energy use

Each Member State shall set-up an energy efficiency obligation scheme in order to accomplish the target of achieving new savings each year from 1 January 2014 to 31 December 2020 of 1,5 % of the annual energy sales to final customers of all energy distributors or all retail energy sales companies by volume, averaged over the most recent three-year period prior to 1 January 2013. The required actions consist in:

Article 7
- Energy efficiency obligations scheme

Carry out the calculation using values of 1 % in 2014 and 2015; 1,25 % in 2016 and 2017; and 1,5 % in 2018, 2019 and 2020

Count energy savings resulting from individual actions newly implemented since 31 December 2008 that continue to have an impact in 2020 and that can be measured and verified, towards the target savings amount

Allow energy savings achieved in the energy transformation, distribution and transmission sectors, including efficient district heating and cooling infrastructure to be counted towards the target savings amount

Exclude from the calculation all or part of the sales, by volume, of energy used in industrial activities listed in Annex I to Directive 2003/87/EC (37001 32..32 (europa.eu))

13

13

1.1.2 Directive 2012/27/EU: Efficiency in energy use

Article 8
- Energy audits and energy management systems

Audits must be carried out in an **independent manner by qualified and/or accredited experts**, as well as implemented and supervised by independent authorities under national legislation

Programmes to **encourage SMEs to undergo energy audits** should be developed, as well as programmes addressed to households

Non-SMEs are subjected to AUDIT OBLIGATION at least every four years from the date of the previous carried out energy audit (exemption for ISO50001 certified companies)

14

14

1.1.2 Directive 2012/27/EU: Efficiency in energy supply

Article 14
- Promotion of energy efficiency in heating and cooling

Article 15
- Energy transformation, transmission and distribution

15

L_2012315EN.01000101.xml (europa.eu)

15

1.1.2 Directive 2012/27/EU: Amending and repealing Directives

Amending Directives

- ***Directive 2009/125/EC*** *– Establishing a framework for the setting of ecodesign requirements for energy-related products (recast) (*Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products Text with EEA relevance (europa.eu)*)*
- ***Directive 2010/30/EU*** *– On the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products (recast) (*Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related productsText with EEA relevance (europa.eu)*)*

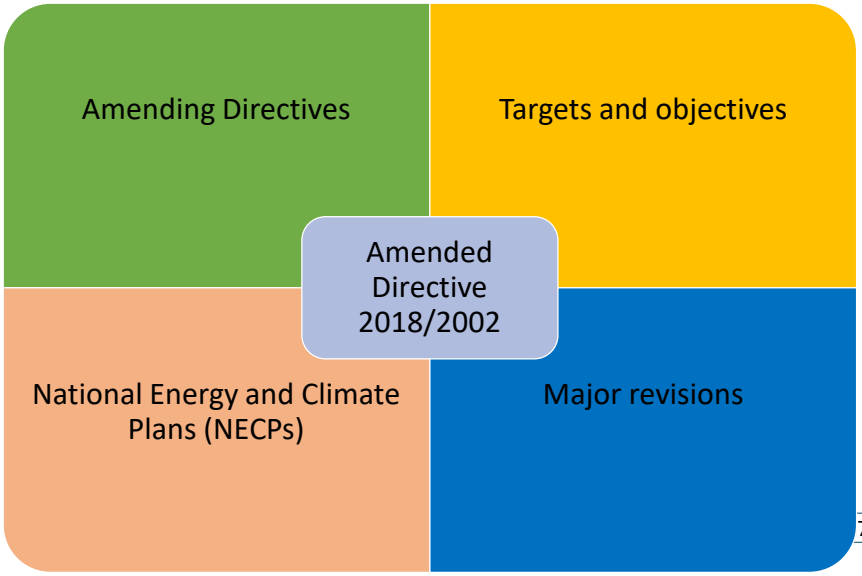
Repealing Directives

- ***Directive 2004/8/EC*** *– On the promotion of cogeneration based on a useful heat demand in the internal energy market and amending directive 94/42/EEC (*36416 50..50 (europa.eu)*)*
- ***Directive 2006/32/EC*** *– On energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC (*eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006L0032*)*

16

16

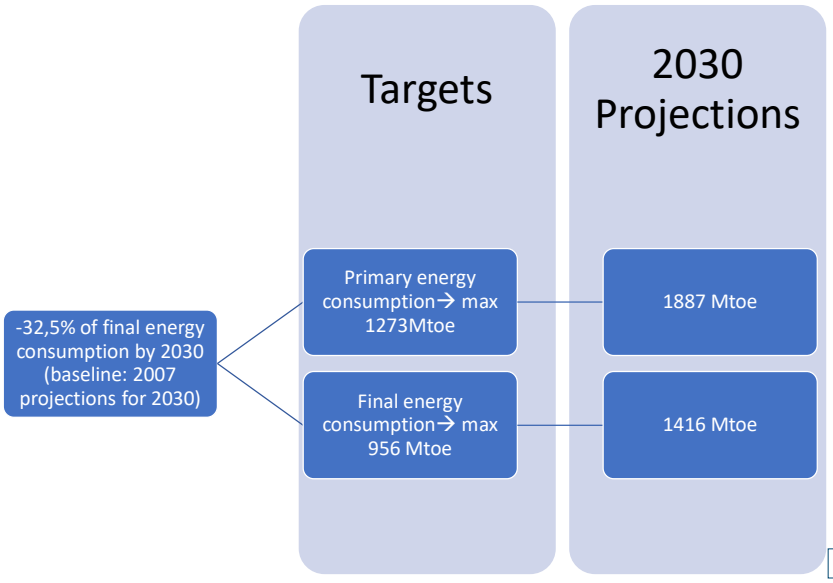
1.1.3 Amended Directive 2018/2002 on energy efficiency



7

17

1.1.3 Amended Directive 2018/2002: Targets and objectives



18

18

1.1.3 Amended Directive 2018/2002: Major revisions

Primary energy factor (PEF)

Pace of implementation

Nearly zero energy buildings (NZEBs)

19

19

1.1.3 Amendive Directive 2018/2002: Major revisions

The primary energy factor for electricity describes the ratio between end-user consumption of electricity and primary energy consumption

Primary energy factor (PEF)

"Reflecting technological progress and the growing share of renewable energy sources in the electricity generation sector, the default coefficient for savings in kWh electricity should be reviewed in order to reflect changes in the primary energy factor (PEF) for electricity. Calculations reflecting the energy mix of the PEF for electricity are based on annual average values. The 'physical energy content' accounting method is used for nuclear electricity and heat generation and the 'technical conversion efficiency' method is used for electricity and heat generation from fossil fuels and biomass. For non-combustible renewable energy, the method is the direct equivalent based on the 'total primary energy' approach. To calculate the primary energy share for electricity in cogeneration, the method set out in Annex II to Directive 2012/27/EU is applied. An average rather than a marginal market position is used. Conversion efficiencies are assumed to be 100 % for non-combustible renewables, 10 % for geothermal power stations and 33 % for nuclear power stations. The calculation of total efficiency for cogeneration is based on the most recent data from Eurostat. As for system boundaries, the PEF is 1 for all energy sources. The PEF value refers to 2018 and is based on data interpolated from the most recent version of the PRIMES Reference Scenario for 2015 and 2020 and adjusted with Eurostat data until 2016. The analysis covers the Member States and Norway. The dataset for Norway is based on the European Network of Transmission System Operators for Electricity data."

Older value (2012/27/EU): 2.5 → Updated value (2018/2002): 2.1

DIRECTIVE (EU) 2018/ 2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of 11 December 2018 - amending Directive 2012/ 27/ EU on energy efficiency (europa.eu)

20

20

1.1.3 Amended Directive 2018/2002: Major revisions

Pace of implementation

*Speed of the implementation pace: yearly final energy savings from January, 1st, 2021 to December, 31st,2030 corresponding to **0,8 % of annual final energy consumption**, averaged over the most recent three-year period prior to January, 1st, 2019.*

Exceptions:
Cyprus and Malta p.a. has been set to -0.24%

DIRECTIVE (EU) 2018/ 2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of 11 December 2018 - amending Directive 2012/ 27/ EU on energy efficiency (europa.eu)

21

21

1.1.3 Amended Directive 2018/2002: Major revisions

Nearly zero energy buildings (NZEBs)

In order to address energy poverty-related issues, the Union's building stock needs, in the long term, to be converted to NZEBs in accordance with the objectives of the Paris Agreement.

"In view of the climate and energy framework for 2030, the energy savings obligation established by Directive 2012/27/EU should be extended beyond 2020. That extension would create greater stability for investors and thus encourage long-term investments and long-term energy efficiency measures, such as the deep renovation of buildings with the long-term objective of facilitating the cost-effective transformation of existing buildings into NZEBs. The energy savings obligation has an important role in the creation of local growth and jobs, and should be maintained to ensure that the Union can achieve its energy and climate objectives by creating further opportunities and to break the link between energy consumption and growth. Cooperation with the private sector is important to assess the conditions on which private investment for energy efficiency projects can be unlocked and to develop new revenue models for innovation in the field of energy efficiency ."

DIRECTIVE (EU) 2018/ 2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of 11 December 2018 - amending Directive 2012/ 27/ EU on energy efficiency (europa.eu)

22

22

1.1.3 Amended Directive 2018/2002: National Energy and Climate Plan (NECPs) obligation

*Under the Governance Regulation 2018/1999, The Member States are required to issue 10 year National Energy and Climate Plan (NECP), in order to explain how they intend to meet energy efficiency and other targets for 2030-→ agreed as part of the Clean Energy for all European packages (*Clean energy for all Europeans package (europa.eu)*)*

*The **NECPs** aims at **outlining** how the EU Member States intend to **address the following topic-related targets** through the development **of long-term strategies** on:*

- *Energy efficiency*
- *Renewables*
- *Greenhouse gas emission (GHG) reduction*
- *Interconnections*
- *Research and Innovation*

23

National energy and climate plans (europa.eu)

23

1.1.3 Directive 2018/2002: Amending Directives

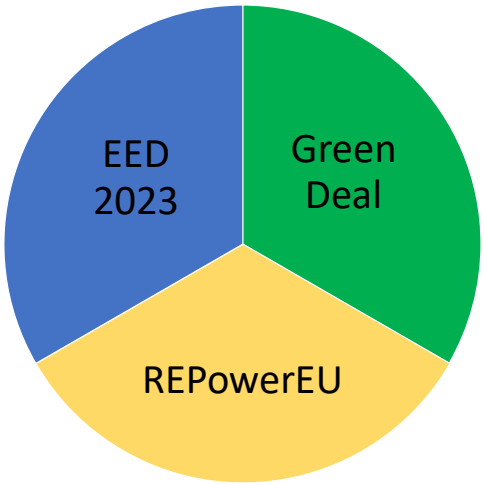
- ***Directive 2012/27/EU** – On energy efficiency (*Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/ECText with EEA relevance (europa.eu)*)*
- ***Directive 2010/31/EU** – On the energy performance of buildings (*Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (europa.eu)*)*
  - Amended with **Directive 2018/844/EU** (Directive (EU) 2018/ of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency (europa.eu))(see NZEBs section)
  - A further amendment will be issued soon resource.html (europa.eu)

DIRECTIVE (EU) 2018/ 2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of 11 December 2018 - amending Directive 2012/ 27/ EU on energy efficiency (europa.eu)

24

24

1.1.4 Structure and strategy of the European Green Deal and REPowerEU and EED 2023



25

25

1.1.4 The European Green Deal (2019)_The structure

15 x

8 x Regulations

They consist in a binding legislative act, which must be applied in its entirely across the EU

6 x Directives

They set objectives that EU Member States must achieve. However, it is up to each individual country to issue their own laws in order to accomplish the goals

1 x Decision

It is binding on those to whome it is addressed (e.g.: an EU country)

26

26

1.1.4 The European Green Deal (2019)_The structure

15 x

8 x Regulations

- 4 x «brand new Regulations»
- 4x recast or amendments of already existing regulations

6 x Directives
1 x Decision

- 4 x «brand new Directives»
- 2x amendments
- 1x recast

27

27

1.1.4 The European Green Deal (2019)_The structure

8 x Regulations

- **Carbon border adjustment mechanism**
- **Social Climate Fund**
- **Proposal to use renewable and low-carbon fuels for maritime transport**
- **Proposal to boost the production and uptake of sustainable aviation fuels**
- Stricter binding annual GHGs emissions reduction
- Stricter performance standards for new passengers cars and new light commercial vehicles
- Stricter rules concerning land use, forestry and agriculture
- Updated Alternative Fuels infrastructure laws

7 x Directives

- **Full update of taxation on energy products and electricity**
- **Stricter EU Emissions Trading Scheme and Market Stability Reserve**
- **Higher amount of allowances to be placed in Market Stability Reserve until 2030**
- **More ambitious target regarding Promotion of Energy from Renewable Sources**
- Amendment regarding offsetting for aircrafts employees
- Amendment regarding contribution to reduction target and implementing a global market-based measure
- Full update of EED (recast)

28

28

1.1.4 The European Green Deal (2019) – Main objectives

- Targets for CO_2 reduction
- Targets for renewable energy
- Targets for energy efficiency
- Taxation and CO_2 pricing
- Cars and light commercial vehicles
- Alternative Fuels infrastructure
- Land use, forest and agriculture

29

29

1.1.4 REPowerEU (2022) – Drivers and targets

1. Reduced dependency on Russian fossil fuels → Safeguard of European citizes and business from energy shortages coming from Ukraine-Russia conflict (80% of russian gas pipelines have been replaced in less than 8 months)
2. Transitioning towards clean energy production

Save energy (20% reduction in energy demand so far)

Produce clean energy (39% of electricity in 2022 derived from renewables)

Diversify its energy supply

30

30

1.1.5 The new Energy Efficiency Directive (EED 2023)

In September **2023** The new, recast Energy Efficiency Directive (EU) **2023/1791**, was published in the EU Official Journal. After its entry into force, EU Member States will have two years to transpose most of the different elements in the directive into national law.

This marks the final step in the legislative process that started with the Commission proposal in July 2021, as part of the "Fit for 55" package, which was supplemented by an additional proposal as part of the REPowerEU plan in May 2022.

Directive (EU) 2023/1791
https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32023L1791&qid=1697549690925

31

31

1.1.5 EED 2023_targets

Additional 11.7% reduction in energy consumption by 2030 (baseline: 2020 projections for 2030)

- Primary energy consumption by 2030→ max 992,5 Mtoe
- Final energy consumption by 2030→ max 763 Mtoe
- Annual pace of implementation: 1,49 %→ gradually increasing from 2024 to 2030 until reaching 1,9% on December 31, 2030
- Public sector (leading by example) : 1. annual energy consumption reduction of 1.9% (excluding public transport and arm forces)
  2. compulsory renovation each year of at least 3% of the total area of owned buildings

Directive (EU) 2023/… of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (europa.eu)

32

32

1.1.6 Comparison and visualization of targets evolution among the directives and plans at stake

Directive/Plan	Date	Target year	Energy reduction targets
Directive 2012/27/EU on Energy Efficiency	November 2012	2020	• Primary energy consumption should not exceed 1312 Mtoe • Final energy consumption should not exceed 959 Mtoe
Directive (EU) 2018/2002 amending Directive 2012/27/EU on Energy Efficiency	December 2018	2030	• Primary energy consumption should not exceed 1273 Mtoe • Final energy consumption should not exceed 956 Mtoe
Directive (EU) 2023/1791 on energy efficiency and amending Regulation (EU) 2023/955 (recast)	September 2023	2030	• Primary energy consumption should not exceed 992,5 Mtoe • Final energy consumption should not exceed 763 Mtoe

33

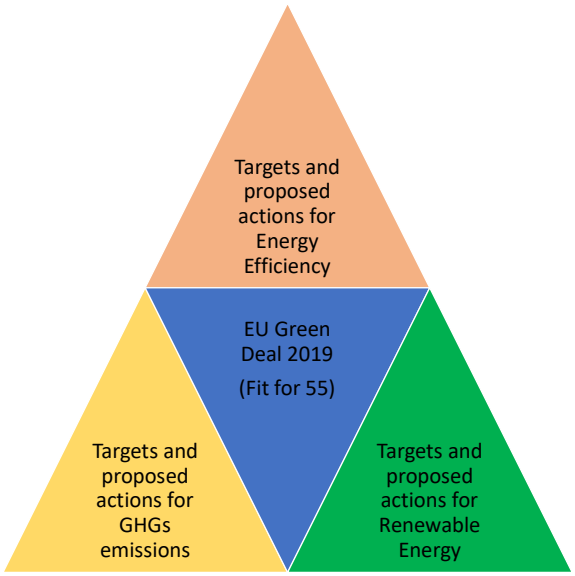
1.2 ENERGY EFFICIENCY, RENEWABLE ENERGY AND GREENHOUSE GAS EMISSION GOALS

34

34

1.2.1 Energy Efficiency, Renewable Energy and GHG targets of the European Green Deal

- Targets for CO_2 reduction
- Targets for renewable energy
- Targets for energy efficiency
- Taxation and CO_2 pricing
- Cars and light commercial vehicles
- Alternative Fuels infrastructure
- Land use, forest and agriculture



35

35

1.2.1 The European Green Deal – Targets for Energy Efficiency

Changed baseline

-9% of final energy consumption by 2030 (baseline: forecasted energy savings due to current policies in 2020, corresponding to -29.4% of final energy consumption baseline 2007 projections)

Updated Targets
(updated baseline: forecasted final energy savings in 2020)

Energy efficiency gap in final energy: 77 Mtoe from 2019 to 2030

2030 Targets
(baseline:2007 Projections)

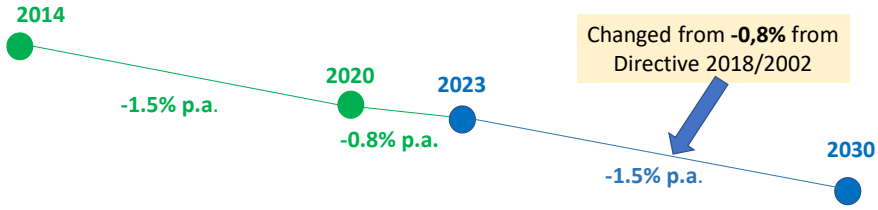
1416 Mtoe

36

36

1.2.1 The European Green Deal – How fast do we have to become more efficient?

Pace of implementation - revision from 2018



*Speed of the implementation pace: yearly final energy savings from January, 1st, 2023 to December, 31st,2030 corresponding to **1.5 % of annual final energy consumption**, averaged over the most recent three-year period prior to January, 1st, 2024.*

37

37

1.2.1 The European Green Deal Energy Efficiency targets – How to get there?

Public organizations

1. p.a. = -1.7%
2. Compulsory renovation each year of at least 3% of the total area of owned buildings
3. Sustainable procurement without excuses

Energy Poverty

1. Proportional improvements
2. National Energy Efficiency Funds

Companies

1. Energy consumption >85TJ→ Mandatory adoption of Energy Management System (EMS)
2. Energy consumption >10TJ → Compulsory audit obligation each four years or Energy Performance Contract (EPC)
3. Data from audit obligations must become publicly available

38

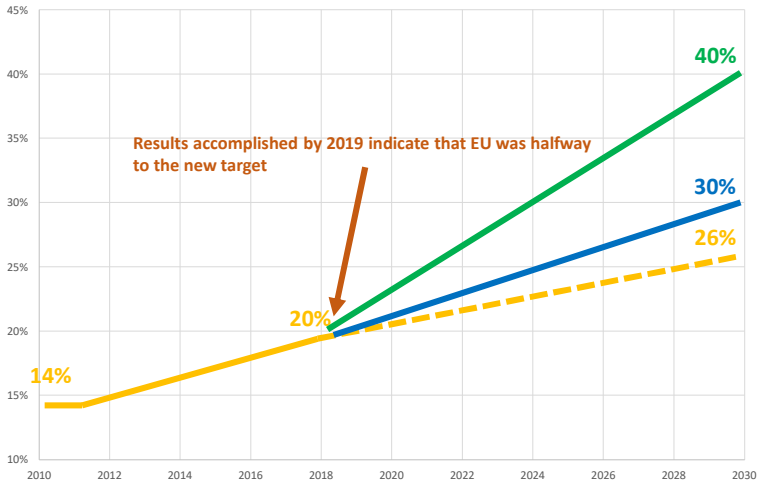
38

1.2.1 The European Green Deal – RES Targets

*RES targets concern **Gross Final Energy Consumption**, namely: all energy employed by end-users and energy sectors, as well as the distribution losses*

Legend:

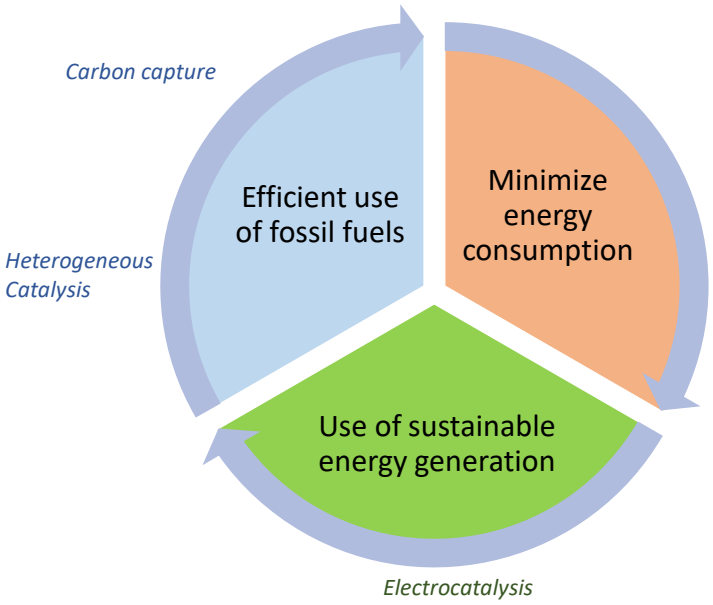
Yellow straight line: RES % achieved until 2019
Yellow dashed line: RES% potentially achieved in 2030 by extrapolation of the implementation pace until 2019
Blue straight line: RES% previous target for 2030
Green straight line: RES% new Green Deal target for 2030



39

39

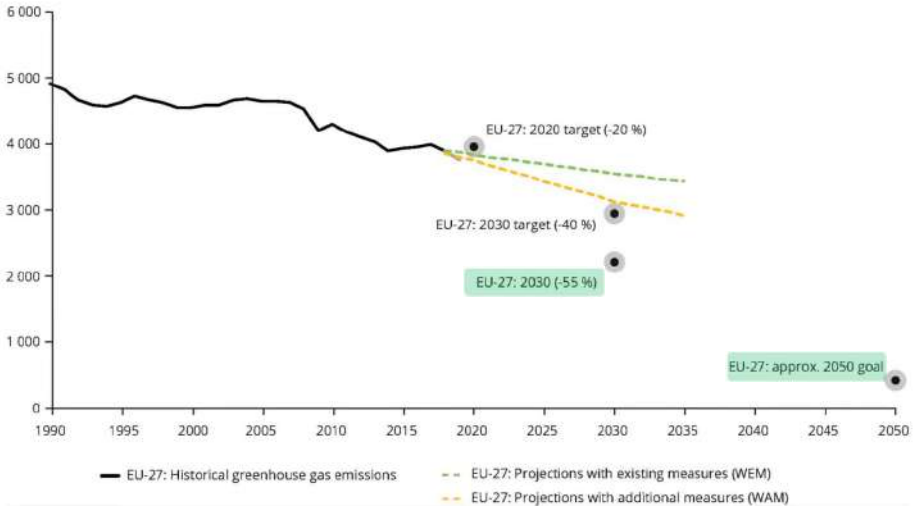
1.2.1 The European Green Deal Renewable Energy targets - How to get there?



40

40

1.2.1 The European Green Deal - Targets for GHGs emissions



41

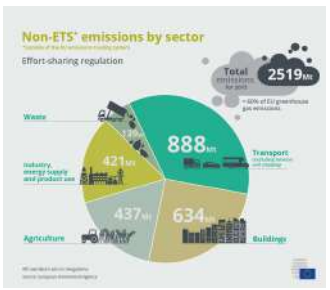
Source: EU Green Deal: complete masterclass - YouTube

41

1.2.1 The European Green Deal GHGs emissions targets – How to get there?

- 60 % (baseline 2005)
- 55 % (baseline 1990)
- 40% (baseline 2005)

Emission Trading Schemes (ETS) Sectors



Effort Sharing Regulation (ESR) Sectors

42

42

1.2.1 The European Green Deal GHGs emissions targets - How to get there? ETS sectors

Credits / allowance for companies and aircraft emissions according to ETS regulation

- Corsia mechanism for extra EU flights

CORSIA explained : Aviation: Benefits Beyond Borders (aviationbenefits.org)

43

43

1.2.1 The European Green Deal GHGs emissions targets 2030 - How to get there? ESR sectors

Member State	Previous ESR target (GHGs emissions – baseline 2005)	Updated ESR target (GHGs emissions – baseline 2005)
Austria	-36%	-48%
Belgium	-35%	-47%
Bulgaria	0%	-10%
Croatia	-7%	-16.7%
Cyprus	-24%	-32%
Czechia	-14%	-26%
Denmark	-39%	-50%
Estonia	-13%	-24%
Finland	-39%	-50%
France	-37%	-47,5%
Germany	-38%	-50%
Greece	-16%	-22,7%
Hungary	-7%	-18.7%
Ireland	-30%	-42%

44

44

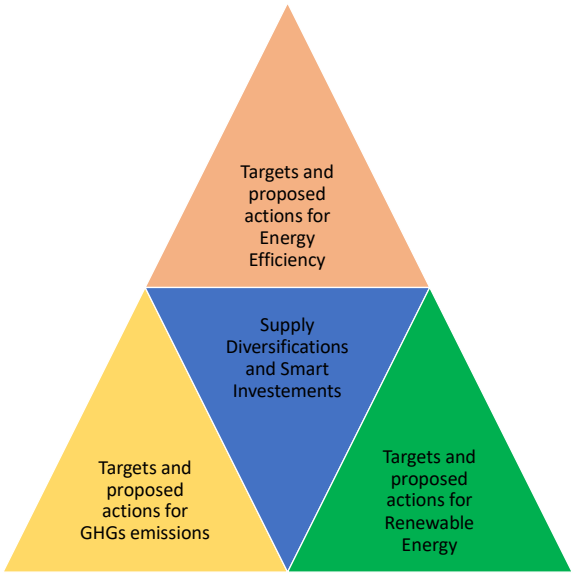
1.2.1 The European Green Deal GHGs emissions targets 2030 - How to get there? ESR sectors

Member State	Previous ESR target	Updated ESR target
Italy	-33%	-43,7%
Latvia	-6%	-17%
Lituania	-9%	-21%
Luxembourg	-40%	-50%
Malta	-19%	-19%
Netherlands	-36%	-48%
Poland	-7%	-17.7%
Portugal	-17%	-28.7%
Romania	-2%	-12.7%
Slovenia	-15%	-27%
Spain	-26%	-37.7%
Sweden	-40%	-50%

45

45

1.2.2 Energy Efficiency, Renewable Energy and GHG targets of the REPowerEU



46

46

1.2.2 REPowerEU - Targets for Energy Efficiency

Accelerating and strengthening structural, mid-to long-term energy efficiency measures

Updated Target for 2030 (updated baseline: forecasted final energy savings in 2020)

-13% of final energy consumption (752 Mtoe)

Previous Target for 2030 (updated baseline: forecasted final energy savings in 2020)

-9% of final energy consumption

47

47

1.2.2 REPowerEU Energy Efficiency targets - How to get there?

Behavioural Changes

Short-term behavioural changes could cut **gas and oil demand by 5%**

Fiscal Measures

Introduction of **reduced VAT rates** on heating systems, building insulation and appliances & products

Contingency measures

In order to issue guidance and prioritization criteria for costumers in case of severe disruption

48

48

1.2.2 REPowerEU Energy Efficiency targets – Possible strengthening of ESMs

Strengthening the implementation of energy audit results in order to ensure that entities which are not subjected to audit obligation are incentivized to uptake them

Introduction of a minimum of energy performance standards for building, by setting a pathway to upgrade the worst-performing ones

Phase out of subsidies and bans introduction for fossil fuel-based boilers in new and existing buildings→ heat pumps regulation encouragement

Increase of energy efficiency in **transport sector**

49

eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0240

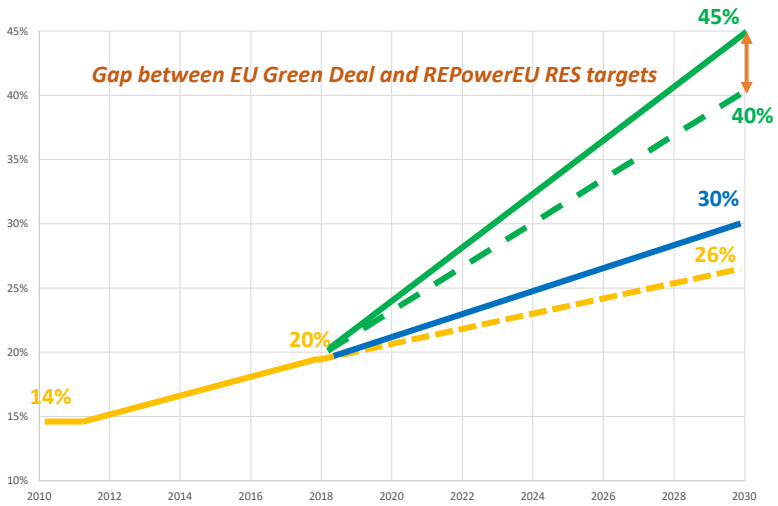
49

1.2.2 REPowerEU – RES Targets

*RES targets concern **Gross Final Energy Consumption**, namely: all energy employed by end-users and energy sectors, as well as the distribution losses*

Legend:

Yellow straight line: RES % achieved until 2019
Yellow dashed line: RES% potentially achieved in 2030 by extrapolation of the implementation pace until 2019
Blue straight line: RES% previous target for 2030
Green dotted line: RES% new Green Deal target for 2030
Green straight line: RES% REPowerEU target for 2030



50

50

1.2.2 REPowerEU – Targets for RES – How to get there

- **EU Solar Strategy** to bring online over **320 GW** of solar PV by 2025 and almost **600 GW** by 2030 (resource.html (europa.eu))
  - **Solar rooftop initiative** with a legal obligation to **install solar panel for new buildings** (either public and commercial or residential)
- **Heat pumps deployment** rate is **doubled**
- **Issue of a Commission Recommendation** to **tackle the bureaucratic complexity** of permission processes related to renewable energy projects (eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=PI_COM:C(2022)3219)
  - Amendment of renewable directive (eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022PC0222)
  - Identification and prioritisation of dedicated areas to-go for renewables (Energy and Industry Geography Lab (europa.eu))
- Setting **the target of 20 million tons of green H_2** both for domestic and import sector by 2030
  - Two delegated Acts on the definition and production of renewable hydrogen have been issued
- Setting the target of additional 35 bcm of produced biomethane by 2030 (eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0230)

51

51

1.2.2 REPowerEU – Reduction of fossil fuel consumption for industry and transport - How to get there

Roll out of carbon contracts for difference in order to support green hydrogen uptake

Setting the target for industry of saving 35 bcm of produced biomethane by 2030 (eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0230)

Specific financing under the Innovation Fund (Innovation Fund (europa.eu)) by **using emission trading revenues** to support the switch away from Russian fossil fuel dependency

The EC:

1. Provides guidance on RES, as well as on power purchase agreements (technical advisory facility with European Investment Bank Homepage | European Investment Bank (eib.org))
2. Proposes to establish EU Solar Industry Alliance (European Solar Photovoltaic Industry Alliance (europa.eu)) in order to enforce technological and industrial leadership in areas such as solar and hydrogen

EC presented a greening of Freight Package (Greening freight for more economic gain (europa.eu)) in order to enhance energy savings and efficiency in the transport sector

52

52

1.2.2 REPowerEU - Supply diversification strategy

EU External Strategy

Objective: Diversification facilitation and building long-term partnerships with suppliers (including hydrogen, green technologies et cet.)

Priority: Global green and energy transition by increasing energy savings and efficiency, boosting the development and deployment of renewables and hydrogen, as well as stepping up energy diplomacy

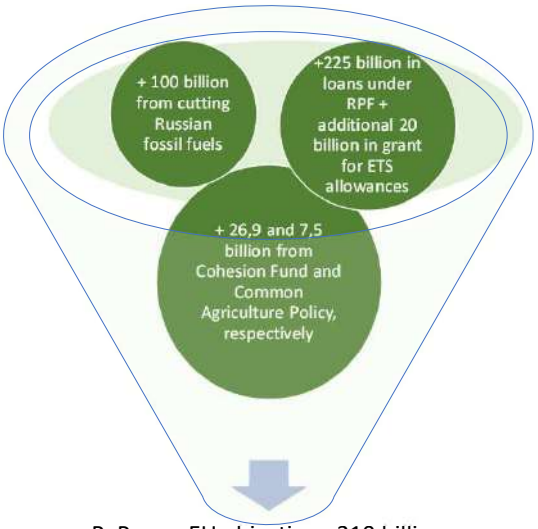
- Major hydrogen corridors planned to be developed in the Mediterranean and North Sea
- In the face of Russian aggression, EU will support Moldova, the Western Balkans and Eastern Partnership countries, as well as the most vulnerable partners
- In particular, EU will provide support to to **Ukraine** in order to ensure security of supply and, in meanwhile, paving the way for electricity and hydrogen trade, as well as energy system restructure→ REPower Ukraine initiative

53

eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022JC0023

53

1.2.2 REPowerEU - Smart Investments

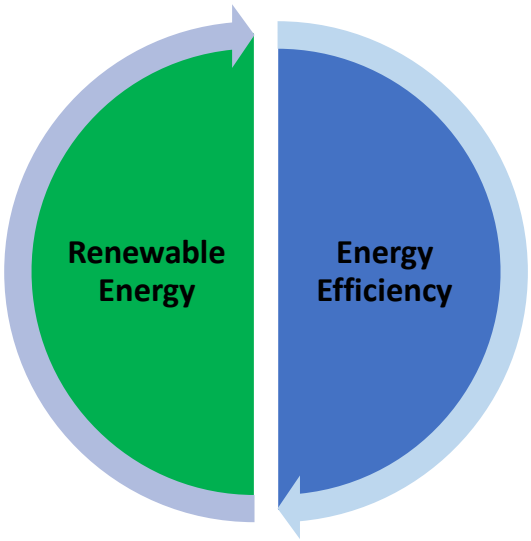


RePower EU objective: -210 billion in the time frame 2022-2027

54

54

1.2.3 Studies on synergies



55

55

1.2.3 Studies on synergies - Renewable Energy & Energy Efficiency

Other useful references:

Dolf G. et al.; International Renewable Energy Agency, Copenhagen Centre on Energy Efficiency, «Synergies between Renewable Energy and Energy Efficiency - A Working Paper Based on Remap 2030,» 2015. [Online].

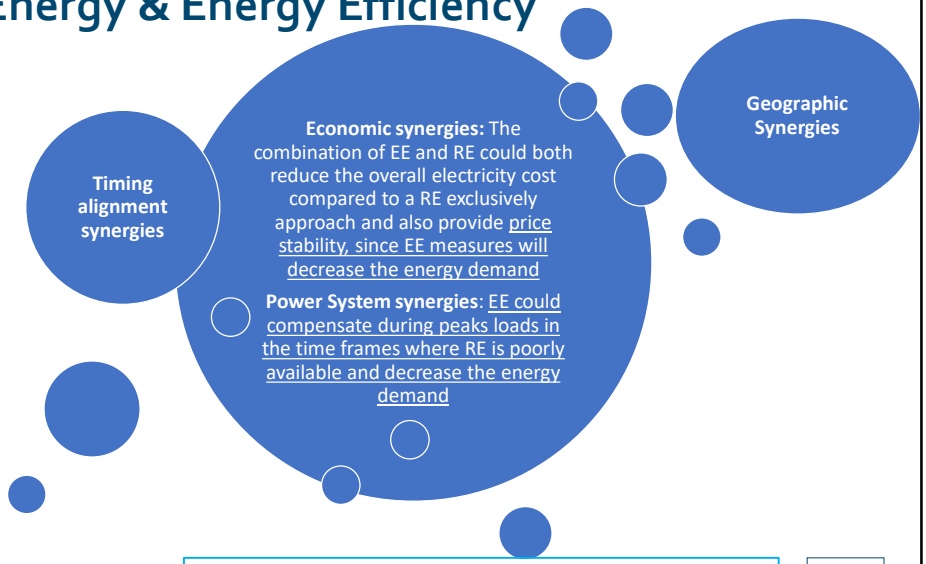
Irena, «Synergies between renewable energy and energy efficiency: A working paper based on remap 2030,» 08 2015. [Online].

Dolf G. et al, «The role of renewable energy in the global energy transformation,» Energy strategy Reviews, vol. 24, pp. 38-50, 2019.

Harmsen R. et al, «The unrecognized contribution of renewable energy to Europe's energy,» Energy Policy, vol. 39, pp. 3425-3433, 2011.

Ringel M. et al, «Towards a green economy in Germany? The role of energy efficiency policies,» Applied energy, vol. 179, n. 1, pp. 1293-1303, 2016.

Schlomann B. et al, «Monitoring of the "Energiewende" - Energy Efficiency Indicators for Germany,» 10 2014. [Online].



Prindle B. and Eldridge M., «The Twin Pillars of Sustainable Energy: Synergies between Energy Efficiency and Renewable Energy Technology and Policy,» 05 2007. [Online].

56

56

1.3 ROLE OF THE EU INDUSTRY IN EU ENERGY STRATEGY

57

57

1.3 Role of the EU industry in EU energy strategy

Industry plays a vital role in achieving EU energy targets.

Some of the main pillars of the European strategy to reach Net Zero Emissions by 2050 are:

Energy efficiency

Energy audits

Renewable energy

58

58

Directive 2012/27/EU
https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32012L0027

1.3.1 Energy audits - Article 8 of Directive 2012/27/EU

Article 8 of Directive 2012/27 concerns the energy audits and energy management systems.

Energy audits must be:
- carried out in **an independent manner by qualified and/or accredited experts**;
- implemented and supervised by independent authorities under national legislation.

Member States shall develop programmes:
- to encourage SMEs to undergo energy audits and the subsequent implementation of the recommendations from these audits;
- to raise awareness among households about the benefits of such audits through appropriate advice services.

Enterprises that are not SMEs are subject to an energy audit carried out in an independent and cost-effective manner by qualified and/or accredited experts or implemented and supervised by independent authorities under national legislation by 5 December 2015 and **at least every four years from the date of the previous energy audit**.

Enterprises that are not SMEs and that are implementing an energy or environmental management system shall be exempted, if the management system concerned includes an energy audit on the basis of the following minimum criteria.

59

59

1.3.1 Energy audits - Article 8 of Directive 2012/27/EU

Minimum criteria for energy audits:

a) be based on up-to-date, measured, traceable operational data on energy consumption and (for electricity) load profiles;

b) comprise a detailed review of the energy consumption profile of buildings or groups of buildings, industrial operations or installations, including transportation;

c) build, whenever possible, on life-cycle cost analysis (LCCA) instead of Simple Payback Periods (SPP) in order to take account of long-term savings, residual values of long-term investments and discount rates;

d) be proportionate, and sufficiently representative to permit the drawing of a reliable picture of overall energy performance and the reliable identification of the most significant opportunities for improvement.

Energy audits shall allow detailed and validated calculations for the proposed measures so as to provide clear information on potential savings.

60

60

1.3.1 Energy audits - New directives and amendments

Directive (EU) 2018/2002 – Energy Efficiency Directive

Directive (EU) 2018/2002 does not amend Article 8 of the previous Directive 2012/27/EU.

Directive (EU) 2023/1791 – revised Energy Efficiency Directive

Article 11 of the **Directive 2023/1791/UE** provides that:

- enterprises with an **average annual consumption higher than 85 TJ** of energy over the previous three years, taking all energy carriers together, **implement an energy management system**;
- enterprises with an **average annual consumption higher than 10 TJ** of energy over the previous three years, taking all energy carriers together, which do not implement an energy management system **are subject to an energy audit**.

Obliged companies carry out a **first** energy audit by **11 October 2026** and that subsequent energy audits are carried out at least **every four years**.
The enterprises concerned shall draw up a concrete and feasible **Action Plan** on the basis of the recommendations arising from those energy audits. The Action Plan shall identify measures to implement each audit recommendation, where it is technically or economically feasible.

61

61

1.3.1 Energy audits - New directives and amendments

Similarly to what is provided for by Article 8 of Directive 2012/27/EU, **energy audits** must be:

- carried out in an independent and cost-effective manner by qualified or accredited experts;
- implemented and supervised by independent authorities under national legislation.

Furthermore, Member States shall develop programmes with the aim of encouraging and providing technical support to SMEs that are not subject to obligation to undergo energy audits and to subsequently implement the recommendations arising from those audits.

In addition to the minimum criteria shown above, the energy audit shall:

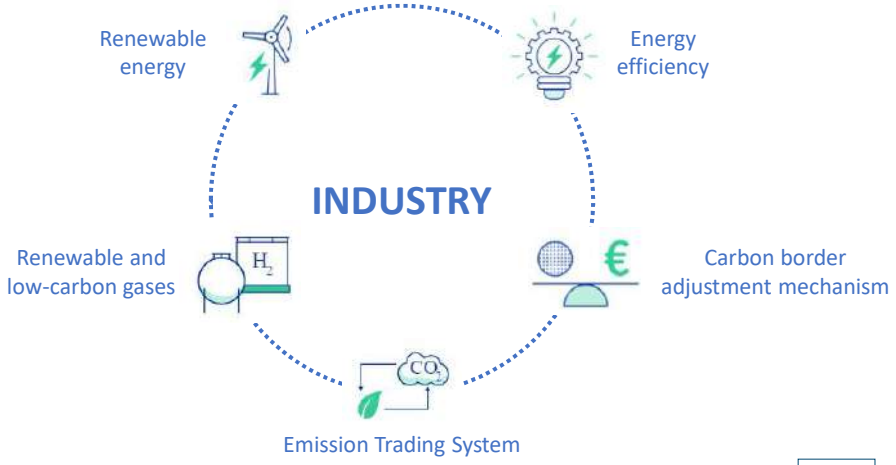
a) identify energy efficiency measures to decrease energy consumption;
b) identify the potential for cost-effective use or production of renewable energy.

Enterprises that implement an environmental management system shall be exempt from the requirements laid down in Article 11, provided that the environmental management system concerned includes an energy audit on the basis of the set out minimum criteria.

62

62

1.3.2 Industry targets in Green Deal, Fit for 55, REPowerEU and EED 2023



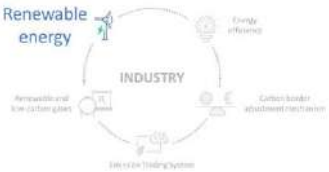
63

63

Directive (EU) 2023/2413 – on the promotion of energy from renewable energy sources

1.3.2 Industry targets in Green Deal, Fit for 55, REPowerEU and EED 2023

New **Directive (EU) 2023/2413** sets an overall European renewable energy target of **42,5%** of its gross final energy consumption by 2030, aiming for 45%.



Industry targets

- Increase the share of renewable sources in the total energy sources used for final energy and non-energy purposes in the industry by at least **1,6%** as an annual average calculated for the periods 2021÷2025 and 2026÷2030
- Contribution of renewable fuels of non-biological origin used for final energy and non-energy purposes shall be at least **42%** of the hydrogen used for final energy and non-energy purposes in industry by 2030 and 60% by 2035

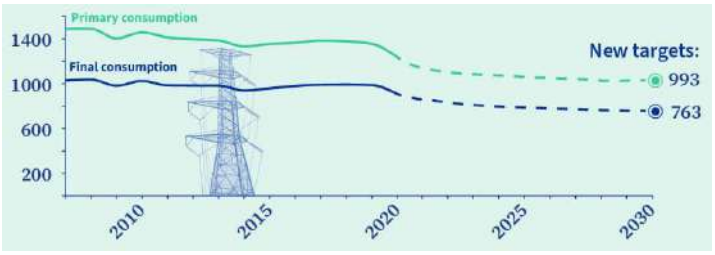
64

64

Directive (EU) 2023/1791 – the revised Energy Efficiency Directive

1.3.2 Industry targets in Green Deal, Fit for 55, REPowerEU and EED 2023

New **Directive (EU) 2023/1791** establishes a further increase of EU energy efficiency ambition by at least **11,7%** in 2030 compared to the level of efforts under the 2020 EU Reference Scenario. The additional reduction of 11,7% results in 763 Mtoe and 992,5 Mtoe in 2030.



Compared to 2005 levels, it means that final energy consumption in the Union should be reduced by approximately **25%** and primary energy consumption should be reduced by approximately **34%**.

65

65

1.3.2 Industry targets in Green Deal, Fit for 55, REPowerEU and EED 2023

Under the new rules, member states will have to gradually increase their energy savings from 2024 to 2030. The end-use energy savings account for **1,49% of the total consumption per year**, gradually reaching **1,9% by the end of 2030**.

Each Member State shall set an indicative national energy efficiency contribution based on final energy consumption to meet, collectively, the Union's binding final energy consumption target. **Member States shall notify those contributions** to the Commission, together with an indicative trajectory for those contributions, **as part of the updates of their integrated national energy and climate plans submitted**. Member States shall provide the shares of primary energy consumption and final energy consumption of energy end-use sectors, including **industry**, residential, services and transport, in their national energy efficiency contributions.

66

66

1.3.2 Industry targets in Green Deal, Fit for 55, REPowerEU and EED 2023

For the EU to reach the decarbonisation goals, systemic change is needed in the energy sector, **cutting the use of fossil fuels and switching to energy from renewable sources**.

The hydrogen and decarbonised gas market package proposes revised and new rules to lower the carbon footprint of the gas market. The goal is to **shift from fossil natural as to renewable and low-carbon gases and boost their uptake** in the EU by 2030 and beyond.

New rules aim to:

- create a market for hydrogen;

- integrate renewable and low-carbon gases into the gas grid;
- engage and protect consumers;
- increase security of supply and cooperation.

67

67

Directive 2003/87/EC - establishing a scheme for greenhouse gas emission allowance trading

Directive (EU) 2023/959 - amended greenhouse gas emission allowance trading directive

1.3.2 Industry targets in Green Deal, Fit for 55, REPowerEU and EED 2023

The EU's **emissions trading system (EU ETS)** is one of the world's largest carbon market and the EU's key tool for reducing greenhouse gas emissions.

Directive 2023/959/EU reforms the ETS by amending Directive 2003/87/EC on the following main points:

- a **reduction in the emissions of the sectors covered by the EU ETS of 62%** compared to 2005 (more ambitious than previous target of 43%);
- faster reduction of the cap (the linear factor shall be 4,3% from 2024 to 2027 and 4,4% from 2028 to 2030) → **fewer allowances on the market**;
- new sectors covered:
  → extension to **maritime transport** (introduced gradually between 2024 and 2026);
  → a separate new ETS for **buildings, road transports and fuels** for additional sectors;
- gradual phasing out of free allowances for certain sectors (in parallel with the introduction of the carbon border adjustment mechanism);
- increased funding for decarbonising ETS sectors.

68

68

REGULATION (EU) 2023/956 - establishing the Carbon Border Adjustment Mechanism (CBAM)

1.3.2 Industry targets in Green Deal, Fit for 55, REPowerEU and EED 2023

Carbon Border adjustment mechanism is expected to be a tool to counter carbon leakage – a situation when industries with high greenhouse gas emissions shift production outside of the EU to jurisdictions with lower climate policy standards than those of the EU.

How will CBAM work

Products covered

- iron and steel;
- cement;
- fertilisers;
- aluminium;
- hydrogen production;
- electricity.

CBAM is designed to function in parallel with the EU's Emission Trading System, mirroring the EU ETS effects for non-EU producers.

69

69

1.4 Current situation in the EU and its impact on Member States energy policies and energy auditing system

70

70

1.4 National and regional policy instruments 1/2

Policy instruments to support audits and, more in general, energy efficiency, can be classified in the following groups:

- **Financial support**: where the primary aim of the policy is to provide financial support to SMEs via grants, loans, subsidies, tax relief or a combination of measures.
- **Information/advice:** including support through awareness raising, guidance, providing energy audits, amongst other forms of information and advice.
- **Regulation**: policies such as supplier obligations and standards.
- **National plan/strategy**: national plans and strategies for energy efficiency, renewable energy or low carbon technologies, or environmental protection which could affect SMEs.

71

71

1.4 National and regional policy instruments 2/2

There is **no comprehensive and updated overview of the national and regional policy instruments in all EU member states**. However, some information, covering only a certain number of EU member states, can be found thanks to EU funded projects, such as LEAP4SME (*which cover Austria, Croatia, Greece, Italy, Malta, Poland, Portugal, Slovakia, and United Kingdom*) and AUDIT2MEASURE (*which cover Germany, Greece, Czech Republic, Italy, Spain, The Netherlands*).

The information shown in the next slides are taken from the above mentioned projects **LEAP4SME** and **AUDIT2MEASURE**.

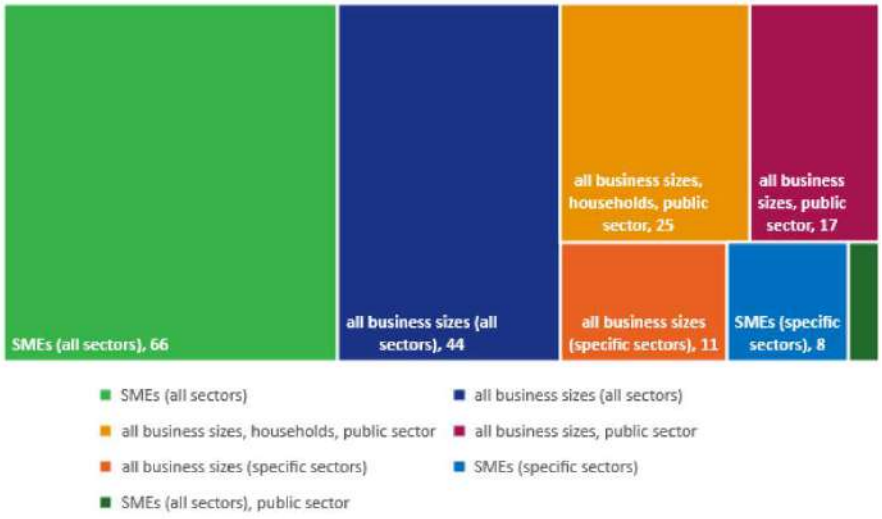
72

72

Some policies are solely targeted at SMEs (all sectors), with a significant number covering large businesses and SMEs (all sectors).

Other policies are targeted at specific sectors, with some supporting SMEs in sectors such as agro-food processing, manufacturing, industrial or tourism.

1.4 Target sectors for the range of policy instruments



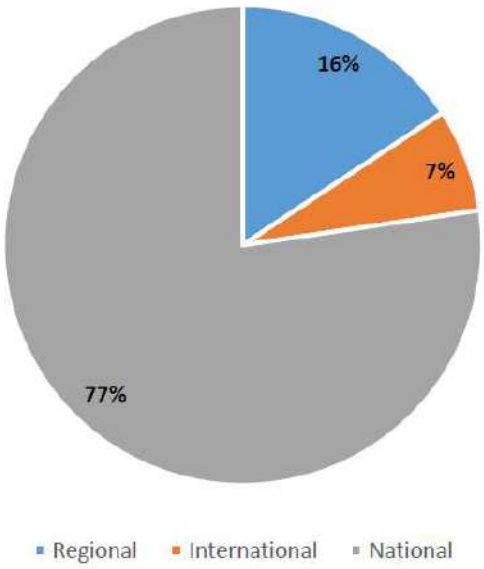
73

Source: LEAP4SME project

73

The majority of the policy instruments are focused on a national scale, while only a few are focused on regional (local areas within countries).
The remaining ones are international, as they are made up of EU funded, multi-country programmes.

1.4 Coverage area for the policy instruments



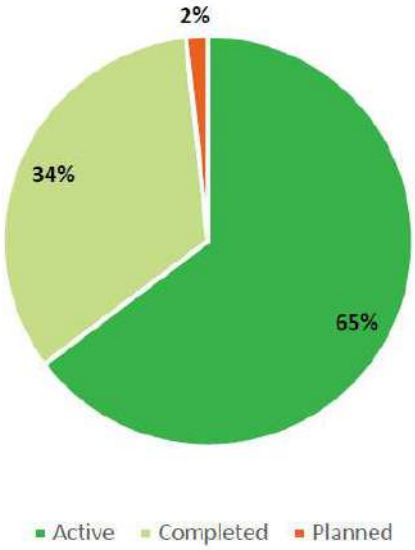
74

Source: LEAP4SME project

74

The majority of the policy instruments are active or complete; the remaining ones are in the planning phase

1.4 Status of policy instruments



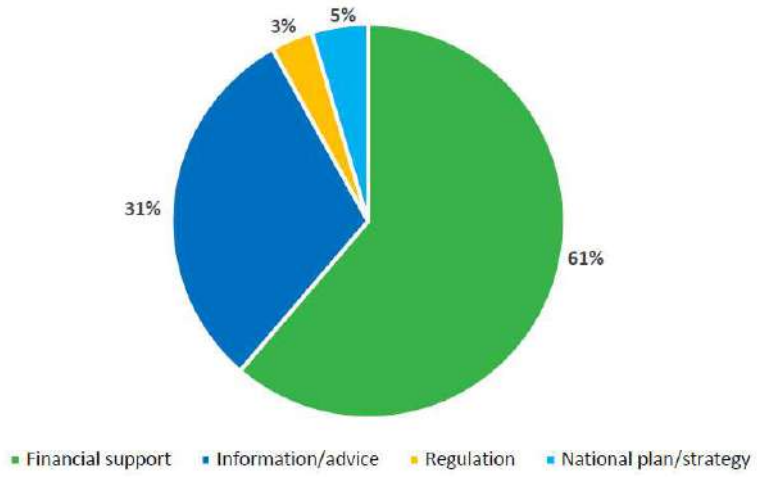
75

Source: LEAP4SME project

75

The largest part of policy instruments in EU members states is composed of «Financial support» instruments

1.4 Types of policy instruments



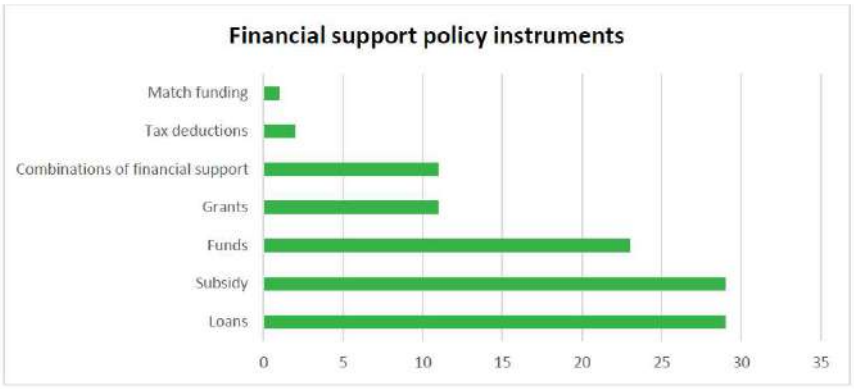
76

Source: LEAP4SME project

76

The majority of policy instruments are loans, subsidies and funds.
A number of policy instruments provide a combination of financial support (ex. loans and tax relief) delivered through a single programme

1.4 Types of financial support policy instruments



77

Source: LEAP4SME project

77

There are several combinations of different types of support delivered through one policy instrument: a combination of awareness raising, energy audits, capacity building and training is particularly prevalent

1.4 Types of information/advice policy instruments

This indicates a popularity of the “one-stop-shop” type policies, where a range of support is provided which could potentially benefit a wide range of SME sizes and types.

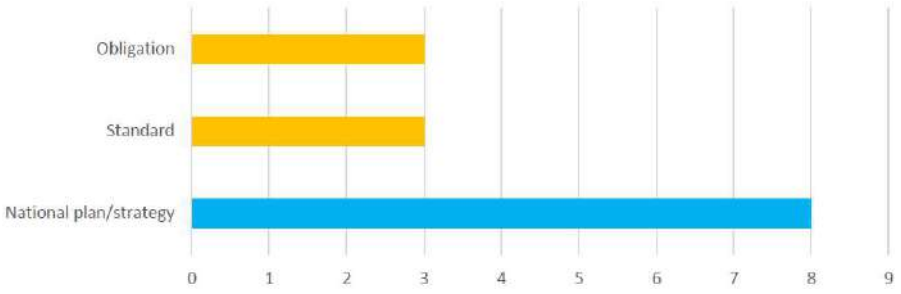
78

Source: LEAP4SME project

78

It is worth noting that there are no regulations or national plans/strategies identified which are directed solely at SMEs because they typically cover a wide range of stakeholders which include SMEs

1.4 Types of Regulation and National plan/strategy policy instruments



79

Source: LEAP4SME project

79

1.4 Energy audit policy instructments

There are **various policy instruments involved carrying out energy audits within SMEs**, either as a way to provide information and advice on energy efficiency or, as a prerequisite to accessing financial support, to assist with the cost of implementing energy efficiency improvements.

An EU funded project, ERASME, found out that there was an unwillingness of industry to spend money for the in-depth audits without certainty of the results, and that the simple audits themselves didn't necessarily lead to action being taken, as there was often a lack of financing available for energy efficiency investments.

80

Source: LEAP4SME project

80

1.4 Development and status of national audit policies 1/3

All the countries involved in the A2M project have policies which set energy audit obligations for enterprises falling into certain categories (these obligations do not differ among regions within surveyed countries).

National policies have evolved over time towards a **harmonisation with the European Energy Efficiency Directive** and international standards such as EN16247, ISO50002 etc.

National audit obligations have come into effect between 2015 and 2019 in most of the countries.

81

Source: AUDIT2MEASURE project

81

1.4 Development and status of national audit policies 2/3

In accordance with EED, all surveyed countries require **mandatory audits** from all obligated enterprises **every 4 years**, although some exceptions exist.

Although non-SMEs are the main target group, **audit obligations criteria differ from one country to another**, with energy intensity often used as a criterium in addition to the number of employees).

82

82

1.4 Development and status of national audit policies 3/3

Overview of general audit obligation criteria.

	CZ	DE	GR	IT	NL	ES
Energy audit obligation since	2000	2015	2015	2015	2008	2016
Criteria for audit obligation for non-SMEs (MWh/a)	>200	>500	All	>581.5	> 50	All
Criteria for audit obligation for SMEs (MWh/a)	>5,000	-	-	>1,000	-	-
Frequency of mandatory audits (years)	4 (10)	4	4	4	4	4

83

Source: AUDIT2MEASURE project

83

1.4 National audit and ESM requirements

Most surveyed countries **do not distinguish between different types of energy audits** in the context of their energy audit obligation policies.

Only a complete audit in accordance with the European standard EN 16247 (see 4.1. European and international standards) ensures compliance.

The **cost of energy audits varies widely** depending on the size and the complexity of the site to be audited (indicatively, ranging from 5,000 EUR and 10,000 EUR across all surveyed countries).

84

Source: AUDIT2MEASURE project

84

1.4 Auditing scopes and exemption from obligation 1/3

Generally, **only energy directly consumed by the enterprise within national borders is considered in mandatory audits**

The surveyed countries take **different approaches regarding energy consumption from transportation and transport facilities**. In all of them, transportation is generally included, though with multiple exceptions.

85

Source: AUDIT2MEASURE project

85

1.4 Auditing scopes and exemption from obligation 2/3

In four of the surveyed countries **certain types of enterprises and activities are exempt from the audit obligation.**

An ISO 50001 certified energy management system exempts enterprises from the audit obligation in all surveyed countries.

86

Source: AUDIT2MEASURE project

86

1.4 Auditing scopes and exemption from obligation 3/3

Overview of general exemptions and ESM implementation obligations

	CZ	DE	GR	IT	NL	ES
ESM implementation obligation since	-	2022	-	2020	2019	-
Criteria for ESM implementation obligation (MWh/a)	-	>10,000	-	>1,000	>10,000	-
Selection criteria for mandatory ESM implementation	-	NPV >0 in 3 years	-	1 ESM	ROI >0 in 5 years	-
Period for mandatory ESM obligation (years)	-	1.5	-	4	4	-

87

Source: AUDIT2MEASURE project

87

1.4 Energy audit financing

The issue of a lack of financing has been tackled through several policy instruments which combined energy audits with access to financial instruments.

These would often be free audits specifically for SMEs.

88

Source: LEAP4SME project

88

1.4 Incentives for non-mandatory audits and ESM implementation

One strategy to promote non-mandatory audits and ESM implementation in enterprises that do not fall under the national audit obligations is public funding.

In most of the countries analysed **there exists some sort of public funding for either non-mandatory audits or ESM implementation**.

89

Source: AUDIT2MEASURE project

89

1.4 National guidance and specifications

All surveyed countries have **developed national standards, guidance and templates for the implementation and reporting of energy audits**. These guidance documents all draw on the European standard EN 16427-1 translated by the respective national standardisation organisations. Therefore, **process methodologies and reporting structures do not vary significantly among surveyed countries**.

Institutions in charge of national audit systems often provide additional instructions in the form of guides or templates to support compliance.

90

Source: AUDIT2MEASURE project

90

1.4 Assessment of energy saving measures

Obligatory (O) and recommended (R) economic impact indicators in mandatory energy audits by country

	CZ	GR	DE	IT	NL	ES
Simple Payback Period (SPP)	O	O		O		O
Return on Investment (ROI)					O	
Internal Rate of Return (IRR)	O		O	O		R
Net present value (NPV)	O		O	O		R
Net present value on investment ratio (NPV/I)				O		
Life Cycle Cost Analysis (LCCA)		O				

Most commonly requested economic assessment indicators include simple payback peri-od (SPP), net present value (NPV) and internal rate of return (IRR).

91

Source: AUDIT2MEASURE project

91

1.4 Overview of national auditors and ESCOs ecosystems

	CZ	DE	GR	IT	NL	ES
National registries or contact lists	ENEX	BAFA	MEE	ACCREDIA	RVO	-
Number of registered auditors (status 2022)	526	8,000	1,466	1,600	1,500	-
Number of registered ESCOs (status 2022)	10	-	18	900	-	-
Self-organisation of auditors	AEM / AEA	DEN e.V. / GIH	-	AssoEGE	-	-
Self-organisation of ESCOs	APES	-	-	AssoESCO	-	AMI / ANESE

92

Source: AUDIT2MEASURE project

92

1.4 Best practices of policy instruments 1/2

- **Italy's "Energivori" scheme**, where energy intensive SMEs applying for a tax relief on the purchased electricity are obliged to conduct an energy audit or implement an energy management system in line with ISO50001;
- **Slovakia's "Reducing energy intensity and increasing the use of renewable energy systems in enterprises scheme"** which involved energy audits and the implementation of measures resulting from them;
- **Malta's "Promotion of Energy Audits in SMEs" programme**, where SMEs are given financial support to take up energy audits;
- **Croatia's "Public calls for energy audits and energy management systems"** which subsidised energy audits for companies;
- **UK Coventry and Warwickshire Green Business Programme** (UK);
- **aws Investment Bonus programme** (Austria).

93

Source: LEAP4SME project

93

1.4 Best practices of policy instruments 3/3

Other policy instruments included energy audits as part of a wider programme of support, often including awareness raising, information and guidance provision, energy audits, capacity and access to finance.

94

Source: LEAP4SME project

94

1.5 EU funded projects – EU funding schemes and programs

The European Commission has put in place several funding schemes at EU level with the goal to improve energy efficiency in SMEs and increase their access to energy audits, such as Horizon 2020 and LIFE; such programs do not provide direct funding to technologies, but focus on R&D, innovation and dissemination.

Besides such funding and support programmes, there are also several other programmes with the goal to promote the exchange of knowledge and best practices related to energy efficiency.

One example could be represented by the Concerted Action of the Energy Efficiency Directive (CA EED), which works across member states to provide a "trusted forum where Members States could exchange experiences and collaborate. With the CA in place, countries could learn from each other, avoid pitfalls and build on the successful approaches of others when implementing the Energy Efficiency Directive".

95

95

1.5 Horizon 2020 1/3

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness.8 SME participation has been encouraged across the whole Horizon 2020 programme, with a particular focus on close-to-market support (https://ec.europa.eu/programmes/horizon2020//en/what-horizon-2020).

EIC Accelerator Pilot

A dedicated instrument for mainstreaming support to research development and innovation-intensive SMEs providing grants along with blended finance (grant in combination with equity investment) (https://ec.europa.eu/programmes/horizon2020/en/area/smes).
Other instruments under the EIC Accelerator Pilot include the Enhanced EIC Pilot, the EIC Pathfinder, the Fast Track to Innovation and the Horizon Prizes (https://ec.europa.eu/programmes/horizon2020//en/h2020-section/eic-accelerator-pilot).

96

96

1.5 Horizon 2020 2/3

Enhanced European Innovation Council (EIC) pilot

The Enhanced European Innovation Council (EIC) pilot supports researchers and innovators developing high-risk, breakthrough innovations with the potential to create new markets and boost jobs, growth and prosperity in Europe. A total amount of €3 billion was budgeted for the period 2018-2020 to fund the most talented innovators and help their companies scale up and expand beyond European borders.

Access to Risk Finance

Under the "Industrial Leadership" pillar, €1 billion has been provided to SMEs through loans, guarantees and other forms of debt finance particularly for research and innovation driven SMEs through InnovFin SME Guarantee and European Fund for Strategic Investments. Since launching in 2014, this mechanism has increased the portfolio of loans available for SMEs by more than €10 billion (https://ec.europa.eu/programmes/horizon2020/en/area/smes).

97

97

1.5 Horizon 2020 3/3

Innovation in SMEs

Intermediated support to SMEs in the form of tailored services and projects, networking and mobilisation actions for innovation service providers and policymakers and provides direct support to the Enterprise Europe Network which improves SMEs access to funding opportunities. The "Innovation in SMEs" fund also supports "entrepreneurship, internationalism and improved access to markets" through the Competitiveness of Small and Medium-Sized Enterprises (COSME) programme (https://ec.europa.eu/programmes/horizon2020/en/h2020-section/innovation-smes).

The Eureka/Eurostars Joint Programme Initiative helps market-orientated transnational collaborative R&D projects.

98

98

1.5 Horizon Europe

Horizon Europe is the EU's key funding programme for research and innovation with a budget of €95.5 billion. It has been formally approved by the European Parliament on April 27th 2021 and will run until 2027. The programme aims to tackle climate change, help to achieve the UN's Sustainable Development Goals and boost the EU's competitiveness and growth.

The main features of the Horizon Europe programme are (https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en):

- European Innovation Council: Support for innovations with potential breakthrough and disruptive nature with scale-up potential that may be too risky for private investors. This is 70% of the budget earmarked for SMEs.
- Missions: Sets of measures to achieve bold, inspirational and measurable goals within a set timeframe. There are 5 main missions as part of Horizon Europe.
- Open science policy: Mandatory open access to publications and open science principles are applied throughout the programme.
- New approach to partnerships: Objective-driven and more ambitious partnerships with industry in support of EU policy objectives.

99

99

1.5 LIFE Programme

The LIFE programme is the EU's funding instrument for the environment and climate action. Created in 1992, it has co-financed thousands of projects. The new LIFE programme (2021-2024) will cover the following areas:

- Nature and biodiversity
- Circular economy and quality of life
- Climate change mitigation and adaptation
- Clean energy transition

The LIFE programme helps companies (mainly SMEs) bring their green products, technologies, services and processes to the market. These so-called close-to-market projects launch innovative, demonstrative solutions that offer clear environmental and/or climate benefits. The main topics are related to waste management, the circular economy, resource efficiency, water, air or climate change mitigation. These projects also have a high level of technical and business readiness. This means that solutions could be implemented in close-to-market conditions (at industrial or commercial scale) during the course of the project or shortly after its completion.

100

100

1.5 European Funds

European Regional Development Fund

The European Regional Development Fund (ERDF) aims to strengthen economic and social cohesion in the European Union by correcting imbalances between its regions. Particular attention is paid to regions which suffer from severe and permanent natural or demographic handicaps, such as the northernmost regions, which have very low population densities, and island, cross-border and mountain regions. Support for SMEs and the low-carbon economy are two key priority areas and ERDF has funded many SME energy efficiency projects

European funded projects focusing on SMEs and energy

Under Horizon 2020, ERDF, or other EU Funds (such as Interreg and the soon-to-commence LIFE CET programme) several programmes have been or will be funded which focus specifically on energy audits or energy efficiency in SMEs

101

101

1.5 LIST OF EXAMPLARY EU FUNDED PROJECTS

102

102

Integration of non-energy benefits into energy audit practices to accelerate the uptake of recommended measures

1.5 Related projects in industrial sector – The KNOwNEBs project

The LIFE funded **KNOwNEBs** project aims to analyze current energy auditing, targeting especially large energy consuming companies in the framework of the Energy Efficiency Directive (EED) and to promote the acceptance of energy auditing by companies that are not required by the legislation as a competitiveness tool.

The project proposes to develop a new methodology for calculating savings, focusing on non-energy benefits in order to make energy efficiency measures suggested in energy audits more attractive. The goal is to accelerate the adoption of energy audits, promoting their extension to companies that are not required by law.

The project also aims to develop the necessary tools to train technical staff and overcome communication barriers between the different players in the decision making process in companies.

103

web-site: https://www.e-sieben.at/en/projects/22003_knownnebs.php

103

Energy Transition Audits towards Decarbonization

1.5 Related projects in industrial sector – The EnTRAINER project

The main objective of the LIFE funded **EnTRAINER** project is to support energy intensive industries with a holistic approach towards increasing the rate of transformation of energy audits into concrete implemented measures, and to further introduce and exploit the benefits of shifting from conventional energy audits into energy transition audits, with a clear focus on effective decarbonization action plans. This will occur through the introduction of a paradigm shift from conventional energy audits to a new, holistic and complete methodology of “Energy Transition Audits” (ETA).
With this new approach, the main focus is to provide a multi-benefit scheme and a complete action plan towards full decarbonization of the audited sites.

104

web-site: https://entrainer-project.eu/

104

1.5 Related projects in industrial sector – The DEESME 2050 project

Developing Energy Efficiency Projects in SMEs for European 2050 targets

The LIFE funded project **DEESME 2050** builds on the developed DEESME multiple benefits approach to capacitate, assist and motivate companies to overcome the obstacles in energy efficiency measures uptake in the furniture sector and its value chain, mainly in Bulgaria, France, Italy and Poland.

In order to achieve this, DEESME 2050 involves, supports and accompanies companies in the implementation of energy efficiency measures based on their level of readiness. The project also builds capacities of the companies' staff on all working levels and endorses sustainability through the preparation of financing, standardisation and replication in cooperation with associations and policymakers.

web-site: https://ieecp.org/projects/deesme2050/

105

105

1.5 Related projects in industrial sector – The ENSMOV Plus project

Enhancing the Implementation and Monitoring and Verification practices of Energy Saving Policies under Article 7 of the Energy Efficiency Directive

The Horizon 2020 funded **ENSMOV Plus** project has supported public authorities and key stakeholders in 14 Member States represented by its consortium (Austria, Belgium, Bulgaria, Croatia, France, Germany, Greece, Hungary, Italy, Lithuania, Netherlands, Poland, Romania and the UK) and beyond, addressing all 28 Member States and accession countries to monitor, revise, improve and complement the design and implementation of their national energy efficiency policies by developing resources on practical and strategic issues arising from the Article 7 EED. ENSMOV follows on from two other very influential projects that helped shape national policies to address Article 7 requirements of the EED – IEE ENSPOL (www.enspol.eu) and H2020 MULTEE (https://multee.eu/).

web-site: https://ensmov.eu/

106

106

1.5 Related projects in industrial sector – The EU-MERCI project

EU coordinated MEthods and procedures based on Real Cases for the effective implementation of policies and measures supporting energy efficiency in the Industry

The main aim of the Horizon Europe funded **EU-MERCI** project has been to provide industrial enterprises and policy makers with best practices and tools to increase the competitiveness of the EU industry by improving the efficient use of energy.

EU-MERCI has identified good practices of implementation of energy efficiency projects, drawing from the experience of thousands real cases of application of energy efficiency support schemes in Europe, in order to support the effective implementation of the EU Energy Efficiency Directive.

Besides, EU-MERCI has also performed an analysis of the existing energy efficiency support schemes to help policy makers in designing new support schemes or improving the existing ones.

web-site: http://www.eumerci.eu/

107

107

1.5 Related projects in industrial sector – The ICCEE project

Improving Cold Chain Energy Efficiency

The main aim of the Horizon Europe funded **ICCEE** project has been to facilitate the food and beverage sector cold chains to undertake energy efficiency measures after carrying out supply chain energy assessments. The cold chains of this sector has, in fact, a large energy saving potential because of its significant stages (refrigerated transport, processing and storage).

The project has followed a holistic approach, shifting from a single company perspective to the chain assessment, which has led to increased opportunities for energy efficiency measures through expert analytical tools and dedicated stakeholder capacity building programmes.

web-site: https://iccee.eu/

108

108

Taking European EnergyManagers to next efficiency levels by implementing energy audit recommendations

1.5 Related projects in industrial sector – The EUREMnext project

The overarching strategic objective of the **EUREMnext** project is to contribute to both environmental protection and competitiveness in businesses by increasing the quality of energy audits and thereby the rate of implementation of energy efficiency measures.

This has been achieved by providing trainings to increase the availability of qualified and accredited experts with a holistic view both on the technical/engineering and economic/financial aspects.

web-site: https://energymanager.eu/en/euremnext-project/

109

109

Engaging European Start-ups and Young SMEs for Action for Sustainable Energy

1.5 Related projects in industrial sector - The START2ACT project

The mission of the Horizon 2020 funded **START2ACT** project has been to support young SMEs and startups to save energy and cut costs at their workplace. To fulfill this mission, the project has offered free-of-charge mentoring and training activities in nine European countries.
START2ACT has aimed to trigger the use and uptake of the many available tools and solutions offering a great potential for energy and money savings, yet still not adequately used due to lack of understanding of how to use them in practice and due to insufficient engagement of people towards changing behaviour in everyday life.
In addition, START2ACT has aimed to trigger sustainable procurement of office equipment connected to the operation of a company, including the selection and furnishings of premises (HVAC, lighting, etc.), and goods and services.

web-site: https://start2act.eu/

110

110

STEAM UP

STEam And Management Under Pressure

1.5 Related projects in industrial sector – The STEAM UP project

The main aim of the Horizon Europe funded **STEAM UP** project has been to assess the substantial and easy to reach energy-saving potential of steam systems in heavy industries, to support the EU objectives for energy efficiency.

To this end, Steam Up has presented concrete business cases to decision makers, based on 75 detailed audits from several European countries.

web-site: https://www.steam-up.eu/

111

111

EMSPI
Energy Management Standardization in Printing Industry

Energy Management Standardisation in the Printing Industry

1.5 Related projects in industrial sector – The EMPSI project

The main aim of the Horizon Europe funded **EMPSI** project has been to promote actions which increase energy efficiency in European small and medium-sized enterprises in the printing industry by promoting the implementation of an energy management system based on the global standard ISO 50001.

The project has tried to create a “critical mass” or multiplier effect at the industry level in order to further disseminate the developed set of tools and communication materials.

The project has offered a useful opportunity for printers as it helps to identify the ways in which printing companies could lower their energy usage, lowering as a result their carbon footprint and energy bills.

web-site: https://www.egin.nl/4-projects/1-projects%20EMSPI.html

112

112

1.5 Related projects in industrial sector – The GREENFOODS project

The IEE funded project **GREENFOODS** has developed a branch concept and several tools and resources for the European food and beverage SMEs to increase their energy efficiency and promote the use of renewable energy. This has been supported and complemented by energy audits, sector-specific trainings on energy efficiency and renewable energies, and the development of a tailor-made funding and financing system for the food and beverage industry SMEs.

web-site: https://www.aee-intec.at/greenfoods-122

113

113

1.5 Related projects in industrial sector – The EU-MORE project

Accelerating early replacement of old inefficient electric motors in industry and the service sector

The LIFE funded **EU-MORE** project aims to speed up replacement of old, inefficient electric motors in industry and the service sector.

Electric motors tend, in fact, to stay in service for 30 to 40 years, which is much longer than generally assumed, thus, with swift action, this replacement rate could be improved.

In the EU, replacing old motors faster would free up additional energy savings, on top of the savings potential of existing regulations, with all the associated benefits.

web-site: https://eu-more.eu/

114

114

1.5 Related projects not exclusively addressing industrial sector – The M-BENEFITS project

Multiple benefits of energy efficiency

Valuing and Communicating Multiple Benefits of Energy-Efficiency Measures

The main aim of the Horizon Europe funded **M-BENEFITS** project has been at including the Multiple Benefits of energy efficiency in investment decisions of companies and thereby substantially increasing the deployment of cost-effective energy saving potentials. It has contributed to the work programme by delivering best-practice examples, tools and trainings on the importance of Multiple Benefits for investment decisions in companies, thereby addressing all relevant decision-makers.
ones.

web-site: https://www.mbenefits.eu/

115

115

1.5 Related projects not exclusively addressing industrial sector – The EEFIG project

Energy Efficiency Financial Institutions Group

Energy Efficiency Financial Institutions Group

The Energy Efficiency Financial Institution Group ("EEFIG") was established to determine how to overcome the well documented challenges to obtaining long-term financing for energy efficiency.

EEFIG considers that its recommendations for market and policy-led actions should be considered in the context of broader structural reforms needed to improve the competitiveness of the EU economy and ensure the Investment Plan for Europe has a sustained impact on the EU 2030 climate and energy strategy.

web-site: https://valueandrisk.eefig.eu/

116

116

1.5 Related projects not exclusively addressing industrial sector – The SmartSPIN project

Accelerating early replacement of old inefficient electric motors in industry and the service sector

The Horizon 2020 funded **SmartSPIN** project aims at developing a new business model to improve the energy efficiency and flexibility in commercial rented sector. The new business solutions are expected to benefit all parties involved and allow both owners and tenants to profit from the cost, energy efficiency improvements and flexibility services in a more transparent way.
Furthermore, the novel SmartSPIN business model integrates the latest advanced smart energy services concepts and technologies available on the market along with other non-energy services. Combined with advanced measurement and verification concepts for data analytics from smart equipment and a new contractual approach that fairly splits the benefits between all stakeholders, SmartSPIN build trust between the parties and pave the way for a greater uptake of smart energy services in the commercial rented sector.

web-site: https://www.smartspin.eu/

117

117

1.5 Related projects not exclusively addressing industrial sector – The MATRYCS project

Modular Big Data Applications for Holistic Energy Services in Buildings

The Horizon 2020 funded **MATRYCS** project aims to capitalise and combine existing modern technological breakthroughs in the areas of ML/DL and big data, in order to develop a new decision-making and data analytics solution for energy-efficient buildings. MATRYCS will realise a holistic, state-of-the-art AI-empowered framework for decision-support models, data analytics and visualisations for Digital Building Twins and real-life applications. The overall vision of MATRYCS is to define and deploy a Reference Architecture for Buildings Data exchange, management and real-time processing, and to translate this reference architecture into an Open, Cloud-based Data Analytics Toolbox (MATRYCS Modular Toolbox).
Eventually, MATRYCS will enable reliable and effective policymaking, as well as support the creation and exploitation of innovative services through the utilization of a wide variety of data, for the safe and effective operation of buildings.

web-site: https://matrycs.eu/

118

118

PERMANENT

Performance Risk Management for Energy Efficiency Projects Training Sessions

1.5 Related projects not exclusively addressing industrial sector – The PERMANENT project

The IEE funded **PERMANENT** project has introduced two important international protocols for energy efficiency project developers and financiers:

- The International Performance Measurement and Verification Protocol (IPMVP) for "measuring" and reporting energy savings;
- The International Energy Efficiency Financing Protocol (IEEFP) for evaluating the risks and benefits of energy efficiency investments.

web-site: https://www.hep.hr/esco/UserDocsImages/eu-projekti/FLYER.pdf

119

119

AUDIT2MEASURE

Thank you.

For more info, visit our website or contact us:

https://ieecp.org/projects/audit-to-measure/

Michael.tendonkelaar@enviros.cz; Simone.Maggiore@rse-web.it

#AUDIT2MEASURE

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

120

AUDIT2MEASURE

Module 2. Energy policy and energy auditing in partner countries

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Module 2

Introduction

The main aim of the Audit2Measure project is to support companies in the uptake of audits measures necessary to reduce the energy consumption supporting their energy transition.

AUDIT-TO-MEASURE will develop and implement a new engagement strategy (called "Audit2Action") to put into action the opportunities emerging from energy audits

Part of the project is also a capacity building programme including a training for:

- Companies operational staff
- Energy auditors, energy experts and energy managers
- Industry associations and multipliers

2

2

Module 2 – Audit2measure

Programme - Energy policy and energy auditing in partner countries

European energy policy and regulatory framework

- National policies addressing energy audits
  - Czech Republic
  - Germany
  - Greece
  - Italy
  - Netherlands
  - Spain
- Auditing details:
  - Auditing details, scope, compliance and enforcement
- Audit2measure survey
- Details of energy audit legislation in national language

3

3

Module 2

European and national regulatory frameworks which underly national energy audit and ESM obligations.

- **2007** - the European Commission issued its action plan for an Energy policy in Europe which targeted 20% reduction in greenhouse gas emissions by 2020
- **2012** -The European Union adopted the first Energy Efficiency Directive (EED) to set a series of measures supporting the EU's goal of saving 20% primary energy by 2020.
  - Article 8 of the EED set the first energy audit obligation for enterprises and defined compliance criteria for energy audits & auditors drawing on European and international standards such as EN 16247 & ISO 50001.
- **2018** - the European Commission elaborated the "Clean energy for all Europeans" package, adopted in 2019, overhauling the EU's former energy policy framework and set a new energy efficiency target of 32.5% reduction in primary energy consumption by 2030
- **2021** - the European Commission released a Proposal for a recast energy efficiency directive as part of the package Delivering on the European Green Deal. The ambitious proposal raises targets to 39% primary energy reduction and 55% GHG emissions reduction by 2030
- **In September 2023** The new, recast Energy Efficiency Directive (EU) 2023/1791, was published in the EU Official Journal. After its entry into force, EU Member States will have two years to transpose most of the different elements in the directive into national law. [1]

1. *see presentations module 1*

4

4

Module 2

National policies addressing energy audits – overview

National audit obligations have come into effect between 2015 and 2019 in most of the countries, although they have already existed in the Czech Republic since 2000 and the Netherlands since 2008.

	CZ	DE	GR	IT	NL	ES
ENERGY AUDIT OBLIGATION SINCE	2000	2015	2015	2015	2008	2016
CRITERIA FOR AUDIT OBLIGATION FOR NON-SMES (MWH/A)	>200	>500	ALL	>581.5	> 50	ALL
CRITERIA FOR AUDIT OBLIGATION FOR SMES (MWH/A)	>5,000	-	-	>1,000	-	-
FREQUENCY OF MANDATORY AUDITS (YEARS)	4 (10)	4	4	4	4	4

5

5

Module 2

National energy audit obligations – I

Czech Republic
In 2000 first introduced an energy audit obligation for companies with a certain minimum energy consumption. Currently energy audits are mandatory for all non-SMEs and SMEs with an annual energy consumption of > 5,000 MWh.

Germany
In 2019, the federal office for economic affairs and export control (BAFA) updated the audit regulations, which now required a more in-depth energy analysis, a more detailed evaluation of the measured consumption data and more detailed documentation of the data.

Greece
Into Greek law, non-SME (large) enterprises are required to conduct energy audits every four years. The mandatory energy audits were first implemented in 2018. In 2021, Law was introduced to transpose the amended EED into Greek law.

6

6

Module 2

National energy audit obligations – II

Italy
On the legislative level, Italy has introduced a decree for the implementation of EU legislative standards on energy efficiency in 2014.

Netherlands
Audit obligation for large enterprises was introduced in 2008. In 2015 an information requirement was added that regulated that, all enterprises with an energy consumption of more than 50 MWh/a or 25,000 m^3 natural gas equivalent had to provide insights on their energy use.
In 2019, the Dutch Energy Use Reduction Requirement was introduced in alignment with the EED. Enterprises that consume more than 50 MWh of electricity or 25,000 m3 of natural gas per year must implement all energy-saving measures with a positive return on investment within five years and report on the measures they have taken.

Spain
In Spain the Real Decreto 56/2016 introduced mandatory audits for non-SMEs. Since then, there have been some changes due to RD 390/2021 of 1st June. There has been a modification of the template with the required audit information that must be reported to the ministry.

7

7

Module 2

NATIONAL AUDIT AND ESM REQUIREMENTS – audit categories

Most surveyed countries do not distinguish between different types of energy audits. Only a complete audit in accordance with the European standard EN 16247 (see 4.1. European and international standards) ensures compliance.

Only, Greece and the Czech Republic both distinguish between 3 energy audit categories that all comply with EN 16247 and suffice to comply with national audit obligation policies.

Greece - three categories of energy audits that apply to different types of buildings and industries:

- **Category A** covers residential and office buildings, as well as retail shops with an area of up to 2,000 m^2;
- **Category B** applies to office, commercial, and other tertiary sector buildings with an area of more than 2,000 m^2, industrial facilities with a total power of up to 1,000 kW or less, and transportation (vehicles);
- **Category C** pertains to industrial installations with a total installed power of more than 1,000 kW. The categorisation is based on the total final consumption and the size of the production facility or building.

8

8

Module 2

NATIONAL AUDIT AND ESM REQUIREMENTS – audit categories

Only, Greece and the Czech Republic both distinguish between 3 energy audit categories that all comply with EN 16247 and suffice to comply with national audit obligation policies.

Czech Republic - Decree No. 140/2021 Coll. (on energy audits) allows for 3 types of energy audits in accordance with international standards:

- **Type 1** applies for smaller enterprises that seek to fulfill the legislative requirement. The outputs are information on the energy consumption of the site, the identification and basic evaluation of low-cost and simple to implement ESM.
- **Type 2** is aimed at enterprises having a basic understanding of their energy consumption through energy bills and monthly measurements to fulfill the legislative requirements and improve their energy savings. The outputs are a detailed understanding of the energy consumption and the identification of ESM.
- **Type 3** addresses enterprises with a detailed understanding of their energy use. The consumption is analysed frequently using specific energy performance indicators, focused sub metering and regular monitoring of variables. The aim is to fulfill legislative requirement and requesting subsidies for the implementation of high-cost ESM.

9

9

Module 2

NATIONAL AUDIT AND ESM REQUIREMENTS – Auditing scopes

Only energy directly consumed by the enterprise within national borders is considered in mandatory audits.

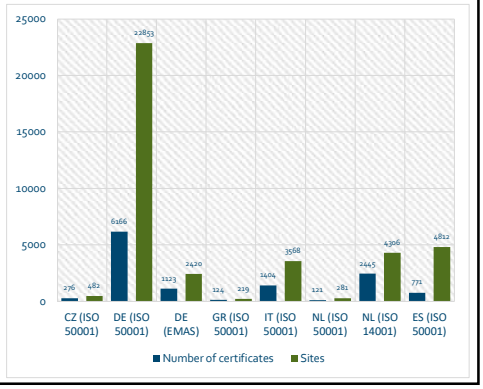
Temporary and third-party sites - In most countries energy consumption that occurs on temporary sites where operations are only carried out for a limited period of time (e.g. less than 6 months in Germany) or on sites that are leased to third parties are not accounted in energy audits. In Germany, energy consumption in the home office is also excluded from the energy audit.

Transportation and transport facilities - The surveyed countries take different approaches regarding energy consumption from transportation and transport facilities such as delivery or transfer points, bus stops, regulating or filling stations

Exemptions from the audit obligation

- In the Czech Republic, intelligence and defence sectors are exempt, while public and municipal enterprises and enterprises with predominantly sovereign activities are exempt in Germany. Similarly, in Italy, all public administration is exempted. Greece excludes foreign enterprises as well as joint ventures.
- ISO50001 certified energy management system exempts enterprises from the audit obligation in all surveyed countries. Only in Germany enterprises with an EMAS certified EMS and in the Netherlands with an ISO 14001 certified EMS are additionally exempted from the audit obligation.

The number of ISO 50001 certified management systems in 2021 in all of the surveyed countries.



10

Module 2

NATIONAL AUDIT AND ESM REQUIREMENTS

ESM implementation obligations - Germany, Italy and the Netherlands have developed an obligation to implement ESM following a mandatory energy audit.

Criteria and target groups for this obligation vary between the three countries. In the remaining countries there are no similar obligations to implement ESM after an obligatory audit.

	CZ	DE	GR	IT	NL	ES
ESM IMPLEMENTATION OBLIGATION SINCE	-	2022	-	2020	2019	-
CRITERIA FOR ESM IMPLEMENTATION OBLIGATION (MWH/A)	-	>10,000	-	>1,000	>10,000	-
SELECTION CRITERIA FOR MANDATORY ESM IMPLEMENTATION	-	NPV >0 IN 3 YEARS	-	1 ESM	ROI >0 IN 5 YEARS	-
PERIOD FOR MANDATORY ESM OBLIGATION (YEARS)	-	1.5	-	4	4	-

Incentives for non-mandatory audits and ESM implementation

One strategy to promote non-mandatory audits and ESM implementation in enterprises that do not fall under the national audit obligations is public funding.

In most countries analysed there exists some sort of public funding for either non-mandatory audits or ESM implementation.

Two exceptions are the Czech Republic and Italy, where there is no financial support for non-mandatory audits, whereas support is provided for the implementation of energy management systems.

11

11

Module 2

AUDIT PROCESS AND REPORTING

European and international standards

EN 16247-1 - in 2012 published by the European Committee for Standardization (CEN) and It is the first international standard providing general requirements on how to carry out energy audits.

ISO 50002 - in 2014 the International Standard Organisation published its own energy audit standard

EN 16247-1 update - also adds a new chapter enabling sampling procedures in the case where comprehensive data collection over the scope and timeframe of the energy audit is not possible

AUDIT PROCESS ACCORDING TO EN 16247-1

- Initial contact
- Kick-off meeting
- Data collection
- Field work
- Analysis
- Report
- Final meeting

AUDIT REPORT ACCORDING TO EN 16247-1

- Summary
- Background
- Energy audit
- Opportunities to improve energy efficiency
- Conclusions

All surveyed countries have developed national standards, guidance and templates for the implementation and reporting of energy audits. These guidance documents all draw on the European standard EN 16427-1 translated by the respective national standardisation organisations.

12

12

Module 2

AUDIT PROCESS AND REPORTING

Assessment of energy saving measures - Requirements vary among countries.

EN 16247-1 prescribes the estimation of investment costs, energy and CO_2 savings, and an economic viability assessment using net present value.

The standard leaves room to define other financial and non-financial impact indicators to assess and prioritise recommended ESMs.

Table: Obligatory (O) and recommended (R) economic impact indicators in mandatory energy audits by country

	CZ	GR	DE	IT	NL	ES
SIMPLE PAYBACK PERIOD (SPP)	O	O		O		O
RETURN ON INVESTMENT (ROI)					O	
INTERNAL RATE OF RETURN (IRR)	O		O	O		R
NET PRESENT VALUE (NPV)	O		O	O		R
NET PRESENT VALUE ON INVESTMENT RATIO (NPV/I)				O		
LIFE CYCLE COST ANALYSIS (LCCA)		O				

Procedures for multi-site enterprises and groups

Determination of the energy consumption

– An enterprise is comprising of several sites – energy consumption of all its individual sites is summed up.

- Groups of enterprises majority-owned by a single corporation (legally and financially linked) - In this case, audit obligations apply to the smallest legally and financially independent entity.

Clustering and sampling approaches for multi-site enterprises - allowed to simplify the auditing of enterprises or corporations with a very large number of distinct sites. The auditor identifies and clusters similar sites based on suitable comparison criteria. Only a representative no. of sites within a cluster needs to undergo complete analysis.

13

13

Module 2

COMPLIANCE, QUALITY CONTROL AND ENFORCEMENT – I

- In most surveyed countries, a national agency or a ministry is in charge of setting up and carrying out the monitoring and enforcement to control the execution and, in some cases, the quality of mandatory audits.
- In all surveyed countries, obligated enterprises must report energy audit results to the institutions in charge of controlling. In some cases, the task of transmitting audit results is delegated to the energy auditor.
- In all surveyed countries, financial penalties apply to obligated enterprises which do not execute an energy audit. The amount of the fines however varies significantly among countries and depending on the circumstances. Some countries also have fines for non-compliance, such as flawed execution of the audit or delayed submission of the report.
- Germany, Italy and the Netherlands have developed requirements for the implementation of ESM following a mandatory energy audit ; however, dedicated control and enforcement measures are largely missing.
- EN 16247-1 and ISO 50002 provide general quality requirements regarding the competences of energy auditors as well as their attitude towards the mandating enterprise.
- In all surveyed countries except the Netherlands, some national requirements for energy specialists apply in order be able to execute energy audits as per national and European standards.

14

14

Module 2

COMPLIANCE, QUALITY CONTROL AND ENFORCEMENT – II

- The Czech Republic, Germany, Greece and Italy maintain official registries of accredited auditing entities – both for auditors and energy management enterprises.
- The Netherlands do not have an official and comprehensive registry; their national agency RVO provides guidance and lists the contact details of energy experts and enterprises which are deemed competent.
- In the Czech Republic, Germany, Italy and Spain, energy experts and enterprises are organized through trade associations.

	CZ	DE	GR	IT	NL	ES
NATIONAL REGISTRIES OR CONTACT LISTS	ENEX	BAFA	MEE	ACCREDIA	RVO	-
NUMBER OF REGISTERED AUDITORS (STATUS 2022)	526	5,300	1,466	1,600	1,500	-
NUMBER OF REGISTERED ESCOS (STATUS 2022)	10	-	18	900	-	-
SELF-ORGANISATION OF AUDITORS	AEM / AEA	DEN E.V. / GIH	-	ASSOEGE	-	-
SELF-ORGANISATION OF ESCOS	APES	-	-	ASSOESCO	-	AMI / ANESE

15

15

Module 2

IMPACT OF NATIONAL AUDIT POLICIES

- **The European EED sets reporting requirements for Member States on the implementation of their national energy efficiency and climate targets. Until 2020, countries had to update their National Energy Efficiency Action Plans (NEEAPs) every three years and report their progress annually. For the 2021 to 2030 period, countries must report on the progress on their National Energy and Climate Plans (NECPs) every two years.**
- The German national evaluation indicated that BAFA[2] assumed approximately 61,000 enterprises fell under the audit obligation in 2015. In 2023, the BAFA database contained in-formation from 23,857 obligated enterprises transmitted between December 2019 to February 2023 (almost 4 years).
- In Italy, over the four-year period between 2015 and 2019, ENEA[3] counted 16,105 audits carried out by 8,871 obligated enterprises. Complete data for the following period (2019 to 2022) is not fully available yet.

2. In Germany, the Federal Office of Economics and Export Control (BAFA) developed a guideline for the preparation of energy audit reports in accordance with the requirements of the German Energy Services Act (EDL-G) and the DIN EN 16247-1. It supports energy experts and obligated enterprises in the implementation and documentation of audits and set content and quality requirements for the audit report.

3. In Italy, the National Energy Agency (ENEA) provides both general and sector-specific guidelines for the audit report, the monitoring plan and site clustering

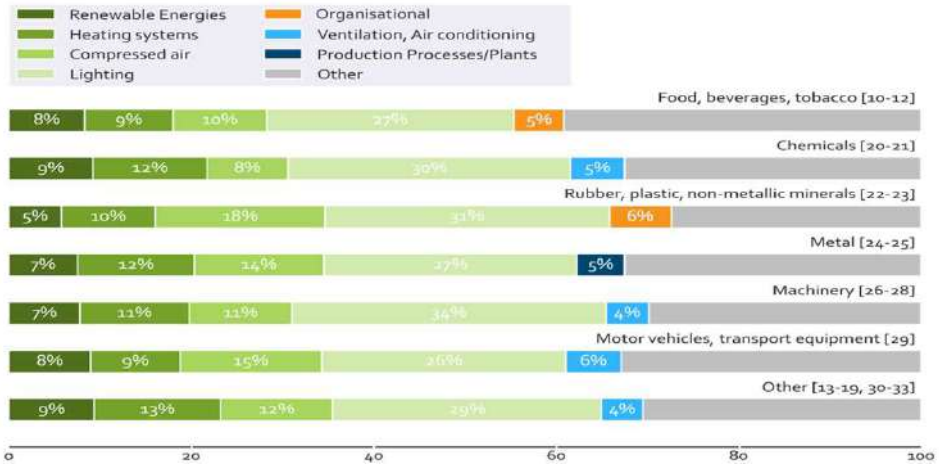
16

16

Module 2

IMPACT OF NATIONAL AUDIT POLICIES – II

Most recommended ESM in mandatory audits by manufacturing sector in Germany between 2019 and 2022:



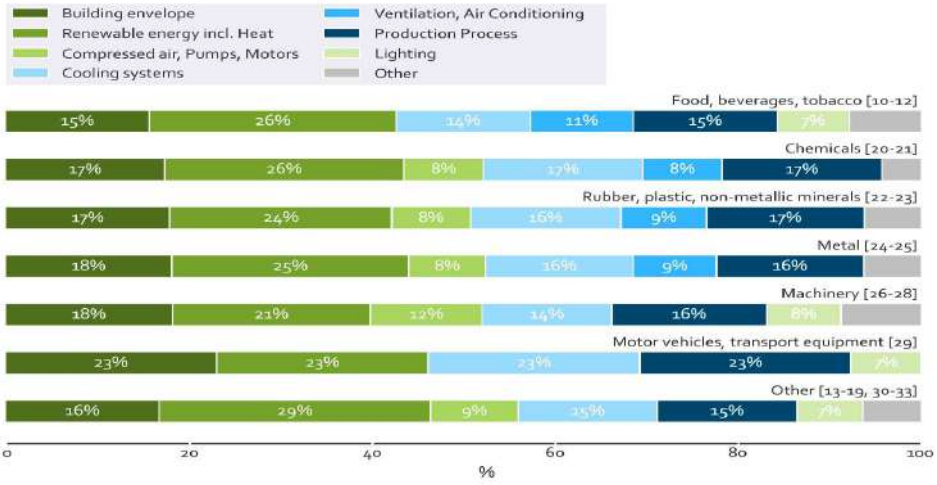
17

17

Module 2

IMPACT OF NATIONAL AUDIT POLICIES – III

Most implemented ESM after mandatory audits by manufacturing sector in Germany in 2021:



18

18

Module 2

IMPACT OF NATIONAL AUDIT POLICIES – IV

Implementation of recommended ESM after mandatory audits

- In Germany's 2017 evaluation, most measures were implemented in the area of lighting, followed by heating systems, ventilation and air conditioning, as well as user behavior. In Italy, in 2021, the most implemented measures were predominantly in the area of lighting as well.

According to the evaluation report of Germany's mandatory audit system, main cited reasons for not implementing energy saving measures in 2017, were:

GERMANY:
- Wait for the appropriate time;
- Other investment priorities;
- Measures are not economically feasible;
- Investments are too high.

ITALY:
- Economic barriers: financial risks and too long payback time;
- Regulatory barriers: legislations on energy efficiency are constantly evolving;
- Informational barriers: lack of knowledge and awareness about energy efficiency.

19

19

Module 2

KEY FINDINGS OF THE ESURVEY – I

- **All surveyed countries have implemented the audit obligation in their policy frameworks in accordance with the EED.** However, the target groups vary significantly among surveyed countries. Although EED currently targets large enterprises, most countries have progressively introduced energy-intensiveness thresholds for the application of the audit obligation.
- **Half of the countries surveyed (Germany, Italy and the Netherlands) have set ESM implementation obligations in addition to audit obligations for energy-intensive enterprises**
- **Audit process and reporting methodologies do not vary significantly among surveyed countries,** as they mostly rely on the guidelines of EN 16247. Most countries provide additional guidance documents and templates for reporting and data submission to the relevant entities, except in Spain where regional governments are in charge of providing guidance to enterprises.
- **National requirements and guidelines** for the assessment and prioritisation of ESM vary significantly among surveyed countries.
- **The European EED sets reporting requirements for Member States** on the implementation of their national energy efficiency and climate targets. To date however, only Germany and Italy have carried out national evaluations.

20

20

Module 2

KEY FINDINGS OF THE ESURVEY – II

	CZ	DE	GR	IT	NL	ES
ENERGY AUDIT OBLIGATION SINCE	2000	2015	2015	2015	2008	2016
CRITERIA FOR AUDIT OBLIGATION FOR NON-SMES (MWH/A)	>200	>500	ALL	>581.5	> 50	ALL
CRITERIA FOR AUDIT OBLIGATION FOR SMES (MWH/A)	>5,000	-	-	>1,000	-	-
FREQUENCY OF MANDATORY AUDITS (YEARS)	4 (10)	4	4	4	4	4
MANDATORY ECONOMIC CRITERIA FOR ESM RECOMMENDATIONS	IRR, NPV	IRR, NPV	LCCA	IRR, NPV	ROI	SPP
EXEMPTION THROUGH CERTIFIED ENERGY MANAGEMENT SYSTEMS	ISO	ISO, EMAS	ISO	ISO	ISO	ISO
ESM IMPLEMENTATION OBLIGATION SINCE	-	2022	-	2020	2019	-
OBLIGATION CRITERIA FOR ESM IMPLEMENTATION (MWH/A)	-	>10,000	-	>1,000	>10,000	-
SELECTION CRITERIA FOR MANDATORY ESM IMPLEMENTATION	-	NPV >0 IN 3 YEARS	-	1 ESM	ROI >0 IN 5 YEARS	-
PERIOD FOR MANDATORY ESM IMPLEMENTATION (YEARS)	-	1.5	-	4	4	-

21

21

Module 2

DETAILS OF NATIONAL ENERGY AUDIT LEGISLATION

- ***Details of energy audit legislation in national language to be added***
- Czech Republic
- Germany
- Greece
- Italy
- Netherlands
- Spain

22

22

National factsheets

CZECH REPUBLIC – I

AUDIT OBLIGATION		
IF YES, SINCE? / IF NO, PLANNED FOR?	NAME OF RELEVANT POLICIES	MANDATORY AUDIT FREQUENCY
2000	DECREE 140/2021 COLL	4 YEARS
TARGET GROUP		NUMBER OF OBLIGATED ENTERPRISES (IN 2019)
NON-SMES WITH AN ANNUAL ENERGY CONSUMPTION ABOVE 500 MWH.		N/A
EXEMPTED SECTORS OF ACTIVITY		EXEMPTION THROUGH EMS (WHICH STANDARDS)
ENTERPRISES INVOLVED IN INTELLIGENCE SERVICES, STATES DEFENCE AND CLASSIFIED INFORMATION.		YES, IF ENERGY MANAGEMENT IS ISO50001 CERTIFIED.
AUDIT SCOPE AND BOUNDARIES		
ONLY ENERGY DIRECTLY CONSUMED BY THE ENTERPRISE, WITHIN NATIONAL BORDERS. TEMPORARY, LEASED OR THIRD-PARTY FACILITIES AND VEHICLES ARE EXCLUDED.		
PROCESS AND REPORTING		
APPLICABLE STANDARDS	NATIONAL GUIDANCE, TEMPLATES	POSSIBLE SIMPLIFICATIONS
DIN EN 16247 / ISO 50002	YES	3 TYPES OF ENERGY AUDITS DEPENDING ON SIZE AND COMPLEXITY OF THE SITE

23

23

National factsheets

CZECH REPUBLIC – II

QUALITY AND COMPLIANCE		
RELEVANT AUTHORITY	DATA COLLECTION METHOD	DATA COLLECTION FREQUENCY
STATE ENERGY INSPECTION (SEI), OVERSEEN BY THE MINISTRY OF INDUSTRY AND TRADE	ENEX E-FORM	EVERY TWO YEARS
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
SAMPLE CHECKS		YES, UP TO 210,000 EUR
EXISTENCE OF A NATIONAL EVALUATION OF THE AUDIT POLICY FRAMEWORK (PLEASE LINK IF AVAILABLE)		
NO		
AUDITORS		
ACCREDITATION / REQUIREMENTS	NATIONAL REGISTRY / DATABASE	TRADE ORGANISATIONS
YES, ACCREDITED BY THE MINISTRY OF INDUSTRY AND TRADE	ENEX ONLINE REGISTRY	AEM, AEA
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
NO, ONLY CONTROL OF AUDITOR ACCREDITATION		NO
OBLIGATION TO IMPLEMENT ENERGY SAVING MEASURES (ESM)		
IF YES, SINCE? / IF NO, PLANNED FOR?	NAME OF RELEVANT POLICIES	IMPLEMENTATION TIME WINDOW
NO, NOT PLANNED		

24

24

National factsheets

GERMANY – I

AUDIT OBLIGATION		
IF YES, SINCE? / IF NO, PLANNED FOR?	NAME OF RELEVANT POLICIES	MANDATORY AUDIT FREQUENCY
2015	EDL-G	4 YEARS (10 IN SOME CASES)
TARGET GROUP		NUMBER OF OBLIGATED ENTERPRISES (IN 2019)
NON-SMES ABOVE 200 MWH/A AND SMES ABOVE 5,000 MWH/A		N/A
EXEMPTED SECTORS OF ACTIVITY		EXEMPTION THROUGH EMS (WHICH STANDARDS?)
PUBLIC ENTERPRISES AND ENTERPRISES PREDOMINANTLY ENGAGED IN SOVEREIGN ACTIVITIES.		YES, IF AT LEAST 90% OF THE ENERGY CONSUMPTION IF COVERED BY AN EMAS OR ISO50001 CERTIFICATION.
AUDIT SCOPE AND BOUNDARIES		
ONLY ENERGY DIRECTLY CONSUMED BY THE ENTERPRISE, WITHIN NATIONAL BORDERS. TEMPORARY, LEASED OR THIRD-PARTY FACILITIES AND VEHICLES ARE EXCLUDED.		
PROCESS AND REPORTING		
APPLICABLE STANDARDS	NATIONAL GUIDANCE, TEMPLATES	POSSIBLE SIMPLIFICATIONS
DIN EN 16247	YES, PROVIDED BY BAFA	MULTI-SITE AUDITS ALLOWING A CLUSTERING BY TYPOLOGY AND SAMPLE ASSESSMENTS

25

25

National factsheets

GERMANY – II

QUALITY AND COMPLIANCE		
RELEVANT AUTHORITY	DATA COLLECTION METHOD	DATA COLLECTION FREQUENCY
BAFA	DATA SUBMISSION TEMPLATE	YEARLY
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
SAMPLE CHECKS		YES, UP TO 50000EUR
EXISTENCE OF A NATIONAL EVALUATION OF THE AUDIT POLICY FRAMEWORK (PLEASE LINK IF AVAILABLE)		
NATIONAL EVALUATION IN 2017		
AUDITORS		
ACCREDITATION / REQUIREMENTS	NATIONAL REGISTRY / DATABASE	TRADE ORGANISATIONS
YES, EDL-G REQUIREMENTS AND ACCREDITATION BY BAFA.	BAFA ONLINE REGISTRY	DEN E.V., GIH
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
BAFA ACCREDITATION AND FURTHER TRAINING OBLIGATION.		NO
OBLIGATION TO IMPLEMENT ENERGY SAVING MEASURES (ESM)		
IF YES, SINCE? / IF NO, PLANNED FOR?	NAME OF RELEVANT POLICIES	IMPLEMENTATION TIME WINDOW
2022 TO 2024	ENSIMIMAV	WITHIN 18 MONTHS AFTER AUDIT.
TARGET GROUP		ESM SELECTION CRITERIA
NON-SMES WITH AN ANNUAL ENERGY CONSUMPTION ABOVE 10 GWH.		ALL ECONOMICALLY VIABLE ESM (NPV POSITIVE WITHIN LESS THAN 20% OF USE LIFE, WITH 15 YEARS MAXIMUM USE LIFE.
ESM IMPLEMENTATION CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
THROUGH NEXT ENERGY AUDIT		NO

26

26

National factsheets

GREECE – I

If yes, since? / If no, planned for?	Name of relevant policies	Mandatory audit frequency
2015	Law 4342/2015 (Art. 10 & 17) Law 4843/2021 (Art. 9)	4 years

Target group	Number of obligated enterprises (in 2019)
Non-SMEs	N/A

Exempted sectors of activity	Exemption through EMS (which standards?)
Branches of foreign enterprises that are not identified as a legal entity, joint ventures.	Yes, if energy management is ISO50001 certified.

Audit scope and boundaries
Only energy directly consumed by the enterprise, within national borders. Temporary, leased or third-party facilities are excluded.

Process and reporting		
Applicable standards	**National guidance, templates**	**Possible simplifications**
DIN EN 16247 / ISO50000	Yes, guideline for Contents of the Energy Audit Results Report	multi-site audits, and three categories of audits depending on size and complexity of the site

27

27

National factsheets

GREECE – II

Quality and compliance		
Relevant Authority	**Data collection method**	**Data collection frequency**
Energy Inspection Departments of the Ministry of Environment and Energy	Online submission to the Ministry's database	N/A

Quality control	Fines (please indicate maximum amount)
Sample checks representing 5% of total audits	Yes, up to 100,000EUR

Existence of a national evaluation of the audit policy framework (please link if available)
N/A

Auditors		
Accreditation / requirements	**National registry / Database**	**Trade organisations**
Yes, according to Decree 99/2018 (Art. 187)	Yes, Registry of Energy Auditors	N/A

Quality control	Fines (please indicate maximum amount)
Energy Inspection Departments of the Inspection Bodies of Northern and Southern Greece	Yes, up to 10,000 EUR

Obligation to implement energy saving measures (ESM)		
If yes, since? / If no, planned for?	**Name of relevant policies**	**Implementation time window**
No, not planned		

28

28

National factsheets

ITALY – I

Audit obligation		
If yes, since? / If no, planned for?	**Name of relevant policies**	**Mandatory audit frequency**
2015	Italian Legislative Decree n. 73/2020	4 years
Target group		**Number of obligated enterprises** (in 2019)
Non-SMEs above 50 toe/a (581.5 MWh/a) and SMEs above 1 GWh/a		Approx. 6,434
Exempted sectors of activity		**Exemption through EMS** (which standards?)
No		Yes, if energy management is ISO50001 certified.
Audit scope and boundaries		
Only energy directly consumed by the enterprise, within national borders. Temporary, leased or third-party facilities and vehicles are excluded.		
Process and reporting		
Applicable standards	**National guidance, templates**	**Possible simplifications**
DIN EN 16247 / ISO 50002	Yes, ENEA guidelines	Multi-site audits allowing a clustering by typology and sample assessments

29

29

National factsheets

ITALY – II

QUALITY AND COMPLIANCE		
RELEVANT AUTHORITY	DATA COLLECTION METHOD	DATA COLLECTION FREQUENCY
NATIONAL AGENCY FOR NEW TECHNOLOGIES, ENERGY AND SUSTAINABLE ECONOMIC DEVELOPMENT (ENEA), SUPERVISED BY THE MINISTRY OF ECONOMIC DEVELOPMENT.	SEND ENERGY AUDIT REPORTS TO ENEA	YEARLY
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
SAMPLE CHECKS (3% OF OBLIGATED ENTERPRISES)		YES, UP TO 40,000 EUR
EXISTENCE OF A NATIONAL EVALUATION OF THE AUDIT POLICY FRAMEWORK (PLEASE LINK IF AVAILABLE)		
ANNUAL EVALUATION CARRIED OUT BY ENEA		
AUDITORS		
ACCREDITATION / REQUIREMENTS	NATIONAL REGISTRY / DATABASE	TRADE ORGANISATIONS
YES, CERTIFICATION	ACCREDIA	ASSOEGE, ASSOESCO
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
YES, AUDITORS MUST PROVIDE INFORMATION ON YEARLY PROGRESS, ESCO CERTIFICATE RENEWAL EVERY 4 YEARS.		NO
OBLIGATION TO IMPLEMENT ENERGY SAVING MEASURES (ESM)		
IF YES, SINCE? / IF NO, PLANNED FOR?	NAME OF RELEVANT POLICIES	IMPLEMENTATION TIME WINDOW
2020	DECREE 73/2020	4 YEARS
TARGET GROUP		ESM SELECTION CRITERIA
ENTERPRISES ABOVE 1 GWH		AT LEAST ONE RECOMMENDED ESM
ESM IMPLEMENTATION CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
NO, SELF-CONTROL		NO

30

30

National factsheets

NETHERLANDS – I

Audit obligation		
If yes, since? / If no, planned for?	**Name of relevant policies**	**Mandatory audit frequency**
2019	**Energiebesparingsplicht**	4 years
Target group		**Number of obligated enterprises** (in 2019)
Non-SMEs above 50 MWh/a		N/A
Exempted sectors of activity		**Exemption through EMS** (which standards?)
EU ETS & ISO certified enterprises are exempt		Yes, if energy management is ISO50001 certified.
Audit scope and boundaries		
Only energy directly consumed by the enterprise, within national borders. Temporary, leased or third-party facilities and vehicles are excluded.		
Process and reporting		
Applicable standards	**National guidance, templates**	**Possible simplifications**
DIN EN 16247	Yes, **RVO GUIDELINES**	multi-site audits allowing a clustering by typology and sample assessments

31

31

National factsheets

NETHERLANDS – II

Quality and compliance		
Relevant Authority	**Data collection method**	**Data collection frequency**
Netherlands Enterprise Agency (RVO)	Mandatory submission of audit reports	yearly
Quality control		**Fines** (please indicate maximum amount)
All submitted audit reports are controlled		Yes, depends on the offence
Existence of a national evaluation of the audit policy framework (please link if available)		
No		
Auditors		
Accreditation / requirements	**National registry / Database**	**Trade organisations**
No, unregulated	RVO contact list	
Quality control		**Fines** (please indicate maximum amount)
Indirectly: RVO controls all audit reports		Yes, depends on the offence
Obligation to implement energy saving measures (ESM)		
If yes, since? / If no, planned for?	**Name of relevant policies**	**Implementation time window**
2019	**Energiebesparingsplicht**	4 years
Target group		**ESM selection criteria**
Enterprises above 10 GWh/a		All ESM with ROI > 0 within 5 years
ESM implementation control		**Fines** (please indicate maximum amount)
No, self-control		Yes, depends on the offence

32

32

National factsheets

SPAIN – I

Audit obligation		
If yes, since? / If no, planned for?	Name of relevant policies	Mandatory audit frequency
2019	**Real Decreto 56/2016, Real Decreto 390/2021**	4 years
Target group		**Number of obligated enterprises** (in 2019)
Non-SMEs		N/A
Exempted sectors of activity		**Exemption through EMS** (which standards?)
None		Yes, if energy management is ISO50001 certified.
Audit scope and boundaries		
Energy directly consumed by the enterprise, within national borders. Regional differences may occur.		
Process and reporting		
Applicable standards	**National guidance, templates**	**Possible simplifications**
DIN EN 16247	Yes, Real Decreto 390/2021 Annex I	No, audit or ESM must cover at least 85% of energy consumption

33

33

National factsheets

SPAIN – II

QUALITY AND COMPLIANCE		
RELEVANT AUTHORITY	DATA COLLECTION METHOD	DATA COLLECTION FREQUENCY
REGIONAL GOVERNMENTS	SUBMISSION TO REGIONAL GOVERNMENT	YEARLY
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
CONTROLS DEPEND ON REGIONAL GOVERNMENTS		YES, UP TO 60,000 EUR
EXISTENCE OF A NATIONAL EVALUATION OF THE AUDIT POLICY FRAMEWORK (PLEASE LINK IF AVAILABLE)		
UPCOMING IN 2023		
AUDITORS		
ACCREDITATION / REQUIREMENTS	NATIONAL REGISTRY / DATABASE	TRADE ORGANISATIONS
YES, ACCORDING TO RD 56/2016	NO, REGIONAL REGISTRIES MAY EXIST	AMI/ANESE
QUALITY CONTROL		FINES (PLEASE INDICATE MAXIMUM AMOUNT)
NO		NO
OBLIGATION TO IMPLEMENT ENERGY SAVING MEASURES (ESM)		
IF YES, SINCE? / IF NO, PLANNED FOR?	NAME OF RELEVANT POLICIES	IMPLEMENTATION TIME WINDOW
NOT PLANNED		

34

34

AUDIT2MEASURE

Thank you.

For more info, visit our website or contact us:

https://ieecp.org/projects/audit-to-measure/

Michael.tendonkelaar@enviros.cz

#AUDIT2MEASURE

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

35

AUDIT2MEASURE

Module 3. Implementation of Energy Efficiency Measures (EEM) defined in the energy audits

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Module 3

Contents

This module provides information on the different factors influencing the implementation of Energy Efficiency Measures (EEMs) in the company.

The audience will benefit to understand the different potential motivations, barriers mitigation and the main roles to implement the EEMs.

2

2

Module 3

Contents

The four submodules included in this module are:

- 3.1 Motivation of industrial companies' staff
- 3.2 Roles and responsibilities of energy audit stakeholders to successfully implement EEMs
- 3.3 Mitigation of perceived risks and barriers' removing
- 3.4 Implementation plan for EEMs identified in the energy audit

3

3

3.1 Motivation of industrial companies' staff

4

4

3.1 Motivation of industrial companies' staff

Objective and content

The objective of this submodule is to explain the most common motivations that encourage the companies to implement EEMs.

The main factors are:

- Financial aid
- Need of replacement of equipment
- Company's policies and plans
- Replication of the measure
- Rapidly increasing energy prices

5

5

3.1 Motivation of industrial companies' staff

The main factors

Financial aid	• Are usually a facilitator for EEMs, as obtaining this incentive might lead to the decision of investing in the company due to pay-back reduction
Need of replacement of equipment	• Detecting the equipment or systems causing frequent or final failure, or too high operating/maintenance costs can be a cause to replace it by a more energy efficient system.
Company's policies and plans	• Company policies and plans might have energy efficiency or renewable targets which are not currently covered by their investment plans.
Replication of the measure	• Usually, companies with similar systems have similar problems or incidences.
Rapidly increasing energy prices	• High energy prices shorten payback periods making the measures more attractive

6

6

3.1 Motivation of industrial companies' staff

Financial aid

There are different types of funding available:

- Grants: sums of capital that usually do not have to be repaid but are to be used for defined purposes. They are provided by international/European organisations, for example the NextGenerationEU funds (more information on module 6).

Source: NextGenerationEU

- Subsidies: direct contributions to offset operating costs over lengthy time periods.it can be managed by national or regional authorities
- Loans: private entities/financial institutions can contribute to pay for the initial investment in exchange for a return with some interest

7

7

3.1 Motivation of industrial companies' staff

Grants and subsidies

Grants and subsidies are used in environmentally-friendly technologies, roll out greener vehicles and public transport, and make our buildings and public spaces more energy efficient, etc.

If the financial aid comes from the EU budget, there are three ways of managing it:

- Direct management by the European Commission (EC)
- Shared management by the EC and national authorities
- Indirect management by partner organisations or other public authorities

Some examples are:

- LIFE, Horizon programmes
- Innovation, NextGenerationEU funds
- IDAE, FENERCOM, EREN (from Spain)

8

8

3.1 Motivation of industrial companies' staff

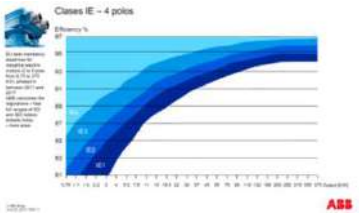
Need of replacement of equipment

The end of its lifetime can either be due to technical or economic reasons.

Once a system fails or has high maintenance due to frequent failures, there is an opportunity to substitute it by a more efficient one. Or if operation costs are too high so a new system is more cost efficient.

For example:

- An old E1 motor can be substituted by an E4 motor.



Source: ABB

9

9

3.1 Motivation of industrial companies' staff

Need of replacement due to failure

Another example:

The replacement of luminaires once they stop working.

From incandescent or fluorescent lights to LED.

Advantages:

- Longer lifespan
- Lower energy consumption

The replacement can also be an opportunity to improve the lighting control system by automating it.

10

10

3.1 Motivation of industrial companies' staff

Policies and plans

Energy & environmental policies and plans of the company can lead towards greener objectives, like efficiency or renewable energy targets. This can drive the corporate culture towards more sustainable behaviours.

For example:

- Considering on the budget a clause for energy related investments
- Workers' behaviour towards more environmentally friendly
- Installation EV charging points/bikes parking in the premises of the company

11

11

3.1 Motivation of industrial companies' staff

EU policies – EU EED

There are two main directives establishing targets by 2030 and 2050 that promote implementing measures by companies. They are explained in more detail on Module 1.

- Energy Efficiency Directive (2012, updated in 2023):
  - Obligation to carry out an energy audit if the annual energy consumption is over 10 TJ (over 3 previous years)
  - Obligation to implement an Energy Management System (ESM) if the energy consumption is over 87 TJ (over 3 previous years)
  - Energy savings of 11,7% by 2030 on every Member State
  - Total energy consumption reduction per year of 1,5% on every Member State

12

12

3.1 Motivation of industrial companies' staff

- 2023 – Provisional agreement to raise to 42,5% 2030 target
- 2018 – Revised RED: 32% renewables for 2030
- 2009 - RED

EU policies – EU RED

The two directives have been reviewed according to the Fit for 55 package.

EU Renewable Energy Directive (2009, updated in 2018, amended and entered into force on the 20th November 2023):

- It aims for a 42,5% reduction of GHG emissions by 2030 (versus 1990).

Source: PowerPoint

13

13

3.1 Motivation of industrial companies' staff

Source: DEEP

Replication

Companies tend to have similar systems and incidences. That is why it can be useful to have a database or contacts with implemented EEMs, in order to know what works and what doesn't.

Relevant data: real values of investment, costs, savings, etc. of EEMs that have been implemented by companies of same sector/size

There exist platforms with a database of real implemented EEMs, like De-risking Energy Efficiency Platform (DEEP).

The A2M project also has a database with EEM examples and their main information and KPIs (Key Performance Indicators).

14

14

3.1 Motivation of industrial companies' staff

Replication of EEMs in Europe – A2M ESM database

Source: Audit2Measure database

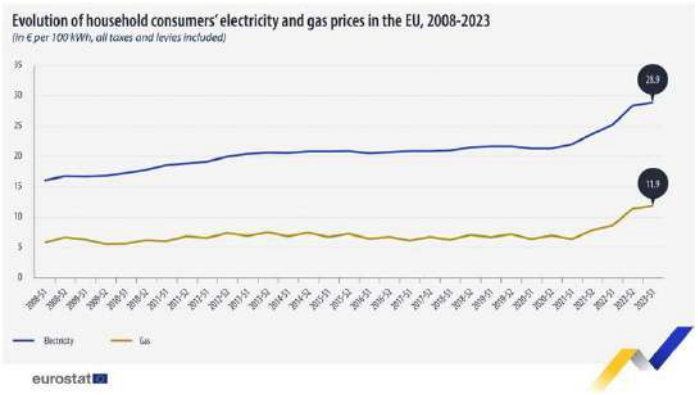
15

15

- 3.1 Motivation of industrial companies' staff

Increasing energy prices

Over the last two years, mainly due to the Ukrainian war, gas prices have risen, and so electricity prices. This generates an opportunity of investment since it reduces payback time.



Source: Eurostat

16

16

3.2 Roles and responsibilities of stakeholders to implement EEMs

17

Objective and content

The objective of this submodule is to explain the different stakeholders involved in the implementation of EEMs, and their respective roles and responsibilities.

Content:

- Energy experts
- Equipment manufacturers and distributors
- Installers and maintainers
- Financing providers and ESCOs
- Public administration

18

3.2 Roles and responsibilities of stakeholders to implement EEMs

3.2 Roles and responsibilities of stakeholders to implement EEMs

Energy experts as energy auditors, engineering companies and technological centres

- They can inform/advise about technical, economical, legal and financing options

Equipment manufacturers and distributors

- They know about energy efficient products and can inform/advise about current technical equipment or systems and provide information about their cost

Installers and maintainers

- The current installer and/or maintainer of the own company could advice about the required replacements of the company

Financing providers and ESCOs

- They can provide financing for the EEMs implementation, as loans/credit, renting or EPCs
- Some technology providers also offer ESCO service, reducing the cost of the technology risk

Public administration providing technical support and financing

- Some energy agencies provide support with technical solutions and/or manage incentives for energy efficiency or RES installations.

19

19

3.2 Roles and responsibilities of stakeholders to implement EEMs

Energy experts

Energy auditors: they inspect the installation and operations to identify the energy consumption.

Engineering companies: they offer different services which can include the planning, design, construction and maintenance of a project.

Technological centres: they can provide information about innovative equipment.

20

20

3.2 Roles and responsibilities of stakeholders to implement EEMs

Manufacturers and distributors

- Equipment manufacturers: these companies are the ones who produce the systems/equipment. They sometimes offer services like the installation or maintenance. It is recommended to select efficiency/high performance equipment to maximise energy savings

  Manufacturers examples:

  WEG – motors, drives, control…

  Saint-Gobain Isover – insulation
- Distributors: they are the ones in charge of selling the systems. Sometimes manufacturers directly sell their products.

21

21

3.2 Roles and responsibilities of stakeholders to implement EEMs

Installation and maintenance companies

- The installation companies that install the required systems.
  - These installation companies could be the manufacturers, subcontracted by the manufacturers or the ones usually utilised by the company.
- There are two ways of maintaining the systems:
  1. Internal maintenance: staff who belongs to the Company and performs the tasks.
  2. External maintenance: an external company is hired to do the maintenance.

22

22

3.2 Roles and responsibilities of stakeholders to implement EEMs

Types of maintenance strategy

Corrective maintenance: carried out after a fault detection

Preventive maintenance: carried out periodically to reduce the failure risk and reduction on performance

Risk-based maintenance: carried out by integrating analysis, measurement and periodic tests. Assesses risks to define an appropriate maintenance program

Condition-based maintenance: carried out by monitoring the performance and comparing to average values. Maintenance is performed when the indicators are out of established values

23

23

3.2 Roles and responsibilities of stakeholders to implement EEMs

Financing providers and ESCOs

Some financing sources are the following, which are explained in more detail on Module 6.

- Financing providers: they can be public institutions like EU agencies, national or regional governments. Or private like banks.
- ESCOs (Energy Service Company): they offer complex energy services, like the implementation of energy efficiency or renewable energy projects and provide the investment and usually offer maintenance as well.

Examples of services:

- Energy audits
- Energy management
- Project design and implementation
- Maintenance and operation
- Service provision (lighting, heating, etc.)

24

24

3.2 Roles and responsibilities of stakeholders to implement EEMs

Public administration

The public administration can include, for example:

- The Ministry dealing with industry and/or energy
- Energy agencies
- Other institutions involved in energy and climate affairs

They facilitate information and other resources (like courses, handbooks, etc.) about energy efficiency and renewable energy sources.

They inform and manage incentives for energy efficiency or RES installations.

25

25

3.3 Mitigation of perceived risks and barriers' removing

26

26

3.3 Mitigation of perceived risks and barriers' removing

Objective and content

The objective of this submodule is to identify the most common barriers on the implementation of EEMs and mitigate the risk perception.

Content:

- Common barriers and their solutions
- Drivers
- Support
- Best practices for increasing energy efficiency investments

27

27

3.3 Mitigation of perceived risks and barriers' removing

Mitigation of perceived risks and barriers removing

Economic barriers	Too high investment costs and long pay-back periods, uncertain/volatile energy prices, technology evolution, lack of funding.
	Encouraged by adequate subsidies and other financial incentives, minimum energy efficiency requirements and encouraging long-term energy strategies.
Organisational barriers	Lack of time, other investment priorities.
	Considered by implementing energy efficiency targets and policies to include EE on the company's plans.
Informational and competence barriers	Lack of information of the advantages of EEM implementation.
	Changed by taking informative measures and vocational trainings; real cases of EEM implementation.

28

28

3.3 Mitigation of perceived risks and barriers' removing

Economic uptakes

Economic barriers	Receive information about the investment needed and how to calculate the economic viability.
	Getting advice on the costs (CAPEX and OPEX) of the EEMs. Receiving Assessment in prioritizing EEMs according to economic results, considering difficulty of implementation.
	Receive advice on existing funding programmes and private financing options. This includes public funds, private financing, ESCOs and EPCs.

29

29

3.3 Mitigation of perceived risks and barriers' removing

Organisational uptakes

Organisational barriers	Getting general information about what cultural change is and the more current mistakes on the energy behaviour in industries relating this aspect.
	Receive advice on the specific information of the potential changes of energy behaviour and how to achieve them (event in the place of the industry, brochure-poster with indicative tips for the change, leaflets for the workers, etc.)
	Getting a steering coaching on requirements for changing workers behaviour and the benefits of using the new measures which may need some training to the workers.

30

30

3.3 Mitigation of perceived risks and barriers' removing

Informational and competence uptakes (1)

Informational and competence barriers	Receive information and explanation about the specific EEM detected, making use of brochures, videos, face to face or video meetings (KPIs, EEM sheets, etc.).
	Getting advice on how to measure and/or calculate the achieved energy efficiency savings by the implemented measure versus the current situation.
	Capacity building (as tailored training courses).
	Get in contact with other users' cases that have applied a specific EEM, to identify and clarify issues on it, as prevent common pitfalls.

31

31

3.3 Mitigation of perceived risks and barriers' removing

Informational and competence uptakes (2)

Informational and competence barriers	Getting general knowledge about the regulation and laws affecting EEMs that are under assessment.
	In critical issues or which need very specialized advice, industries should receive contact of legal energy experts.
	Receive a first steering overview of the present policy framework in the participating country as a general first step.

32

32

3.3 Mitigation of perceived risks and barriers' removing

Support

Provide support	Technical support	Economic - financial support	Regulatory-legal support	Behaviour - cultural change
Energy experts and auditors	X	Only information	X	X
Business associations	X	Information and financing if ESCO association		X
Technological centres, and universities	X	Sometimes information		
Manufacturers/retail, installers and their associations	X	Sometimes		
Financing institutions, banks, other private financing		X		
Energy Services Companies, ESCOs	X	X	X	
Energy legal experts or companies			X	
National and local authorities	X	X		

33

33

3.3 Mitigation of perceived risks and barriers' removing

Drivers

- Implementing energy management systems
- Market conditions that influence the need of reduce operating costs
- Funding for innovative technologies
- Public funding and grants
- The green transition is an opportunity for company's updating and renewed competitiveness
- Ambitious EE objectives to meet the Paris climate objectives (like Fit for 55 package)
- National initiatives
- Investor pressure
- Public recognition of the company's commitment
- Customers are asking for low-carbon products and reporting the suppliers' carbon footprint. It can either be other companies or household consumers.
- Increasing energy prices

34

34

3.3 Mitigation of perceived risks and barriers' removing

Best practices for increasing energy efficiency investments

- Energy management systems and energy audits
- Energy efficiency obligation schemes and white certificates
- Voluntary agreements between the government and the company
- Energy efficiency networks which include setting of energy saving goals
- Reduction the environmental footprint of the whole production chain, through Environmental, Social and corporate Governance (ESG) schemes

35

35

3.4 Implementation plan for EEMs identified in the energy audit

36

36

3·4 Implementation plan for EEMs

Objective and content

The objective of this submodule is to establish an implementation plan for the identified EEMs.

Content:

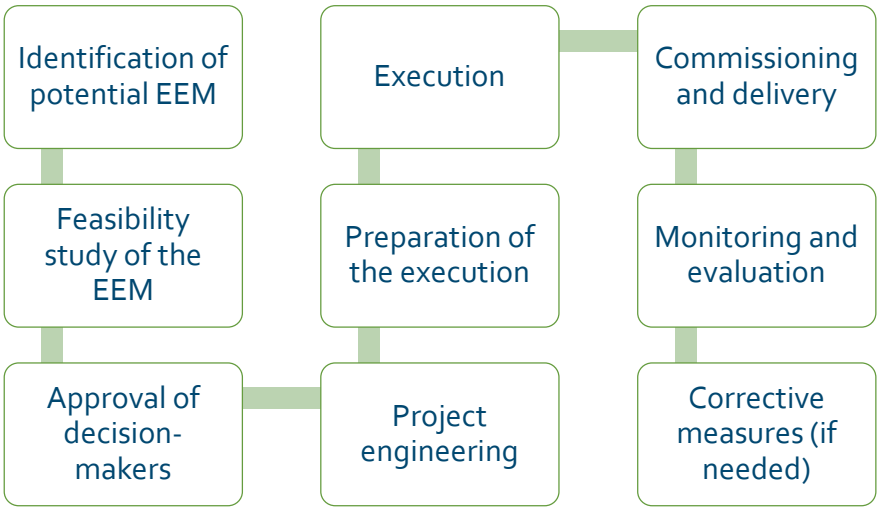
- Steps of the implementation plan, from the identification of the EEM to the monitoring.

37

37

3·4 Implementation plan for EEMs

Steps of the implementation plan



38

38

3.4 Implementation plan for EEMs

1. Identification of potential EEM

The first step on the implementation plan, is to identify all the potential EEMs of the company by:

- Reviewing an existing energy audit
- Performing a new energy audit
- Visiting the facilities
- Asking the workers

39

39

3.4 Implementation plan for EEMs

2. Feasibility study of the EEM

One a potential EEM is identified, it should be analysed on three levels to study their viability.

- Technical level: compatibility with other technologies, space needed, potential energy savings, etc.
- Economic level: profitability of the measure, potential savings, investment and additional costs
- Legal level: compatibility with applicable law, regulatory restrictions

40

40

3.4 Implementation plan for EEMs

3. Approval of decision-makers

The following step is to present the EEM to the decision-makers, showing the conclusions after the analysis.

After this, the decision-makers can either choose:

- To proceed with the EEM
- To explore other alternatives, for instance, with lower investment costs
- Not to implement the EEM

41

41

3.4 Implementation plan for EEMs

4. Project engineering

Once approved the project has to be studied in detail:

- Engineering: technical-economic memory, work plan, deadlines, roles and responsibilities assigned to each worker involved
- Financial analysis: company's capital available, possible public subsidies, private financing, etc.
- Timing analysis for the execution of the EEM without affecting or trying to have the least effect on the processes

42

42

3.4 Implementation plan for EEMs

5. Preparation of the execution

Some preparative steps should be done before the execution of the project:

- Availability of capital or external funding
- Licensing and permits
- Taxes
- Equipment purchase

43

43

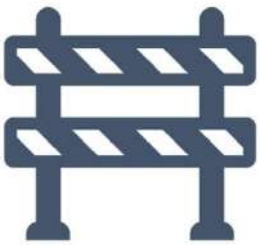
3.4 Implementation plan for EEMs

6. Execution

During the execution, it is important to coordinate according to the work plan, in order not to affect the daily operation of the facility.

It can consist of:

- Civil work, construction
- Installation of equipment
- Supervision of construction



44

44

3.4 Implementation plan for EEMs

7. Commissioning and delivery

Usually, it is the installation company the one that commissions the system, but it could be the facility's workers depending on the situation.

45

45

3.4 Implementation plan for EEMs

8. Monitoring

Once operating, the system will require some monitoring involving:

- Maintenance either corrective or preventive
- Integration into an Energy Management System (optional)
- Verification of energy savings (optional)
- Identification of other benefits
- If needed, undertake corrective measures (e.g. if the system does not work as expected)

46

46

AUDIT2MEASURE

Thank you.

For more info, visit our website or contact us:

https://ieecp.org/projects/audit-to-measure/

fpuente@escansa.com; mpuente@escansa.com; energia@escansa.com

#AUDIT2MEASURE

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

47

AUDIT2MEASURE

Module 4. Raising awareness of ESMs in the industry sector

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Module 4

Introduction to the module

This module addresses the benefits of energy saving measures and how to present these to e.g. top management

Therefore, the following topics will be addressed:

- What is the business case for energy saving measures
- Typical indicators
- Typical measures and practical examples

2

2

Module 4

Raising awareness of Energy Efficiency measures in the industry sector – 8 module topics

1. Raising awareness – the business case for ESMs
2. Indicators of economic assessment
3. Most common ESMs in selected industry sectors
4. Most common RES installations in selected industry sectors
5. Assessment of measures and their risks
6. Energy efficiency organizational measures – energy management systems (EnMS)
7. Carbon footprint calculation in the industrial sector
8. Practical examples of ESMs

3

3

Module 4

Detailed training programme

Submodule	Description
4.1 Raising awareness within the A2M project	What is the "*the business case for EEMs*"
4.2 Indicators of economic assessment	Overview of main indicators: payback period, IRR and NPV
4.3 Most common EEMs (energy efficiency) in selected industry sectors	Overview of typical ESM on energy efficiency with description, typical usage, etc.
4.4 Most common RES installations in selected industry sectors	Overview of individual RES with description, typical usage, etc.
4.5 Assessment of measures and their risks	What are the major risks and their solutions when implementing energy saving measures
4.6 Energy efficiency organizational measures (energy management, "soft" measures, etc.)	The module will focus on the implementation of EnMS in the industry sector – energy policy, energy review, EnPI (Energy Performance Indicator), energy saving potential
4.7 Carbon footprint calculation in the industrial sector	What is included in carbon footprint calculation
4.8 Practical examples of ESMs	Presentation of (country specific) practical examples with typical energy saving, payback period, lifetime period, etc.

4

Module 4

Module 4.1 – the business case for energy saving measures

5

5

Module 4.1 – business case

The benefits of energy saving measures

- Most companies are well aware of the basic benefits of energy saving measures, like saving energy costs
- But investments in energy saving measures are only one of many (investment) priorities a company has, such as investing in new production equipment, recruitment of capable staff etc.
- It is therefore important to present the business case of energy saving measures, including *all possible benefits.*
- *… and taking into account the specific situation of each company*

6

6

Module 4.1 – business case

The business case for energy saving measures – I

When implementing energy saving measures, one main benefit jumps out:

1. **Cost savings,** including:
   - **Operational Costs**: Improved energy efficiency directly reduces energy consumption, leading to lower energy bills and operational costs.
   - **Maintenance Costs**: Efficient equipment often requires less maintenance and downtime, reducing associated costs

But the business case for energy saving measures is not complete without the following additional benefits:

2. **Risk mitigation:**
   - **Energy Price Volatility:** By reducing energy consumption of energy-intensive processes, companies can reduce the impact of energy price fluctuations for their operations
3. **Resource efficiency:**
   - **Raw Materials:** Energy-efficient processes often go hand-in hand with fewer raw materials use , contributing to resource efficiency and reducing associated purchase costs.
   - **Water Conservation:** Some energy-efficient technologies also contribute to water conservation, an important consideration, especially in regions facing water scarcity

7

7

Module 4.1 – business case

The business case for energy saving measures – II

4. **Enhanced competitiveness**
   - **Market Positioning:** Companies that prioritize energy efficiency can use it as a competitive advantage, showcasing their commitment to sustainability and environmental responsibility.
   - **Regulatory Compliance:** Compliance with energy efficiency standards and regulations can prevent fines and legal issues, maintaining a positive business reputation.
5. **Government incentives:**
   - **Financial Incentives:** Possibility to make use of EU or national support programmes, tax incentives, grants, or rebates for companies that implement energy-efficiency measures → reducing the overall investment and implementation costs of ESMs
6. **Innovation and technological advancement:**
   - **Technological Leadership:** Embracing advanced energy-efficient technologies can position a company as an industry leader in innovation and technological advancement.
   - **R&D Opportunities:** Investing in energy efficient technologies may lead to the development of new products or processes, opening up additional revenue streams

8

8

Module 4.1 – business case

The business case for energy saving measures – II

7. **Brand image and stakeholder relations:**
   - **Corporate Social Responsibility (CSR):** Demonstrating a commitment to energy efficiency aligns with CSR goals, enhancing the company's reputation and brand image.
   - **Investor and Customer Relations:** Investors and customers increasingly value sustainability, and energy-efficient practices can attract and retain environmentally conscious clients and stakeholders.
8. **Employee productivity and satisfaction:**
   - **Work Environment:** Energy-efficient facilities often provide a more comfortable and productive working environment, positively impacting employee satisfaction and productivity. The also may attract environmentally conscious talent.

9

9

Module 4.1 – business case

The business case for energy saving measures – III

- To conclude, the business case for energy efficiency in industry extends beyond simple cost savings and includes:
  - enhanced competitiveness, risk mitigation, resource efficiency, improved stakeholder relations, and opportunities for innovation.
- Embracing energy efficiency therefore not only a responsible environmental choice but also a strategic business decision with long-term benefits
  - But, … it requires to find common ground between the overall business strategy and the energy / environmental strategy

10

10

Module 4.2 - EEM

Typical energy efficiency measures in industry

Energy efficiency measures cover:

- Technological measures – e.g. investments in technology
- Non-technological measures:
  - From enhanced maintenance to the implementation of a full energy management system
- At least some of these measures should be included in the energy audit that most companies have
- The following slides list a no. of typical energy efficiency measures in industry

11

11

Module 4.2 - EEM

Typical energy efficiency measures in industry – I

1. Energy management systems (EMS), aimed at continuously monitoring and optimizing energy use
2. Introduction of more highly efficient technical devices in the production process
   - Replacement of old equipment by high-efficiency motors, pumps, compressors etc.
   - Installation of variable speed drives (VSD) to control motor speed and match energy use to actual demand
3. Waste heat recovery
   - Capturing and utilizing waste heat generated during industrial processes for additional heating purposes (e.g. hot water preparation or heating for technological purposes)
4. Combined heat and power (CHP) systems
   - In case of excess heat - implementing CHP systems to generate both electricity and useful heat from a single energy source, increasing overall efficiency (and reducing purchase of electricity or heat)
5. Process optimization
   - Improving process design and control to reduce energy-intensive steps and enhance overall efficiency.
   - Implementing advanced process control (APC) systems to optimize production parameters in real-time.

12

12

Module 4.2 - EEM

Typical energy efficiency measures in industry – II

6. Energy efficient lighting
   - Upgrading to energy-efficient lighting systems, such as LED technology, and implementing motion sensors to control lighting in non-occupied areas.
7. Insulation and Building Envelope Improvements
   - Improving insulation in (office / production) buildings / sites and facilities to reduce heat loss or gain.
   - Upgrading windows (double / triple glazing) to improve overall building energy efficiency.
8. Boiler efficiency improvements
   - Regular maintenance to optimize operation
   - Replacement of older boilers by more efficient ones or by heat pumps
9. Cooling system optimization
   - Upgrading cooling systems with more energy-efficient technologies
   - Use waste heat for cooling applications by driving an adsorption chiller
10. Renewable energy integration
    - Rooftop PV installations
    - Biomass / biogas boilers in case of availability of (cheap) biomass / biogas

Module 4.2 - EEM

Typical EEM example in industry – waste heat recovery

Common methods and technologies for recovering waste heat in industrial processes are:

1. Heat exchangers
   - **Air-to-Air Heat Exchangers**: Capture waste heat from exhaust air and transfer it to incoming fresh air, preheating the combustion air for furnaces or boilers.
   - **Water-to-Water Heat Exchangers**: Transfer waste heat from industrial processes to water, which can then be used for e.g. space heating or preheating boiler feedwater
   - **Gas-to-Liquid Heat Exchangers**: capture waste heat from exhaust air and transfer it to a liquid (special liquid with a higher boiling point than water), e.g. mainly used in compressors

Module 4.2 - EEM

Typical EEM example in industry – waste heat recovery

2. Combined heat and power systems
   - Generate electricity and capture waste heat produced during power generation for use in industrial processes or heating applications
   - Different technologies exist based on temperature of waste heat (e.g. ORC for low to medium high temperature waste heat streams)
3. Absorption chillers
   - Use waste heat for cooling applications by driving an adsorption chiller (suitable for industries with both heating and cooling requirements)
4. Industrial heat pumps
   - Utilize waste heat to drive heat pumps, which can upgrade the temperature of the waste heat for use in other processes or for space heating

When considering waste heat recovery, essential to conduct a thorough analysis of the industrial processes, the temperature and volume of waste heat generated, and the possible application options for heat utilization.

These can be both in or outside the premises of the company.

15

15

Module 4

Module 4.2 – financial assessment of ESMs

16

16

Module 4.2 – finance

Indicators of financial assessment

When providing arguments for the benefits or profitability of ESMs, there is a need of using financial indicators like:

- Payback period
- NPV (Net present value)
- IRR (Internal Rate of Return)

17

17

Module 4.2 – finance

Payback period

The payback period represents the period of time required to recover the initial investment

$$a_{Payback} = \frac{I_0}{Earnings - Expenses}\ [a]$$

- The payback time must always be shorter than the lifetime of the technology to make economic sense
- The lower the payback time the better
- The payback period can be calculated as simple payback or discounted payback

18

18

Module 4.2 – finance

Simple payback vs. discounted payback

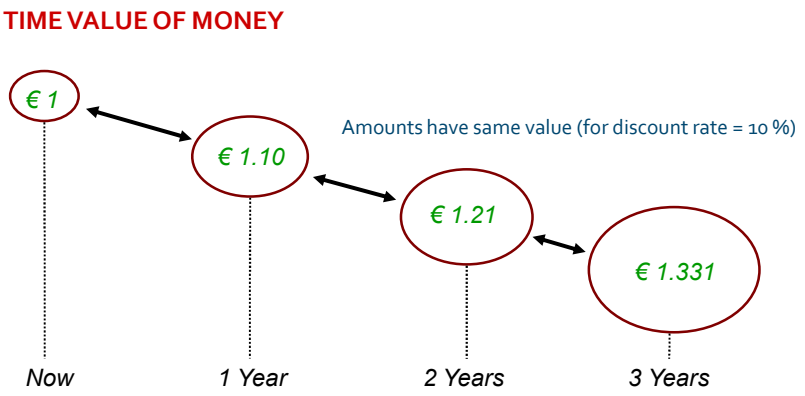
- The payback period of an investment is usually the determining factor in whether or not an organization will make the investment
- For instance, the investment is € 100,000 and the annual energy savings are € 25,000 per year – the **simple payback** period is 4 years
- The **discounted payback** period accounts for the "time value of money."The time value of money means that money now is more valuable than the same amount of money in the future.
- The discounted payback period will be longer than the simple payback period, *but* … the discounted payback period will give a more accurate estimate on whether to expect a return on investment.
- Using the previous example, the € 25,000 in savings each year from the € 100,000 investment. However, if the **discount rate** is 5%, the discounted payback period is close to 4.6 years.

19

19

Module 4.2 – finance

Time value of money and discount rate

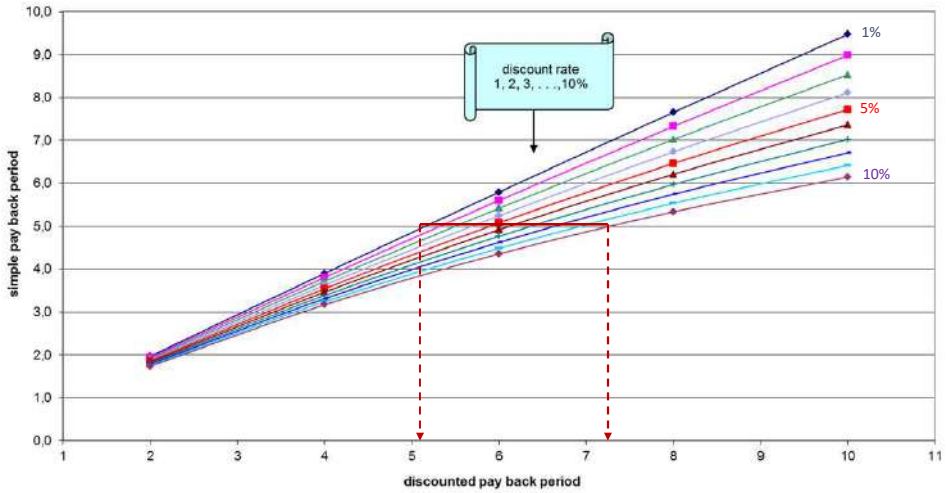


20

20

Module 4.2 - finance

Simple payback vs. discounted payback – depending on the level of the discount rate

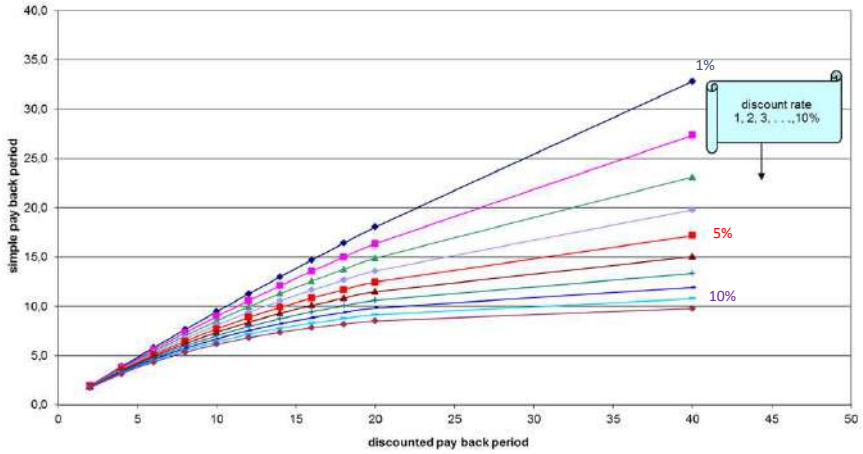


21

21

Module 4.2 – finance

Simple payback vs. discounted payback – depending on the level of the discount rate



22

22

Module 4.2 - finance

NPV – Net Present Value

The net present value represent the sum of all present values of cash flows in a determined period of time, usually the expected or minimum lifetime of the technology.

$$NPV = -I_0 + \sum_{t=1}^{n} \frac{Earnings_t - Expenses_t}{q^t} \; [€]$$

$I_0 = Initial\ Investment\ [€]$

$NPV > 0$ → profitable

$NPV < 0$ → not profitable

- Best Investment → Highest NPV
- *NPV > o means that the investment has added value to the firm (beyond the discount rate used in the calculation)*

23

Module 4.2 - EEM

Net present value

- **NPV (Net present value)** – is the difference between the present value of cash inflows and the present value of cash outflows over a selected period of time

$$\mathrm{NPV_{T_h}} = \sum_{t=1}^{T_h} \mathrm{CF_t}.(1+\mathrm{r})^{-t} - \mathrm{IN} + \sum_{x=1}^{n} \mathrm{N}_{\mathrm{zux,Th}}$$

  - CF_t = cash flow (earnings – expenses) in year t
  - r = discount rate
  - T_h = assessment period (in line with expected lifetime of technology)
  - IN = investment costs
  - N = residual value of investment at end of lifetime

24

Module 4.2 - EEM

Internal rate of return

- **IRR (Internal Rate of Return) [%]** – is a metric used in financial analysis to estimate the profitability of potential investments. IRR is the discount rate that makes the net present value (NPV) of cash flows equal to zero in a discounted cash flow analysis.

$$0 = \sum_{t=1}^{T_h} CF_t . (1 + IRR)^{-t} - IN + \sum_{x=1}^{n} N_{zux,Th}$$

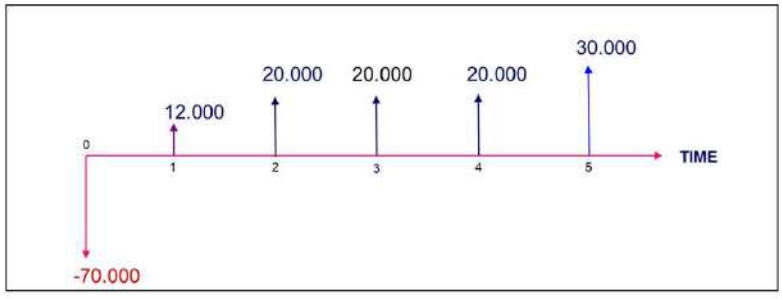
- The investment is profitable if the IRR is higher than the weighted average cost of capital **(WACC)**
  - *WACC represents the minimum return that a company must earn on an existing asset base to satisfy its creditors, owners, and other providers of capital*
  - *WACC is often interchangeably used with discount rate*

25

25

Module 4.2 – EEM

NPV calculation example



Upfront investment: - € 70,000

Cash flow (*energy savings – operational costs - depreciation*):

- Year 1 € 12,000
- Year 2 to 4 € 20,000
- Year 5 € 30,000 (20,000 + 10,000 (residual value))

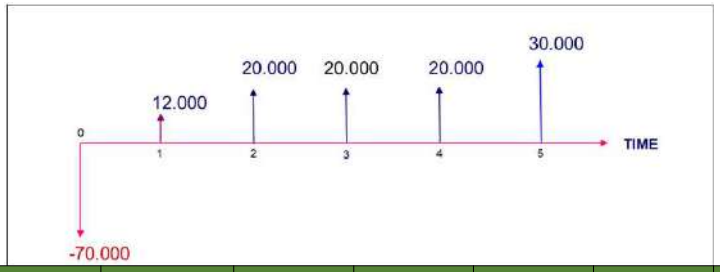
Discount rate 8%

26

26

Module 4.2 – EEM

NPV calculation example



	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cash flow	-€ 70 000,00	€ 12 000,00	€ 20 000,00	€ 20 000,00	€ 20 000,00	€ 30 000,00
Discount rate	**8%**					
Denominator	1,00	1,08	1,17	1,26	1,36	1,47
Present value	-€ 70 000,00	€ 11 111,11	€ 17 146,78	€ 15 876,64	€ 14 700,60	€ 20 417,50
Net Present Value	**€ 9 252,63**					
Internal Rate of Return	**12,32%**					

- **Net present value > 0** means that the project is profitable
- **IRR higher than the discount rate** means that the project generates added value to the company

27

27

Module 4.2 - finance

Conclusions

- Discounted payback period is preferred over simple payback period (as cost of capital is never "0")
  - discount rate depends on the accepted cost of capital (e.g. what is the minimum return on capital expected)
- NPV sums up the changes in cash flow over the chosen period of time.
  - Should correctly include all relevant cost items like operational costs, depreciation etc.
- IRR calculates the alternative cost of capital of the project (compared to the discount rate)

28

28

Module 4

Module 4.3 / 4.4 – Typical EEM and RES examples in industry

29

29

Module 4.3 - EEM

Typical EEM examples in industry

In the following slides a no . typical energy efficiency measures (with expected savings) are shown:

- Flue gas ORC
- Heat recovery from compressors
- Installation of economizer
- Installation of air pre-heater
- Repairing steam leaks
- Recovery of condensate

30

30

Module 4.3 - EEM

Typical EEM example in industry – Flue gas ORC

- The **ORC** (Organic Rankine cycle) is suitable for operations in which the temperature of the flue gas from the technology is higher than 350 °C.
- In the system it behaves like a regular flue gas exchanger
- Typical electric power: 40 – 250 kWe (it depends on the heat output in the flue gas)
- Average efficiency – 18 – 22 %
- **Benefits**:
  - production of electricity and heat in the form of hot water with a temperature of up to 90 °C.
  - the energy produced is emission-free

31

31

Module 4.3 - EEM

Typical EEM example in industry – Heat recovery from compressors

- Waste heat from compressors represents approximately 60 % of the electrical input of the compressor.
- Waste heat in the compressor is generated during air compression and is removed by the grease oil through the oil/air cooler to the surroundings.
- The heat obtained can be used for indoor heating or hot water heating.
- **Benefits**:
  - Heat production
  - the energy produced is emission-free

Heat exchanger PTG (KAESER Kompressoren)

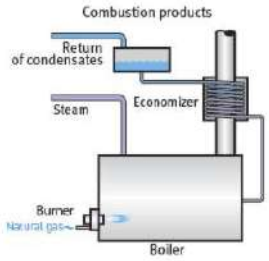
32

32

Module 4.3 - EEM

Typical EEM example in industry – Installation of economizer

- An **economizer** is a flue gas heat exchanger that can be used in almost any steam boiler system.
- The feed water from the high pressure heaters enters the economizer and picks up heat from the flue gases after the low temperature super – heater
- The investment costs of an integrated economizer are roughly 7 to 15% of the boiler, but at the same time, the economizer increases the efficiency of the device by up to 7%.
- The boiler designers always keep the economizer water outlet temperature to about 25 to 35 degrees below the drum saturation temperature.
- As a rule of thumb, for every 1 degree pick up of economizer water temperature, there will be a drop of about 3 to 3.5 degrees in the flue gas.



33

33

Module 4.3 - EEM

Typical EEM example in industry – Installation of air pre-heater

- **Air pre-heaters** are provided in boilers to preheat the combustion air. There are 2 main types:
  - Recuperative
  - Regenerative air heaters
- Tubular or recuperative air pre-heaters are provided in boilers of medium and small range of steam generation. This type of air pre-heater becomes very large in size if they have to be used in very high capacity boilers like 600 tons/hour of steam production and above. In these cases regenerative air pre-heaters are used.
- By using an **Air pre-heater and Economizer boiler together efficiency can be increased from 73 % to 89 %.**

34

34

Module 4.3 - EEM

Typical EEM example in industry – Repair of steam leaks

- Steam is an expensive energy carrier and when steam is lost from the system through leaks this can result in significant economic losses.
- Steam leaks occur everywhere but most common places such as: Flanges and gasketed joints, Pipe fittings, Valves, stem and packings, Steam traps, Relief valves, Pipe failures.
- For example:
  - A steam leak through a 4 mm hole on a 2 bar header means a steam leak of approximately 26.2 kg/h. The leak, however, occurs throughout the year, i.e. 8 760 hours.

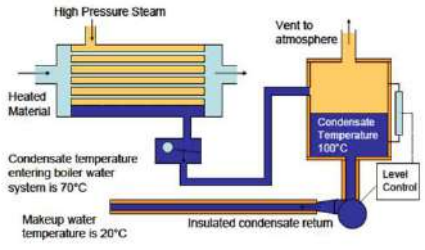
35

35

Module 4.3 - EEM

Typical EEM example in industry – Recovery of available condensate

- Condensate is produced after steam has transferred all its thermal energy and condensed into water.
- There is significant amount of thermal energy still associated with the condensate.
- Every unit of condensate recovered implies one less unit of make up water required.
- Incorporating a condensate recovery system would require a condensate receiver with an ambient to collect all the condensate. It would then be pumped to the boiler plant.



36

36

Module 4.4 – RES

Integrating renewable energy – I

Integrating renewable energy into industrial operations → a strategic approach that considers the specific needs, processes, and constraints of the industry:

1. Renewable energy assessment:
   - Assessment of the energy needs followed by suitable RES available in the region (solar, wind, biomass or geothermal)
   - Determine the % of total energy consumption that could be covered by RES
2. On-Site Renewable Energy opportunities
   - What are the on-site options, availability of space, sunlight, wind
   - Possible integration of biomass / biogas systems (e.g. for space heating / process heat replacing fossil fuels)
3. Available public incentives (grants etc.) and regulatory frameworks related to grid connection

37

37

Module 4.4 - RES

Integrating renewable energy – II

Renewable energy versus energy efficiency?

- Prioritize energy efficiency measures within your industrial facility before integrating renewable energy to optimize overall energy use.
- Efficiency measures can reduce the overall energy demand, making it easier to meet a significant portion of the remaining demand with renewable sources.
- Integrate energy storage solutions, such as batteries, to store excess energy generated by RES (for use during high demand or low RES production)

38

38

Module 4.4 - RES

Typical RES example in industry – Photovoltaic power plant

- **PV** can be placed on the roof of buildings, on available land or above the parking spaces (carport)
- It is advisable to dimension the photovoltaic power plant based on the company's own consumption (minimum flows into the distribution network)
- Average efficiency – 20 % (average for Central Europe)
- **Benefits**:
  - production of electricity
  - the energy produced is emission-free

39

39

Module 4

Module 4.5 – Assessment of measures and their risks

40

40

Module 4.5 – Decision making

Decision making

When a (short) financial calculation shows that a project is beneficial to the company, there are a no of other issues to take into account that decide whether to invest in the proposed ESM:

- Availability of (grant) funding:
  - Reduces upfront investment and with that the financial parameters (e.g. payback of investment may become "acceptable" to top management)
  - Different types of (green) loans with beneficial conditions
- Technical risks and conditions

- *Funding further discussed in module 6*

41

41

Module 4.5 – Decision making

Risks

All investments in energy saving measures include some risks. The primary risks can be divided into the following categories :

- Technical risks (including risks with achieving the energy savings)
- Risks during construction and start-up
- Commercial risks
- Financial risks
- Other (e.g. social) risks

42

42

Module 4.5 – Decision making

Risks

Performance (savings) risk

- Usually lower for "standard" solutions like:
  - Lighting
  - Wall insulation, double/triple glazing
  - Replacement of motors, boilers
  - Steam traps
- Higher risks in case of more complex measures:
  - Combined heat and power units (many variables)
  - Process equipment upgrade
  - HVAC systems
  - … or combinations of measures

43

43

Module 4.5 – Decision making

Overview of technical risks and possible solutions

RISK	SOLUTION
Technical risks of the technology installed – uncertainty that the technology is proven	Require demonstrated previous results from any technology – e.g. require references from manufacturers or suppliers
Risks related to ongoing performance of the technology – performance of the technology worse than expected, - operational costs higher than expected	Contractually assign all major technology & technical risks to the applicable contractor/vendor by **specifying performance requirements to be achieved as a condition for payment** – document what risk is whose responsibility.
Contractor / vendor not available anymore after technology was put into operation	How long the contractor/vendor is on the market may be an indicator of his/her success. Ensure that regular maintenance is part of the contract
Energy savings not in line with what is mentioned in energy audit	Energy audit to be reviewed by external expert before deciding on investment, include how savings will be measured.

44

44

Module 4.5 – Decision making

Risks during construction and commissioning

RISK	SOLUTION
Non-compliance with project financing requirements	Utilize experienced project managers, engineers and ensure they are involved at the energy audit phase
Price of the installation does not cover all items (i.e. no turnkey price)	Negotiate a "turnkey" installed price
Non-adherence to design specifications	Use performance specifications for contractor commissioning criteria
Not meeting completion deadlines	Utilize experienced design/build contractors
Not meeting commissioning requirements	Negotiate a specific payment calendar, with final payment after test-phase operation has finished
Non-compliance with regulatory and legal Issues	Review progress on frequent basis based on project documentation.

45

45

Module 4.5 – Decision making

Commercial and other risks

RISK	SOLUTION
Price risk	Work with subcontractors / vendors that have previous experience. Negotiate a lump sum, or just a small portion of price dependent on used material indices, labour works, etc.
Market risk and competitiveness Investment decisions are based on assumptions made beforehand (e.g. data known about investment costs and maintenance costs). Investment costs may increase, energy costs may decrease, both influencing rate of return	Make a sensitivity analysis of the possible investments taking into account possible variations in investment costs, operational costs and market situations. Under (changing) market situations we can consider: • purchase price of electricity and gas, • sales price of electricity (in case of selling surplus electricity from RES installations or CHP units • External demand and sales price of heat (in case of selling excess heat to consumers outside the company)

46

Module 4.5 – Decision making

Decision making and risks - conclusions

All investments include some (technical) risks:

- Performance: energy savings not always fully realized
- Risks during construction
- Commercial risks

General solutions:

- Request references (demonstrated previous results)
- Include performance requirements in the contract
- Consider hiring an energy service company

47

47

Module 4

Module 4.6 – Energy management systems

48

48

Module 4.6 - EnMS

Energy efficiency organizational measures

One of the most common measures is the introduction of an energy management system, either with or without certification (ISO 50001)

Implementing an energy management system (EnMS) in an industrial company involves a structured approach to optimize energy use, reduce costs, and enhance overall energy efficiency.

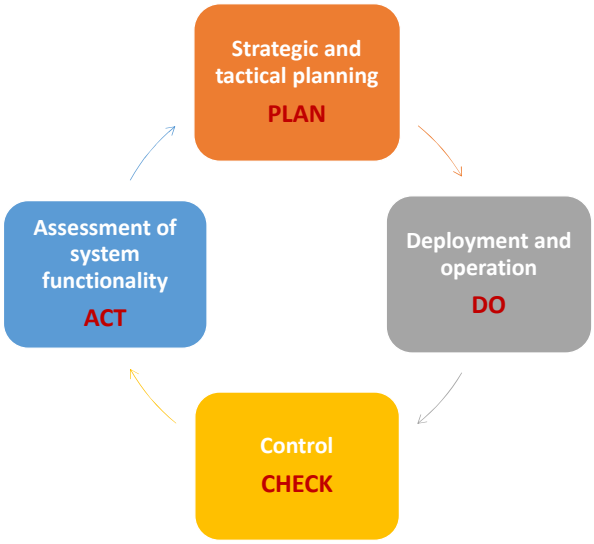
Apart from the monitoring and optimization of energy use and the identification of ESMs, a proper EnMS integrates measures like employee training and awareness.

49

49

Module 4.6 - EnMS

EnMS principle – PDCA cycle – as with other ISO systems



50

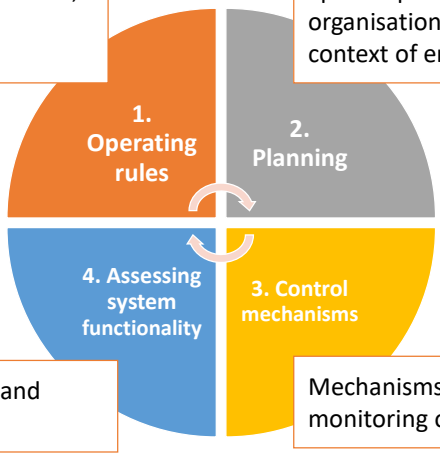
50

Module 4.6 - EnMS

Four essential components in the implementation and operation of an EnMS

General setting of boundaries, rules, procedures, responsibilities, duties

Specific planning within the organisation as a whole and in the context of energy management



Evaluation of activities and energy intensity

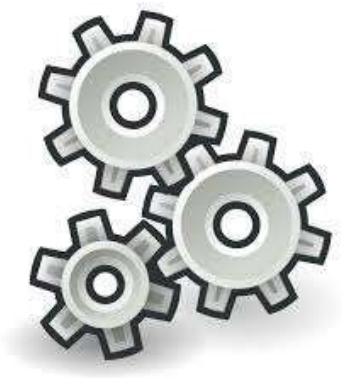
Mechanisms for continuous monitoring of activities

51

51

Module 4.6 - EnMS

Setting up EnMS operating rules



52

52

Module 4.6 - EnMS

Setting up EnMS operating rules

- **Establishing an Energy Policy**
  - A document that expresses commitment:
    - to continuously improve the energy efficiency of the organisation
    - support in all EnMS-related activities
    - securing resources - financial, human, time
  - Signing of the policy by a management representative
  - Disclosure of the policy document
- **Setting the boundaries of the energy management system**
  - description - in a directive / manual or in a separate document - geographical, organisational, operational boundaries
  - General → EnMS includes the largest energy consumers in the organization

53

53

Module 4.6 - EnMS

Setting up EnMS operating rules

- **Leadership and leadership commitment, roles, responsibilities and authority**
  - Representative of the top management of the organisation - responsible for EnMS
  - Energy manager - implementation activities + possibly energy management team (e.g. 1 person responsible for the energy management system per branch)
  - Internal auditor(s)

54

54

Module 4.6 - EnMS

Setting up EnMS operating rules

- **Introduction of appropriate system of documentation**
  - Documentation to be electronic and/or printed
  - **Recommendations - Creation of a Manual/Directive**
  - Documents required by the standard: documented information on procedures/activities
  - Other necessary documents: forms - preparation for records
  - **Documentary information:** describes the applicable procedures and processes in the organisation
  - **Forms:** templates for regular entries in existing documentation
- **Documentation management**
  - Responsibilities, issuance, approval, distribution, amendment, archiving and periodic review - in a separate document

55

55

Module 4.6 - EnMS

Setting up EnMS operating rules

- **Communication**
  - **Setting internal and external communication rules**
    - **Internal** - e.g. meetings, internal correspondence, training minutes
    - **External -** energy policy on the web, publication of certificates

  Related documentation: minutes of meetings, description of communication in a directive, manual or a separate document
- **Employee training**
  - Initial training of employees after/at the introduction of the system
  - Regular training in energy management principles (e.g. once a year)

  Related documentation: training plan, training programme, attendance sheets from training
- **Register of legislative documents**
- **Rules for purchasing of energy, products, equipment**

56

56

Module 4.6 - EnMS

Setting up EnMS operating rules

- **Energy management at workplaces**
  - description of data collection - what data, how often, who collects it, whom to report to (Measurement Plan)
  - workplace operating schedules

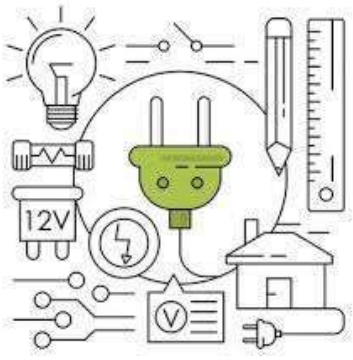
Related documentation: described in a directive, manual or a separate document, description of energy saving ideas from responsible persons at each site

Least-cost measures	Low-cost measures	High-cost measures
• Organisational measures - observance of internal temperatures, implementation of stand-by programmes, e.g. at night, training of employees in the basic principles of behaviour in the building, regular inspections, cleaning and maintenance, including recording, etc.	• For example, sealing windows, installing self-closing doors, changing the layout of buildings, monitoring losses with a thermographic camera, thermostatic valves on radiators, regular cleaning of air filters in air conditioning, introducing automatic switches (daylight and occupancy sensors), etc.	• Reconstruction of the heating system, insulation, replacement of windows, replacement of incandescent or fluorescent lighting with LED lighting, etc.

57

Module 4.6 - EnMS

Planning phase



58

58

Module 4.6 - EnMS

Planning phase

59

59

Module 4.6 - EnMS

Planning phase

Existing or baseline condition
- Current energy carriers
- Past and present energy use
- Past and current energy consumption

Review of energy consumption
- Significant energy uses
- Relevant variables for significant energy uses
- Current energy intensity
- Priority opportunities for improvement

Objectives
- Energy data collection plan
- Energy Performance Index EnPI
- Future use and energy consumption
- Energy targets and target values
- Action Plans

60

60

Module 4.6 - EnMS

Planning phase

- **Review of energy consumption**
  - Analysis of the current state of the energy supply and consumption and identification of important flows and consumers:
    - Evaluation of past and current energy consumption
    - Identification of the area of significant energy use - equipment
    - Identification of significant variables affecting energy consumption
    - Identifying opportunities for reducing energy intensity

Related documentation: in the manual/directory

61

61

Module 4.6 - EnMS

Planning phase - Review of energy consumption

Determination of **energy performance indicators (EnPI)** – used to review the energy consumption

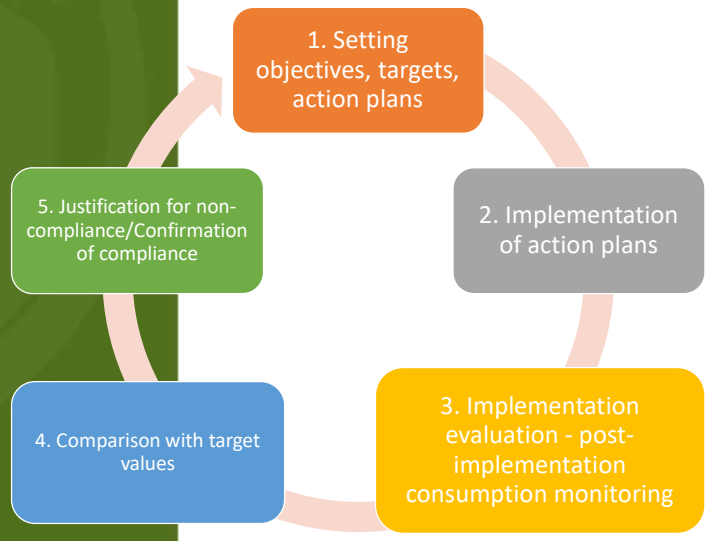
- EnPI can generally be defined at the level of equipment, system, products or e.g. processes in an organisation
- EnPI can be expressed in different ways:
  - amount of energy (kWh, GJ) or ratio (kWh/t material, litre of fuel/100 km)
  - statistical model (linear regression analysis).
- A baseline and current status is always established so that progress in energy performance is clear

62

62

Module 4.6 - EnMS

Planning phase – goal, target value, action plan



- Objectives must be chosen to be: **SMART** - **S**pecific, **M**easurable, **A**chievable, **R**elevant and **T**ime-Bound
- Each objective is assigned to 1) a responsible entity or person, 2) a means, 3) a deadline, and 4) a method of verification
- Targets are set / updated at the beginning of each monitoring period, for the following period

63

63

Module 4.6 - EnMS

Planning phase

- Related documentation: description in manual/guide, separate document updated every monitoring period
- **Relationship between goal, target value, what is the action plan**

Target
- What we want to achieve in general:
- e.g. reduction of energy consumption in all buildings of the factory

Target value
- The specific value we want to achieve - e.g. a 5% reduction in consumption relative to the previous period, achieving XXX MWh/year

Action Plan
- Specific steps to achieve the goal with assigned responsibilities, deadlines, resources - e.g. insulation and replacement of windows at the admin building

64

64

Module 4.6 - EnMS

Checking phase – system control mechanisms

65

65

Module 4.6 – EnMS

Checking phase – control mechanisms

- **Monitoring, measurement, analysis**
  - Precise description of measurement procedures, competencies, metrological order of key components of the operation that determine energy performance
  - link to operational documentation
- **Evaluation of compliance with legal requirements**
  - carried out annually or at pre-determined intervals (see EnMS Review)
  - Nonconformities, corrective and preventive measures
  - Records management - creation, approval, cancellation, modification - description in directive, manual

66

66

Module 4.6 – EnMS

Checking phase – control mechanisms

- **Internal audit**
  - Objective: to determine how the EnMS is working within the organisation
  - Carried out each year
  - link to operational documentation
- **Corrective measures**
  - Need to determine how a problem (or deviation) occurred and define actions to correct the problem, prevent the problem from recurring
  - Based on deviations detected by the energy manager, inspection bodies or internal audit
  - Corrective action to be taken

67

67

Module 4.6 - EnMS

Review of the EnMS system

68

68

Module 4.6 – EnMS

Review of the EnMS

- Regularly per calendar year (1 to 2 times) depending on system settings - **EnMS Review**
- Persons involved: management representative, energy manager, possibly other persons
- The documents are prepared by the energy manager:
  - Last year's energy targets - achieved/not achieved and why
  - Proposed objectives for the next period
  - Information on internal audits carried out
  - Information on corrective and preventive measures issued
  - Compliance with legislative requirements is assessed
  - Any further information to be discussed regarding the EnMS

69

69

Module 4.6 - EnMS

Energy management systems – summary of steps – I

The implementation of an EnMS includes a structured step-by-step approach:

1. Securing commitment of top-management
2. Establish a company energy policy
3. Conduct an energy review, set a baseline and define KPIs
4. Ensure legal and regulatory compliance
5. Develop energy management plan
6. Employee training and awareness
7. Implement system for monitoring and measuring energy consumption regularly
8. Data analysis and reporting

70

70

Module 4.6 - EnMS

Energy management systems – summary of steps – II

… - continued:

9. Implement energy efficiency projects identified in the energy management plan
10. Integrate EE criteria in the procurement process
11. Emergency preparedness and response
12. Performance evaluation
13. Continuous improvement based on the PDCA cycle
14. Certification (e.g. ISO 15001)
15. Documentation and record keeping

71

71

Module 4

Module 4.7 – Carbon footprint calculation

72

72

Module 4.7

Carbon footprint calculation

Energy audits currently include the measurement of carbon savings of the proposed ESMs.

- Carbon savings [t.CO_2] – calculated on the basis of the specific CO_2 emission value of the current state (mainly energy consumption) and the state after the realization of the opportunity reducing the energy consumption.

A complete greenhouse gas (GHG) emission assessment is measuring the carbon footprint of an industrial company.

This involves assessing and quantifying the GHG emissions associated with its operations.

73

73

Module 4.7

Main steps in carbon footprint calculation

1. Define scope and boundaries
2. Gather data
   - Incl. energy consumption / fuel usage / other relevant activities
3. Find the right emission factors and calculate emissions based on:
   1. Direct emissions from own (controlled) sources
   2. Indirect emissions from purchased energy sources (electricity and heat)
   3. Indirect emissions from the entire value chain
      - This may include; upstream and downstream activities such as transport, employee commuting, business travel, and the supply chain
      - For calculation of the 3rd category of emissions collaboration with partners may be necessary to collect the relevant data
4. Reporting
5. Monitoring and updating
6. Certification?

74

74

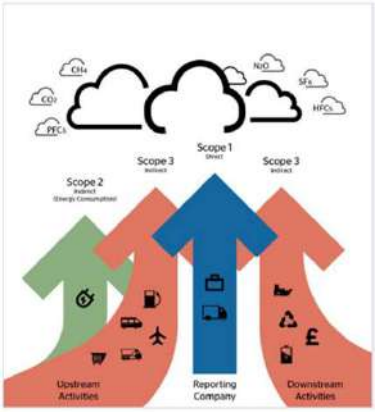
Module 4.7

Carbon footprint calculation – emission scope and boundaries

Emissions are typically categorized into scopes

- **Scope 1** – direct emissions occurring from sources owned or controlled by the organization. Examples are fuel and vehicle use and refrigerant losses
- **Scope 2** – indirect emissions associated with the purchase of electricity, steam, heat or cooling
- **Scope 3** – indirect emissions associated with activities occurring across a company's value chain – outside of its direct influence

Companies usually start with identifying their scope 1 and 2 emissions.



75

75

Module 4.7

Carbon footprint calculation

- Measurements should include 100% of scope 1 direct and scope 2 indirect emissions from the company's operation. For scope three an organizational **boundary** needs to be established.
- Define what operations should fall under the scope of the carbon footprint
- Report emissions based on equity share or control approach
  - Equity Share – reflects economic interest. Under this approach, companies account for emissions from activities according to its share of equity in that operation.
  - Control Approach – company accounts for all emissions from activities over which it has control. Control may be defined as either financial or operational control
- Companies with simple corporate structure without joint operations, the boundary will likely be the same whichever approach is used

76

76

Module 4.7

Carbon footprint calculation

- Calculation will follow the structure as shown below.
- Typical activity data:
  - **Energy Consumption** – electricity and fuels used by the organisation.
  - **Vehicle Use** – companies should account for emissions from company-owned vehicles. The distinction of company-owned here is crucial – emissions from vehicles not owned by the organisation should be accounted for as value-chain emissions within Scope 3.
  - **Fugitive Gases** – emissions occurring due to leaks of greenhouse gases from your equipment or processes. Common examples are refrigerants used in air conditioning or coolers that often have high climate impact.
- An **emission factor** reflects the emissions intensity of an operation or activity. An appropriate emission factor will need to be selected to link each of the activities to their associated emissions. National agencies usually publish main emission factors for free.

77

77

Module 4.8

Module 4.8 – Practical examples of ESMs from Audit2measure

78

78

Module 4.8

Practical examples of ESMs

These practical examples of energy saving measures include different technologies and approaches from A2M partners identified at existing companies:

- Lighting modernization
- Energy management system
- PV installation
- Heat recovery
- Biogas boiler
- Optimisation of the (air) supply network

79

79

Module 4.8

Lighting modernization (ENVIROS)

Modernization of lighting systems using modern types of lights is a very effective way to reduce electricity consumption. It is a relatively inexpensive measure, which, however, brings an interesting saving both in energy and operating costs.

E.g. the replacement of 431 existing discharge lamps with a power of 220W for industrial LED lights with a power of 100W.

Key figures	
Capital expenditures (CAPEX – k€)	192.3
Primary energy savings (toe/year)	61.0
CO_2 savings (tCO_2/year)	235.74
Payback period of investment	3.1

80

80

Module 4.8

Energy management system (ENVIROS)

The goal of EM is to optimize energy consumption through analysis of secondary measurement.

The basic element of the EMS is the addition of the existing level of secondary metering

A cloud monitoring system will be used for the evaluation, which enables future modifications, expansion, compatibility, wide support from the supplier, etc.

From the obtained and processed data, it is possible to carry out a detailed analysis and to respond to deviations in energy consumption and solve their cause from the predicted trends.

Key figures	
Capital expenditures (CAPEX – k€)	95.2
Primary energy savings (toe/year)	29.4
CO_2 savings (tCO_2/year)	15.48
Payback period of investment	5.3

81

81

Module 4.8

PV installation (ENVIROS)

A photovoltaic power plant produces electricity for the company‘s own consumption.

It can be placed on the roof of administrative buildings or production halls (preferred) or on available land).

The average efficiency of electricity production is around 20%

Key figures	
Capital expenditures (CAPEX – k€)	435.7
Primary energy savings (toe/year)	73.0
CO_2 savings (tCO_2/year)	280.84
Payback period of investment	17.9

82

82

Module 4.8

Heat recovery by installing an economizer (ESCAN)

Installation of an economizer on both steam boilers.

Economizers are installed in the flue pipe, where the feed water is preheated by a heat exchanger, increasing the efficiency of the system by up to 4%.

The exhaust gases are at approximately 200 ºC and pass through the heat exchanger where the raw water from the grid (15-20ºC) goes through the other side of the exchanger.

It is recommended to check in advance the space available for the heat exchanger, as this equipment has a certain size.

Key figures	
Capital expenditures (CAPEX – k€)	71.9
Primary energy savings (toe/year)	16.0
CO_2 savings (tCO_2/year)	38.02
Payback period of investment	6.3

83

83

Module 4.8

New biogas boiler (HERA)

The measure consists in the installation of a boiler to produce technical steam at 18 bar, which feeds the medium and low-pressure lines of the plant.

The boiler is fed with the biogas obtained from the anaerobic digestion of the wastewater generated in the factory, containing residuals of the yeast production from beetroot's molasses.

The measure allows to reduce the facility's intake of natural gas employed for the steam production.

Key figures	
Capital expenditures (CAPEX – k€)	600
Primary energy savings (toe/year)	1 033
CO_2 savings (tCO_2/year)	2 492
Payback period of investment	1

84

84

Module 4.8

Optimization of the supply network (ADELPHI)

Compressed air systems require a significant amount of energy, usually electricity, of which most is lost as waste heat and leakages.

Optimization measures for compressed air supply networks are:

- High quality network components: replace deteriorated or low-quality connectors
- Condensate separators: the main lines should have a slope of 1 m / 100 m with drainage points every 30 m
- Efficient design: Loops lower flow speed, reducing pressure losses, and make it easier to expand or modify the system.
- Adequate pipe dimensions: To avoid excessive pressure losses, a flow speed of 6.0 m/s should not be exceeded.

Key figures	
Capital expenditures (CAPEX – k€)	17.5
Primary energy savings (toe/year)	24.3
CO_2 savings (tCO_2/year)	113
Payback period of investment	1

85

Module 4.8

Heat recovery from compressors (ENVIROS)

Waste heat from compressors represents a very interesting potential, which corresponds to approximately 60% of the electrical input of the compressor.

Waste heat in the compressor is generated during air compression and is removed by the grease oil through the oil/air cooler to the surroundings.

E.g.: The installed electrical input of the compressors is 145 kW with a possible heat output of 87 kW. With a calculated electricity consumption of 583 MWh/year, the amount of waste heat represents 350 MWh/year. Waste heat also has interesting potential from the point of view of the temperature level, which is approximately 70 °C.

Key figures	
Capital expenditures (CAPEX – k€)	74.72
Primary energy savings (toe/year)	32.0
CO_2 savings (tCO_2/year)	70.96
Payback period of investment	3.7

86

86

Module 4.8

Conversion to dark radiators (ADELPHI)

Dark infrared radiators are an effective solution for large and hard-to-heat industrial spaces, enabling controlled directional space heating regardless of cold draughts and air flow.

This makes them 30 to 70 % more energy efficient than conventional heaters which allows for short amortization periods and can be operated with various energy carriers such as methane, biogas or green hydrogen.

They can be used as a complement to other energy efficient space heating systems such as condensing boiler technologies or as a standalone solution.

Key figures	
Capital expenditures (CAPEX – k€)	57.3
Primary energy savings (toe/year)	16.1
CO_2 savings (tCO_2/year)	36.5
Payback period of investment	1

87

87

AUDIT2MEASURE

Thank you.

For more info, visit our website or contact us:

https://ieecp.org/projects/audit-to-measure/

Michael.tendonkelaar@enviros.cz

#AUDIT2MEASURE

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

88

AUDIT2MEASURE

Audit and Technical Assistance Financing Netherlands

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Module 5

Overview

This block provides knowledge on energy audits, the applicable national rules and regulations, an introduction to the European Energy Efficiency Directive (EED), available technical assistance (before the investment implementation), general information on how to manage financing of energy audits and presents several feasibility studies of ESMs as examples to help guide you through the topic.

2

2

Module 5

Audit and Technical Assistance Financing

Introduction - Netherlands

Structure of this module:

5.1 Environment and Planning Act (Omgevingswet)
5.2 Energy Efficiency Directive (EED)
5.3 Energy Saving Obligation (Energiebesparingsplicht)
5.4 Summary & Financing Options

3

3

5.1 Environment and Planning Act (Omgevingswet)

The Environment and Planning Act

- Effective as of January 1st, 2024
- Simplify Dutch environmental legislation
- Replaces 15 existing laws (Activiteitenbesluit milieubeheer)
- Reduced rules and regulations
- Support environmental studies
- Enable faster decision making
- Align with EU regulation

4

4

5.1 Environment and Planning Act (Omgevingswet)

The Environment and Planning Act

3 Examples:

1. Environmental plan for authorities
2. One-stop-shop
3. Fewer studies

- Van Activiteitenbesluit milieubeheer naar
  Besluit activiteiten leefomgeving en Besluit bouwwerken leefomgeving
  - Splitsing gebouw en activiteit
  - Begrip inrichting vervalt

- Begrip milieubelastende activiteit:
  "een activiteit die nadelige gevolgen voor het milieu kan hebben"
  Milieubelastende activiteiten hoofdstuk 3 Bal - Informatiepunt Leefomgeving (iplo.nl)

5

5.1 Environment and Planning Act (Omgevingswet)

Better alignment with EU

6

6

5.1 Environment and Planning Act (Omgevingswet)

Transition period – 2024-2032

Step-by-step introduction

- 'Waterschappen' -> January 2026
- Municipalities -> January 2027
- Complete transition as of January 2032

7

7

5.2 Energy Efficiency Directive (EED)

Energy Efficiency Directive (EED)

European Directive on Energy Efficiency of member states:

- Aim is to meet the 2030 target of reducing GHG emissions by 55%
- Several revisions over the years
- Latest revision in 2023
- Energy Efficiency first (EE1st)

8

8

5.2 Energy Efficiency Directive (EED)

Mandatory Audit reports and EnMS

- Large energy consuming companies
- Mandatory audits for annual consumption of 10 TJ
- Mandatory Energy Management System (EnMS) for 85 TJ
- Energy Auditor requirements

The EED Introduced the mandatory Energy Efficiency Audit for large energy consuming companies

9

9

5.2 Energy Efficiency Directive (EED)

Timeline 2012-2023

September 2023 — The revised directive was published in the EU Official Journal and entered into force on 10 October 2023.

July 2023 — Formal agreement of the revised Energy Efficiency Directive

May 2022 — The REPowerEU Plan proposing to raise the energy efficiency targets further

July 2021 — Commission proposal for a recast of the directive, part of Fit for 55 package

December 2018 — Agreement of the amending energy Efficiency Directive 2018/2002

Hide 2 items

November 2012 — Directive on Energy Efficiency 2012/27/EU

10

5.2 Energy Efficiency Directive (EED)

EED in the Netherlands

Who enforces the EED audit obligation?

- The Netherlands Enterprise Agency (RVO)
- Evaluates all submitted reports
- Late submissions can receive fines / non-compliance penalties.
- The EED audit happens every 4 years

The EED Audit is an additional requirement for large energy consumers that goes on top of the 'Informatieplicht' en 'onderzoeksplicht' of companies

11

11

5.2 Energy Efficiency Directive (EED)

EED Criteria

How do you meet the EED Audit Obligation?

- 250 employees (FTE)

or

- Annual turnover of €50 million

12

12

5.2 Energy Efficiency Directive (EED)

What does the report contain?

- A description of activities
- An overview of energy flows
- Important factors for energy use
- A calculated energy saving potential
- A list of energy saving measures

The EED report requirements overlap with the requirements set by the (national) Energy Saving Obligations

13

13

5.2 Energy Efficiency Directive (EED)

Possible Exemptions

- ISO 50.001 certification or ISO 14.001 certification + ISO 14.051
- Quality labels approved by the Dutch Ministry of Economic Affairs
- Allows for granularity at the level of business locations

Vrijstelling voor:	ISO 50.001	CO_2 prestatieladder
• EED auditplicht • Onderdelen onderzoeksplicht	of	Keurmerk Erkend Duurzaam
	ISO 14.001 icm 14.051	CO_2-reductiemanagement met ISO 14001
		Fastlane

14

5·3
Energy Saving Obligation

The Energy Saving Obligation

1. Energy Saving Notification Obligation
2. Energy Saving Investigation Obligation

A Step-by-step tool is provided to investigate which (of the three) obligations your company is subject to via (Dutch):

https://infographics.rvo.nl/stappenplan/

15

15

5·3
Energy Saving Obligation

Investigation Obligation

16

16

5·3
Energy Saving Obligation

Investigation Obligation

7

17

5·3
Energy Saving Obligation

EED vs Energy Saving Obligation

- Overlaps exist between the two obligations
- Differences are:
  - The EED obligation is more extensive.
  - The Energy Saving Investigation Obligation asks unused heat flows
  - The Energy Saving Investigation Obligation knows additional cost-effective measures
  - Calculations of the payback period
  - Implementation plan for measures with a payback period of five years or less.

A Template provided combining the national and EU obligations.

18

18

5·3
Energy Saving Obligation

EED vs Investigation Obligation

EED audit

- Inventarisatie kosteneffectieve maatregelen
- Per onderneming
- Processen, gebouw en zakelijk vervoer
- Energiebesparing

Onderzoeksplicht

- Inventarisatie maatregelen met een terugverdientijd van 5 jaar
- Per milieubelastende activiteit (per vestiging)
- Processen
- Energiebesparing, hernieuwbare opwek, overstap andere energiedrager

\+ - Aandrijfsystemen, isolatie, basislijst
- Overzicht getroffen maatregelen
- Uitvoeringsplan
- Beschrijving structurele energiezorg

19

19

5·3
Energy Saving Obligation

Changes introduced in 2023

Additional measures were added:

Nu:

- het verplicht treffen van alle energiebesparende maatregelen met een terugverdientijd van 5 jaar of minder.
- Vanaf een jaarverbruik van 50.000 kWh elektriciteit of 25.000 m3 aardgasequivalent
- EU ETS en vergunningplichtige bedrijven uitgezonderd.

Vanaf 2023:

- Naast besparing ook eigen opwek en overstap naar andere energiedrager verplicht (terugverdientijd 5 jaar)
- Ondergrens blijft bestaan
- Doelgroep uitgebreid naar EU ETS en vergunningplichtige bedrijven
- Onderzoeksplicht grote gebruikers (relatie EED audit) – indieningsdatum 1-12-2023
- Doelmatig beheer en onderhoud verplicht
- Geen plicht voor zelfvoorzienende bedrijven

20

20

5·3
Energy Saving Obligation

Changes introduced in 2023

Uitgangspunten aanpassing energiebesparingsplicht

- CO_2-reductie borgen
- Eigen hernieuwbare opwek opnemen
- Aansluiten bij Omgevingswet
- Aandacht voor lasten en uitvoerbaarheid (met name voor MKB)
- Aandacht voor handhaafbaarheid
- Uitbreiding doelgroep

21

21

5·3
Energy Saving Obligation

3 important considerations

Besides the update of the energy saving obligation:

- Terugverdientijdmethodiek
- Actualisatie van de Erkende Maatregelenlijsten
- Uitwerken nieuwe onderzoeksplicht voor energie-intensieve bedrijven

22

22

5·3
Energy Saving Obligation

Rate of Return Calculation

Terugverdientijdmethodiek

- Bepaling CO_2-emissie (Elektriciteit CBS integrale methode)
- Kosten meerinvestering
- Kostenbesparing (incl. vastgestelde energietarieven)
- Maatwerkmethode voor grote bedrijfsspecifieke maatregelen
  Eigen tarieven | Advieskosten

23

23

5·3
Energy Saving Obligation

Update 'Energy List'

Actualisatie Erkende Maatregellijsten (EML)

Aanpassen:

- Systematiek Omgevingswet
- Energieprijzen
- Stand der techniek

24

24

5.4 Summary & Financing Options

In Summary

Drie plichten

Informatieplicht
Vestigingen (gebouw en activiteiten) met gebruik
> 50.000 kWh of
> 25.000 m³

Onderzoeksplicht
Vestigingen met gebruik
> 10.000.000 kWh of
➢ 170.000 m³
(activiteiten afd. 3.3 t/m 3.11 Bal)

EED-auditplicht
Ondernemingen met
> 250 fte
en/of omzet en
balanstotaal

25

25

5.4 Summary & Financing Options

3 potential obligations!

Drie plichten

Informatieplicht Energiebesparing	Afhankelijk van de grootte van uw onderneming valt de onderneming onder de EED-auditplicht. Vestigingen van uw onderneming vallen onder de Informatieplicht en/of de Onderzoeks-plicht afhankelijk van het energiegebruik van de vestiging
Onderzoeksplicht Energiebesparing	Gebouwen vallen altijd onder de Informatieplicht (de rapportage moet door de gebouweigenaar ingediend worden)
EED-auditplicht	Er is overlap tussen de Onderzoeksplicht en de EED-auditplicht
	De provincie of gemeente is het bevoegd gezag voor Informatie en Onderzoeksplicht. RVO voor de EED-auditplicht

26

26

5.4 Summary & Financing Options

Available reporting templates

27

27

5.4 Summary & Financing Options

Conversion factors

The conversion factors used in your energy calculations, to GJ:

Electricity	1 kWh =	0,0036 GJ
Natural Gas	1 Nm^3 =	0,03165 GJ
Heat	1 GJ = 1	GJ
Gas/diesel	1 liter = 0,036	GJ
Petrol	1 liter = 0,032	GJ

28

28

5.4 Summary & Financing Options

Financing options

1. Energie-investeringsafrek (EIA)
2. Versnelde Klimaatinvesteringen in de Industrie (VEKI)
3. Milieu-Investeringsaftrek (MIA)
4. Willekeurige afschrijving milieu-investeringen (Vamil)

Costs for the Audit can (potentially) be included in the EIA

More info on the available financing options in Module 6

29

29

AUDIT2MEASURE

Thank you.

For more info, visit our website or contact us:

www.ieecp.org

erik@ieecp.org | ivan@ieecp.org

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

30

AUDIT2MEASURE

ESM Financing in Partner Countries Netherlands

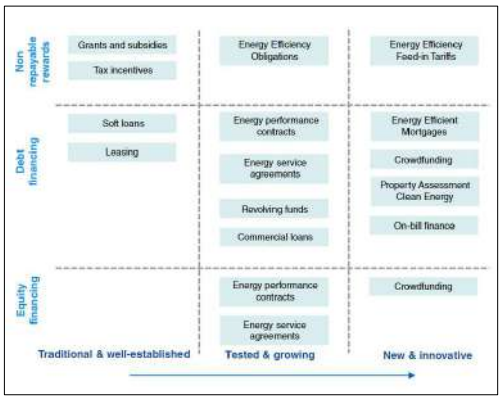
Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

6.1 Financial Mechanisms – Public and Private

General Financing Options

- Three main options available for financing policy instruments aimed at promoting energy saving measures (ESMs):
  - ❑ Public budget, taxes or other funds financed from **public sources** (subsidies, tax incentives)
  - ❑ Allocating the cost of ESMs to **energy prices** (pay-as-you-go financing, e.g. energy efficiency obligation schemes)
  - ❑ By means of **investor capital** (pay-as-you-save financing, for example Energy Performance Contract)



Bertoldi, P., Economidou, M., Palermo, V., Boza-Kiss, B. and Todeschi, V., How to finance energy renovation of residential buildings: Review of current and emerging financing instruments in the EU (2020)

2

2

6.1 Financial Mechanisms – Public and Private

Public Financing – General Aspects

Grants

- Grants are forms of financial assistance used to address inadequate market investments and to overcome upfront cost barriers.
- Grant allocations cover all (or most) of the costs incurred by the beneficiaries in executing the activities and are typically non-repayable, provided that the beneficiary complies with the contractual terms.
- Grants constitute a significant portion of the European Union's budget and eligible organizations typically apply for grants by submitting ideas for projects following a 'Call for proposals'.
- Examples of EU grant-based funding programmes relevant for industrial energy efficiency:
  - Horizon Europe (Research and innovation projects)
  - Innovation Fund (Research and innovation projects)
  - LIFE-Clean Energy Transition (Projects addressing structural and organizational barriers)

3

3

6.1 Financial Mechanisms – Public and Private

Public Financing – General Aspects

Subsidies

- Subsidies are financial instruments directed towards specific sectors, businesses, or individuals to achieve particular economic, social, or environmental goals.
- They are typically provided by national or regional authorities.
- Subsidy schemes are often affected by the issue of **Free riders,** i.e. subjects who would have undertaken energy efficiency projects even without subsidies

4

4

6.1 Financial Mechanisms – Public and Private

Public Financing – General Aspects

Tax Incentives

- Taxation can be used to promote energy efficiency through incentives such as tax exemptions, allowances, and benefits. The incentive regime may be related to the capital gain tax, VAT or free depreciation.
- Tax schemes can have a positive impact on new, innovative technologies, by allowing for frequent updates of the eligible ESMs.
- In order to establish the exact amount of tax exemption, a certain level of knowledge of the industry's cost structure is required.
- The amount of tax exemption usually decrease progressively with the size of the company (it is higher for SMEs).

5

5

6.1 Financial Mechanisms – Public and Private

Public Financing – General Aspects

Energy Efficiency Obligation Schemes

- EEOS are market-based instruments setting an obligation on energy companies (energy distributors or suppliers/retailers) to achieve energy savings targets.
- EEOS only define a given **energy-saving target to be reached**, leaving complete freedom to private sector agents to choose the means to achieve it.
- In some MS (e.g. Italy and France), when the energy-saving target is reached, the company receives a **white certificate** that can be traded with companies that haven't met the energy-saving target.
- The obligated organizations can cover their expenses by charging consumers through energy bills or regulated tariffs in the case of regulated distribution companies. Since the funding doesn't rely on public spending, these plans are not influenced by budget cuts.

6

6

6.1 Financial Mechanisms – Public and Private

Public Financing - EU Level

NextGenerationEU

- NextGenerationEU is an EU economic recovery package designed to support the EU member states in recovering from the COVID-19 pandemic and to drive the digital and green transformation of the EU.
- It includes investments aimed to make Europe the first climate-neutral continent by 2050: the total allocated funds amount to **€750 billion**.
- Along with the Commission's Multi-annual Financial Framework 2021-2027, it will co-finance energy efficiency investments in the EU through 3 different funds: **Recovery and Resilience Facility,** Cohesion funds and the Modernisation Fund.

7

7

6.1 Financial Mechanisms – Public and Private

Public Financing - EU Level

Recovery and Resilience Facility

- The Recovery and Resilience Facility (RRF) **provides funds to Member States** through a combination of loans and grants to implement reforms and investments that align with EU priorities.
- The allocated budget is of €385 billion in loans and €338 billion in grants (723 in total).
- Pillar 1 is Green Transition, which focuses on focusing on green technologies and capacities - sustainable mobility, **energy efficiency** and renewables, climate change adaptation; circular economy; and biodiversity

8

8

6.1 Financial Mechanisms – Public and Private

Public Financing - EU Level

Grants - Horizon Europe

- **Horizon Europe**, successor of the Horizon 2020 programme, is the European Union's key funding program for research and innovation, with a budget of over €95.5 billion for the period of 2021-2027
- **Horizon Europe**'s Cluster 5 (Climate, Energy and Mobility) is managed by the European Climate, Infrastructure and Environment Executive Agency (CINEA) has several areas of intervention, including *Buildings and industrial facilities in energy transition*
- Call for proposals under cluster 5 (and for the other EU funding programmes) can be found in the European Commission's Funding and Tenders Portal

9

9

6.1 Financial Mechanisms – Public and Private

Public Financing - EU Level

Grants – Innovation Fund

- The **Innovation Fund** is a funding programme managed by CINEA and aimed at supporting the demonstration of innovative low-carbon technologies
- The Fund is totally financed with the EU Emission Trading System and the total available funding is projected to be about €40 billion (2020-2030).
- The areas covered by funded projects are innovative low-carbon technologies and processes in energy-intensive industries, renewables, energy storage, net-zero mobility and buildings, hydrogen and CCUS.
- Examples of signed past and ongoing projects can be found at the Innovation Fund Dashboard

10

10

6.1 Financial Mechanisms – Public and Private

Public Financing - EU Level

Grants – LIFE Clean Energy Transition

- The LIFE Clean Energy Transition is included in the LIFE Programme (2021-2027) and is managed by CINEA.
- It has a budget of €1 billion with 5 areas of intervention:
  - Building national, regional and local policy frameworks
  - Accelerating technology roll-out, digitalisation, new services and business models
  - Attracting private finance
  - Supporting the development of local and regional investment projects
  - Involving and empowering citizens

11

11

6.1 Financial Mechanisms – Public and Private

Private Financing – General Aspects

Loans

- Loans are a form of debt financing that provides liquidity and direct access to capital.
- Private debt finance for ESMs faces limitations due to financial institutions perceiving EE loans as high-risk investments and facing challenges like high transaction costs for small projects.
- For this reason, loans are typically financed with special lines of credit established by public entities and providing funds at low interest rates to local financial institutions, allowing for risk sharing between public and private bodies.

12

12

6.1 Financial Mechanisms – Public and Private

Private Financing – EU Level

European Investment Bank (EIB)

- The EIB provides loans to the private sector in the form of direct or intermediated loans.
- **Direct corporate loans** are suited for very large investments and typically start at €25 million, covering up to 50% of a project's total cost.
- **Intermediated loans** are provided to financial institutions which then borrow to final beneficiaries (SMEs, mid-caps or large corporates). These loans can be used to finance small investments in ESMs like tangible and intangible assets, including purchase or renovation.
- The EIB provides an online catalogue of financial intermediaries available in the EU.

13

13

6.1 Financial Mechanisms – Public and Private

ESM Public Financing – the Netherlands

14

14

6.1 Financial Mechanisms – Public and Private

Energie-investeringsaftrek (EIA)

- EIA stands for Energy-Investment Allowance and allows companies to receive a tax deduction for specific investments
- The tax scheme is administered by the Netherlands Enterprise Agency '*Rijksdienst Voor Ondernemend Nederland*' (RVO) and by the Tax Administration '*Belastingdienst*'
- Through the EIA, companies can receive a tax deduction for defined and tailor-made investments resulting in substantial energy savings

15

15

6.1 Financial Mechanisms – Public and Private

Energie-investeringsaftrek (EIA)

General features

- The EIA is a scheme for companies, not for private individuals, associations or foundations
- Companies can deduct **45.5% of the investment costs from the taxable profit,** on top of depreciation
- Conditions to qualify for EIA:
  - You are an entrepreneur in the Netherlands, Aruba, Curacao, Sint Maarten or the BES Islands.
  - You pay income tax or company tax.
  - The ESM you want to implement is included in the Energy List 2023 and meets the listed requirements.
  - The investment for the ESM is **minimum of €2500 and maximum of € 136 million** per year.
  - The ESM has not been implemented before.
  - You report the investment on time, within 3 months after the order to supply.

16

16

6.1 Financial Mechanisms – Public and Private

Energie-investeringsaftrek (EIA)

Deduction calculation example

- Suppose that your company has a taxable profit of € 200.000 and corporate tax amounts to 25.8 %.
- The ESM you have selected for your company costs € 50.000
- EIA covers 45.5% of the ESM cost, i.e. € 22.750
- The taxable profit is reduced to: € 200.000 – 22.750 = € 177250
- Corporate tax WITHOUT EIA: € 51.600
- Corporate tax WITH EIA: € 45.730
- **The EIA benefit is € 5.870 (11.7% of the ESM cost)**

17

17

6.1 Financial Mechanisms – Public and Private

Energie-investeringsaftrek (EIA)

- **Eligibility of costs**
  - **Purchase costs,** including purchase of new materials for adjustments to existing assets
  - **Labor costs,** e.g. for employees and contractors for the production or installation of the asset
  - **Costs for energy advise** (see next)**,** i.e. an exploration of the possibilities to improve the energy efficiency of your existing commercial building or business process. The energy advise must be recorded in an advisory report.
- **Non-eligible costs**
  - **Costs for land**
  - **Maintenance costs**

18

18

6.1 Financial Mechanisms – Public and Private

Energie-investeringsaftrek (EIA)

Eligible ESMs

- ESMs eligible for the EIA include assets that meet energy performance requirements and promote efficient use of energy.
- Each ESM is encoded and listed in detail in the *Energielijst 2023 – Chapter 3*
- The eligible energy investments may fall into the following macro-categories and technologies:
  - **Business buildings**: heating (heat pumps), adiabatic cooling, energy efficient ventilation, insulation, LED lighting, drives
  - **Processes**: energy efficient heating, cooling and ventilation, insulation, drives, energy efficient dryers, waste heat utilization
  - **Transportation**: heating and cooling for vehicles, electric motors, energy reuse
  - **Renewable energy**: heating (solar collectors, ground heat exchangers), PV systems, battery storage
  - **Energy balancing**: Power to gas, power to heat, smart grids, heat storage
  - **Energy advice**

19

19

6.1 Financial Mechanisms – Public and Private

Energie-investeringsaftrek (EIA)

Compatibility with other subsidy schemes

- If an investment is eligible for both EIA and MIA (Environmental investment deduction), **you must choose one of the two schemes or split the investment costs into an EIA and an MIA part**.
- The ISDE (Sustainable Energy Investment Subsidy) scheme includes assets that are also on the *2023 Energielijst*. **It is not possible to apply to both schemes with the same ESM**.
- It is possible to apply for both EIA and SDE+(+) (Stimulation of Sustainable Energy Production and Climate Transition), **only if a part of the project costs are not covered by SDE+(+)**.
- EIA **is not compatible with the SCE** (Subsidy Scheme for Cooperative Energy Generation)

20

20

6.1 Financial Mechanisms – Public and Private

Energie-investeringsaftrek (EIA)

Energie-investeringsaftrek (EIA)

How to apply

- The procedure for the application involves reporting digitally your investment, per type of asset, via the online portal eLoket (RVO): https://mijn.rvo.nl/eloket/login-start.html
- Further details about the platform functionalities are available at: https://english.rvo.nl/topics/about-us/doing-business/eloket-and-eherkenning

21

21

6.1 Financial Mechanisms – Public and Private

Versnelde klimaatinvesteringen industrie (VEKI)

- The Accelerated Climate-related Investments in Industry (VEKI) is a subsidy scheme for industrial companies that want to implement CO_2-saving investments with **a payback period of more than 5 years**.
- The subsidy is intended for investments in proven CO_2-reducing techniques
- The subsidy scheme will end in January 2024.

22

22

6.1 Financial Mechanisms – Public and Private

Versnelde klimaatinvesteringen industrie (VEKI)

- **Subsidy rate for energy efficiency projects (ESMs) amounts to 30% of the eligible costs,** with a maximum subsidy of €15 million per project
- Additional +10 percentage points are foreseen for medium-sized enterprises, with a final +20 percentage points bonus for small enterprises
- The overall subsidy rate for ESMs carried out by small enterprises is thus 60%
- The minimum subsidy for eligibility must be €30.000 for SMEs and €125.000 for large companies.

23

23

6.1 Financial Mechanisms – Public and Private

Versnelde klimaatinvesteringen industrie (VEKI)

Eligible projects

- The investment must have a paypack time of more than 5 years.
- The calculation of payback period must be performed with company-specific energy prices from the most recent energy contract.
- The ESM must have proven its effectiveness in similar projects.
- The project must be implemented within 3 years after the start of activities and cannot start before submitting the subsidy application.

Non-Eligible projects

- Projects in compliance with already established and not yet applicable EU standards.
- Projects for the use of renewable energy sources and fall under Article 41 of the General Block Exemption Regulation.
- Biofuel or CCUS projects.
- Projects that are only the pre-engineering of an installation.

24

24

6.1 Financial Mechanisms – Public and Private

MIA/Vamil

- MIA (Environmental Investment Deduction) and Vamil (Arbitrary depreciations of environmental investments) offer tax benefits for entrepreneurs who invest in environmentally friendly business assets.
- These tax schemes administered by the Netherlands Enterprise Agency '*Rijksdienst Voor Ondernemend Nederland*' (RVO).
- MIA and VAMIL are two different schemes but are often combined.

25

25

6.1 Financial Mechanisms – Public and Private

Milieu-investeringsaftrek (MIA)

- MIA, similarly to EIA, offers entrepreneurs the opportunity to reduce the taxable profit implementing investments with environmental benefits.
- Businesses can deduct **27%, 36% or 45% of the investment amount** from the profit.
- The percentage of the deduction depends on the environmental effects and the class of the project (from A to G).
- The eligible investments are reported in the *Environmental List*, updated every year by the Ministry of Infrastructure and Water Management and RVO.
- The investments present on the list
  - Have a larger environmental benefit in the Netherlands compared to common alternatives
  - Are more expensive than the common alternatives
  - **Are not limited to energy, thus ESMs represent just a minority of the eligible investments**

26

26

6.1 Financial Mechanisms – Public and Private

MIA \ Vamil

Milieu-investeringsaftrek (MIA)

- **Eligible cost categories** are the same as for EIA
- The project investment cost must be minimum of €2500 and maximum of €50 million.
- Potentially eligible ESMs technologies are very limited and involve electric and hydrogen powered transportation and working vehicles and machines, Cadmium and Fluorine-free solar panels, utility buildings with sustainability certifications (such as DGNB certification)

27

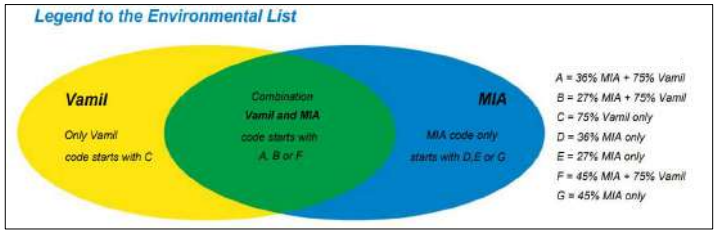
27

6.1 Financial Mechanisms – Public and Private

MIA \ Vamil

Willekeurige afschrijving milieu-investeringen (Vamil)

- With the Vamil, businesses can write off an investment at any time. The random depreciation is limited to 75%.
- By depreciating more quickly, businesses can reduce their taxable profit and thus pay less tax in that year, offering liquidity advantages.
- MIA and Vamil are often combined and both are based on the *Environmental List* for the eligible investments



28

28

6.1 Financial Mechanisms – Public and Private

ESM Private Financing – the Netherlands

29

29

6.1 Financial Mechanisms – Public and Private

Private Financing for ESMs

DLL Group

- It offers loans with beneficial interest rates co-financed by the EIB with minimum term of 2 years, from small projects up to €25 million.
- SMEs, Mid-caps and large industrial companies are eligible to apply.
- The loan can be used for:
  - Tangible investments: purchases of plant and equipment, with exceptions concerning land purchases.
  - Intangible investments, such as expenditure in R&D
- The application is examined and approved by DLL.

30

30

6.1 Financial Mechanisms – Public and Private

Private Financing for ESMs

ING Bank N.V.

- It offers loans with interest rate discount (0.6%) co-financed by the EIB for projects in the following areas:
  - Energy transition
  - Making buildings more sustainable (for own use)
  - Circular entrepreneurship
  - Sustainable mobility
- Companies with fewer than 3000 employees (excluding specific sectors) are eligible to apply.
- Consultation may be requested through ING website.

31

31

6.1 Financial Mechanisms – Public and Private

Private Financing for ESMs

Rabobank – Rabo Green Loan

- Business loan for sustainable projects with interest rate discount determined by the bank depending on the investment.
- Eligibility is assessed by RVO, based on the Green Project Regulations.
- ESMs categories eligible are Process intensification, Cooling and freezing and beneficial use of residual energy.
- The maximum term of the loan is ten years.
- Loans are available for a minimum of €25,000.

32

32

6.1 Financial Mechanisms – Public and Private

Private Financing for ESMs

Rabobank – Rabo Impact Loan

- Loans with interest rate discount (1.1%) co-financed by the EIB and limited to companies in possession of a sustainability label (e.g. EU EcoLabel). The complete list of eligible labels is available on the website.
- Eligible companies must employ at most 3000 employees (Full-time Equivalent)
- The term of the loan is five or ten years.
- Loans are available for a minimum of €250000 and a maximum of €7.5 million.

33

33

6.1 Financial Mechanisms – Public and Private

EPC – Energy Performance Contracting – General Aspects

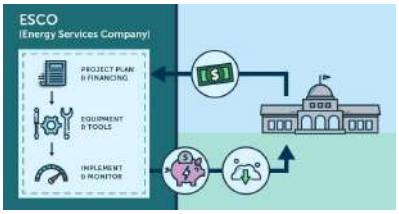
34

34

6.2 Energy Performance Contracting (EPC)

ESCOs and Energy Performance Contracts

- Energy Service Companies (ESCOs) are firms that provide energy services, such as the implementation of energy efficiency and renewable energy projects.
- The remuneration of ESCOs is directly tied to the energy savings achieved.
- ESCOs absorb performance and sometimes credit risks, providing the end-user with a way to invest in energy improvements without significant risks.



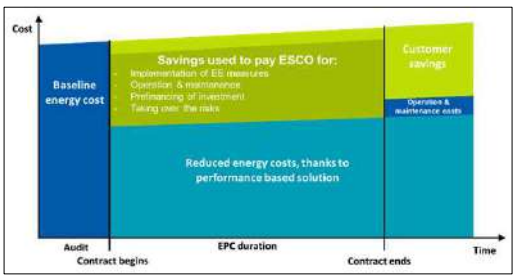
35

35

6.2 Energy Performance Contracting (EPC)

ESCOs and Energy Performance Contracts

- Energy Performance Contracting (EPC) is a form of financing allowing funding energy upgrades from cost reductions.
- Under an Energy Performance Contract, ESCOs implement energy efficiency (or renewable energy) projects and repay the costs with the income generated by the cost savings.
- The ESCO will be remunerated only if the project brings to the expected energy savings.



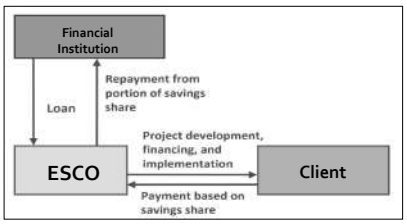
36

36

6.2 Energy Performance Contracting (EPC)

EPC Models: Shared Savings

- In the Shared Savings model, the ESCO and the client (facility owner) share the actual savings resulting from the implemented energy efficiency measures.
- The ESCO typically covers the ESM upfront costs by means of a financial institution.
- The client and the ESCO agree on a pre-determined percentage of the achieved savings that will remunerate the ESCO.
- There are no guarantees for the owner to receive the last share of savings, but **the advantage is that the ESCO assumes performance and credit risk.**



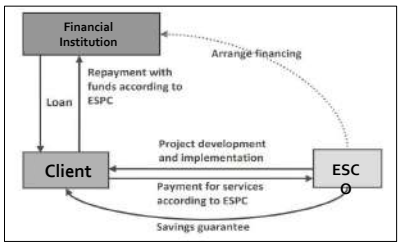
37

37

6.2 Energy Performance Contracting (EPC)

EPC Models: Guaranteed Savings

- In the guaranteed savings model, the ESCO guarantees a certain level of savings to the client as a result of the implemented ESM.
- If the actual savings fall short of the guaranteed amount, the ESCO is often contractually obligated to cover the shortfall, either through additional efficiency measures or financial compensation. **The client is thus protected from performance risk.**
- The client is responsible for paying the ESCO a fixed fee over a specified contract term, regardless of the actual savings achieved.
- **The financial institution directly finances the client for ESM implementation**.



38

38

EPC Models: Shared vs Guaranteed Savings

Shared Savings EPC	Guaranteed Savings EPC
Performance linked to cost of energy savings	Performance related to level of energy saved
Ensures that the energy savings cover debt service obligations	Payments to ESCO depend on energy price, reliance on energy price fluctuations can be risky for the ESCO
ESCO assumes **performance and credit risk**	ESCO assumes only **credit risk**
Can serve customers that do not have access to financing	Requires creditworthy customer
Better for large ESCOs since they are able to be highly leveraged in more projects	Better for small ESCOs

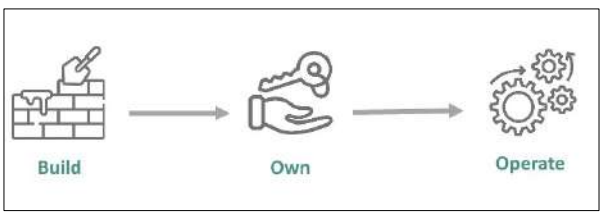
39

39

6.2 Energy Performance Contracting (EPC)

EPC Implementation: BOO

- In the Build-Own-Operate (BOO) model, the ESCO is permanently involved in the operation and possession of the investment.
- The ESCO is involved in designing, building, financing, owning and operating the installed equipment, **while the client purchases a specific energy service** from the ESCO.
- The ESCO owns the installed equipment.
- The ownership by the ESCO can lead to a long-term commitment to the performance of the equipment.



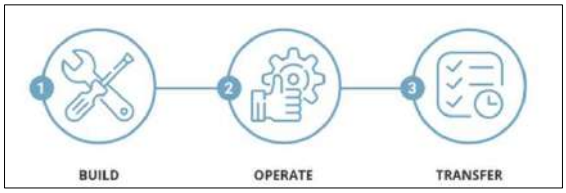
40

40

6.2 Energy Performance Contracting (EPC)

EPC Implementation: BOT

- In the Build-Operate-Transfer (BOT) model, the ESCO is responsible for designing, financing, and constructing the infrastructure project (**BUILD**).
- The ESCO operates and maintains the infrastructure for a predetermined concession period, during which they recoup their investment and generate a profit (**OPERATE**).
- At the end of the concession period, the operation of the infrastructure is transferred back to the client (**TRANSFER**).
- The ESCO is not the owner of the equipment during the service period.



41

41

6.2 Energy Performance Contracting (EPC)

EPC Implementation: BOOT

- The Build-Own-Operate-Transfer (BOOT) is a combination of the BOO and BOT models, in which the **ESCO owns and operates the equipment** for a pre-determined period of time.
- At the end of that period, the **operation and ownership are transferred back** to the customer.

42

42

6.2 Energy Performance Contracting (EPC)

European Code of Conduct for EPC (1/2)

- The EPC Code of Conduct is a set of values and principles considered fundamental for the implementation of EPC in EU contries.
- It also provides a quality indicator for customers that are willing to be served by EPC providers.

43

43

6.2 Energy Performance Contracting (EPC)

European Code of Conduct for EPC (2/2)

- The Code of Conduct contains 9 guiding principles for the implementation of high quality and transparent EPC:
  1. The EPC provider delivers **economically efficient energy savings**
  2. The EPC provider **assumes performance risk**
  3. **Energy savings are guaranteed** and determined by **Measurement and Verification** (M&V)
  4. The EPC provider supports the client in the **implementation of an Energy Management System**
  5. The relationship between the EPC provider and the Client is **long-term, fair and transparent**
  6. All steps in the process of the EPC project are conducted **lawfully and with integrity**
  7. The EPC provider supports the Client in **financing of the EPC project**
  8. The EPC provider ensures **qualified staff** for EPC project implementation
  9. The EPC provider focuses on **high quality and care** in all phases of project implementation

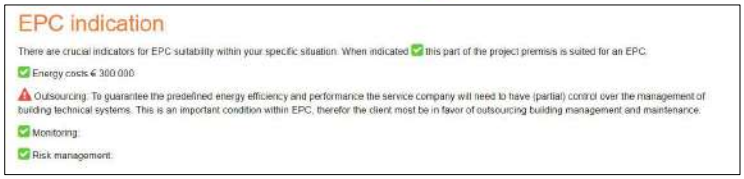
44

44

6.2 Energy Performance Contracting (EPC) - Netherlands

EPC PreCheck

- RVO's online tool **EPC PreCheck** provides decision-makers a way to assess if energy performance contracting may be useful for their company.



45

45

6.2 Energy Performance Contracting (EPC) - Netherlands

EPC step-by-step Plan

- The number of implemented EPCs in the Netherlands has been lower than expected in the recent years.
- RVO has developed a step-by-step plan to guide companies in the implementation of EPCs.
- The plan is articulated into 4 phases:
  - **Research** phase
  - **Preparation** Phase
  - **Tender** phase
  - **Contract** management

46

46

6.2 Energy Performance Contracting (EPC) - Netherlands

EPC Facilitators

- Facilitators are intermediary advisors between the client and the EPC provider (ESCO), providing **technical, financial and legal knowledge**.
- EPC facilitators can guide the clients through the EPC implementation process balancing the interest of the two parties without conflict of interests.
- A list of energy performance advisors can be found on the Central Register of Technology website.

47

47

AUDIT2MEASURE

Thank you.

For more info, visit our website or contact us:

www.ieecp.org

ivan@ieecp.org, erik@ieecp.org

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

48

ANNEX II – COUNTRY SPECIFIC SLIDES

- Module 2 – Audit regulations in the Czech Republic (Czech version) – 10 slides
- Module 5 - Audit and Technical Assistance Financing
    - Italian version with examples from Italy (7 slides)
    - Spanish version with examples from Spain (29 slides)
- Module 6 – ESM financing
    - Italian version with examples from Italy (23 slides)
    - Spanish version with examples from Spain (62 slides)

AUDIT2MEASURE

2. Energetický audit v ČR

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Povinnost zpracovat energetického auditu (EA) dle zákona 406/2000 sb.

§9 Energetický audit

Podnikatel s více než 250 zaměstnanci nebo s ročním obratem vyšším než 1,3 mld. Kč nebo bilanční sumou rozvahy 1,1 mld. Kč – platnost 4 roky

Podnikatel s roční spotřebou energetického hospodářství (EH) vyšší než 5 000 MWh

Česká republika, kraj, obec, příspěvková organizace, státní a veřejná vysoká škola a ČNB s roční spotřebou EH vyšší než 500 MWh

Povinnost podle odst. 1) se nevztahuje na podnikatele se spotřebou nižší než 200 MWh

Povinnost podle odst. 1 – 3) se nevztahuje ne osobu se zavedeným energetickým managementem dle ČSN EN ISO 50001

Energetický audit dle odst. 2 a 3) platí 10 let

2

2

Rozsah a zpracování energetického auditu

Energetický audit zahrnuje veškeré části EH (energetického hospodářství) auditované osoby

Způsob provedení EA se provádí v souladu s harmonizační normou ČSN EN ISO 50002

Energetický audit je zpracován ve formě písemné zprávy o provedeném EA

Musí být zpracován příslušným energetickým specialistou

Způsob zpracování zprávy o provedeném EA je prováděcí vyhl. 140/2021 Sb. o energetickém auditu

3

3

Vyhláška 140/2021 sb.

Vyhláška stanovuje obsah písemné zprávy a způsob jejího zpracování

Stanovuje údaje rozhodné pro povinný energetický audit

- Způsob stanovení:
  - Počtu zaměstnanců
  - Výše ročního obratu
  - Výše roční bilanční sumy rozvahy

Energetický audit je zpracován dle plánu EA dohodnutým mezi energetickým specialistou a zadavatelem před započetím EA. Obsah plánu EA je uvedený v Příloze č. 2 vyhlášky 140/2021 Sb.

4

4

Obsah zprávy o provedeném EA

Souhrn energetického auditu

- Identifikační údaje
- Souhrn příležitostí ke snížení energetické náročnosti
- Program realizace příležitostí ke snížení energetické náročnosti

Vymezení předmětu EA

- Energetický specialista specifikuje hranice hodnoceného EH a uvede přehled jednotlivých ucelených částí (UČEH), které stanovil a specifikoval (územním, organizačním nebo procesním členěním či kombinací)

5

5

Obsah zprávy o provedeném EA

Podrobnosti zprávy o provedeném EA

- Přehled užití a spotřeby energie EH zadavatele a jeho UČEH
  - Bilance energetických vstupů
  - Přehled užití energie všech UČEH – v minimálním rozsahu 2 ucelených roků (nebo 24 po sobě jdoucích měsíců)
  - Přehled ukazatelů energetické náročnosti
  - Analýzu užití energie významných spotřebičů
- Příležitosti ke snížení energetické náročnosti
  - Rozsah navržených příležitostí musí odpovídat plánu EA.
  - Bilance navržených příležitostí musí vykazovat min. úsporu 10 % spotřeby EH nebo 10 % v celkových emisích CO_2 se zohledněním synergických vlivů

6

6

Obsah zprávy o provedeném EA

Přílohy zprávy o provedeném EA

- Plán EA
- Seznam požadovaných a obdržených podkladů
- Plán měření a výstupy z měření, bylo-li plánováno a provedeno
- Soubor ilustrativních fotografií

7

7

Vzor tabulek v EA

Prováděcím právním předpisem (vyhl. 140/2021 Sb.) je stanoven vzor některých tabulek, které jsou nedílnou součástí EA, jedná se o:

- Souhrn příležitostí ke snížení energetické náročnosti
- Bilance energetických vstupů
- Analýza užití energie
- Ukazatele energetické náročnosti
- Analýza energetické účinnosti vybraných spotřebičů

8

8

Hodnocení navržených příležitostí

Příležitosti jsou hodnoceny z hlediska:

- **Technického** – popis technické vhodnosti a realizovatelnosti
- **Ekonomického** – ukazatele Čistá současná hodnota (NPV), Vnitřní výnosové procento (IRR), Reálná doba návratnosti (Td)
- **Ekologického** – posouzení hodnoty měrné emise CO_2:

Všechny příležitosti jsou hodnoceny metodou multikriteriálního hodnocení na základě zvolených kritérií v plánu EA

9

9

AUDIT2MEASURE

Děkuji za pozornost

Pro více informací, navštivte naší webovou stránku nebo kontaktujte nás:

www.enviros.cz, https://ieecp.org/projects/audit-to-measure/

michal.scheinherr@enviros.cz , michael.tendonkelaar@enviros.cz

Co-funded by the European Union under project ID 101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

10

AUDIT2MEASURE

T5.1 modules

RSE

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Modulo 5 - Finanziamenti per gli audit energetici e la consulenza tecnica - Indice

2

2

5.1.1 Programmi di sostegno scaduti

L'articolo 8, comma 2, della **direttiva 2012/27/UE** sull'efficienza energetica prevede che gli Stati membri elaborino **programmi intesi ad incoraggiare le PMI a sottoporsi a audit energetici** e favorire la successiva attuazione delle raccomandazioni risultanti da tali audit. Gli Stati membri possono istituire **regimi di sostegno per le PMI al fine di coprire i costi di un audit energetico e i costi dell'attuazione di interventi** altamente efficaci in rapporto ai costi in esso raccomandati.

L'articolo 8, comma 9, del **D.lgs. 102/2014** dispone che entro il 31 dicembre 2014 e successivamente con cadenza annuale **fino al 2020**, il MISE pubblica un bando per il **cofinanziamento** (conferimento di risorse, da destinarsi alla realizzazione dei programmi regionali, di pari entità da parte dello Stato e della Regione partecipante) **di programmi presentati dalle Regioni finalizzati a sostenere la realizzazione di diagnosi energetiche nelle PMI o l'adozione nelle PMI di sistemi di gestione conformi alle norme ISO 50001**. I programmi di sostegno presentati dalle Regioni prevedono che **gli incentivi siano concessi** alle imprese beneficiarie **a seguito della effettiva realizzazione delle misure di efficientamento energetico identificate** dalla diagnosi energetica o dell'ottenimento della certificazione ISO 50001.
A tal fine, si provvede, nel limite massimo di **15 milioni di euro** per ciascuno degli anni **dal 2014 al 2020**, a valere sulla quota spettante al MISE.

3

3

5.1.1 Programmi di sostegno scaduti

Al fine di promuovere il miglioramento dell'efficienza energetica nelle PMI, il **D.lgs. 73/2020** prevede, entro il 31 dicembre 2021 e successivamente ogni due anni **fino al 2030**, l'emanazione di **bandi pubblici per** il finanziamento **dell'implementazione di sistemi di gestione dell'energia** conformi allo standard ISO 50001 da parte del MISE, con il supporto del GSE e sentita la Conferenza delle Regioni. Lo stanziamento per la misura in questione è nel limite massimo di 15 milioni di euro per ciascuno degli anni dal 2021 al 2030, a valere sulla quota spettante al MISE.

L'**ENEA** entro il 31 gennaio, per ciascuno degli anni dal 2021 al 2030, **elabora** e sottopone all'approvazione del MISE **un programma annuale di sensibilizzazione e assistenza alle PMI per l'esecuzione delle diagnosi energetiche** presso i propri siti produttivi e per la realizzazione degli interventi di efficientamento energetico proposti nelle diagnosi stesse.

Il D.lgs. 73/2020 prevede stanziamenti per la certificazione ISO 50001, ma non per gli audit energetici

4

4

5.1.1 Programmi di sostegno scaduti

Esempio: bando RLT12020009582 Regione Lombardia, aperto dal 24/02/2020 al 31/03/2022

Agevolazione

Contributo a **fondo perduto** a copertura del 50% delle spese ammissibili, per la realizzazione di **diagnosi energetiche** o per **l'adozione di sistemi di gestione ISO 50001** in ognuna delle sedi operative, fino ad un massimo di 10 sedi operative. Per ciascuna sede operativa, il contributo massimo è di:

- **€ 8.000** per la diagnosi energetica;
- **€ 16.000** per l'adozione del sistema di gestione ISO 50001.

Destinatari

Piccole e Medie Imprese in possesso dei seguenti requisiti:

- codice ATECO B (Estrazione di minerali da cave e miniere) o C (Attività manifatturiere);
- costituite da almeno due anni;
- con sede operativa in Lombardia.

Progetti ammissibili

- dovrà essere redatta in data successiva alla comunicazione regionale di assegnazione del contributo e dovrà essere completata nei successivi 4 mesi;
- entro 24 mesi dalla data di consegna del rapporto di diagnosi, dovrà essere realizzato almeno un intervento di efficientamento energetico tra quelli suggeriti dalla diagnosi;
- tali interventi dovranno assicurare un miglioramento dell'indice di prestazione energetica dell'impresa non inferiore al 2% rispetto alla media degli ultimi 2 anni;
- sono ammissibili anche gli interventi che implicano solo modifiche gestionali, senza investimenti strumentali, purché sia documentato il suddetto miglioramento.

Spese ammissibili

- incarico a tecnici esperti, esterni all'impresa, per la redazione della diagnosi energetica in osservanza dei criteri di cui all'Allegato 2 del D.lgs. 102/14 e delle norme UNI CEI 16247 1-3;
- eventuale installazione di software o altri dispositivi per la misurazione analitica e dinamica dei consumi energetici della sede produttiva.

5

5

5.1.1 Programmi di sostegno scaduti

Esempio: Pr Fesr 2021-2027 Priorità 2 Regione Emilia-Romagna, aperto dal 25/10/2023 al 30/11/2023

Agevolazione

Il contributo è erogato mediante **Finanziamento Agevolato** e **Conto Capitale**:

- il **finanziamento**, concesso nella forma tecnica di mutuo, copre fino al **100% del progetto presentato**, con un **importo finanziato minimo** pari a **25.000 €** e **massimo** di **1.000.000 €**.
- il contributo a **fondo perduto** copre la quota parte delle spese tecniche sostenute per la **diagnosi energetica**, e/o lo **studio di fattibilità** e/o la preparazione del progetto di investimento e/o il piano economico finanziario e/o la verifica di idoneità delle coperture.

Destinatari

- Grandi imprese e PMI con unità locale in cui si realizza l'investimento in Emilia-Romagna;
- ESCo.

Progetti ammissibili

Progetti volti alla **promozione** dell'**efficienza energetica** e dell'uso di **energia rinnovabile** attraverso la realizzazione delle seguenti tipologie di intervento:

- efficientamento energetico;
- realizzazione di impianti di produzione di energia da fonti rinnovabili;
- interventi di miglioramento e adeguamento sismico in associazione ad interventi energetici;
- Interventi per la circolarità dei processi e lo sviluppo di impianti per l'economia circolare.

Spese ammissibili

- interventi su immobili strumentali: ristrutturazione, opere edili funzionali al progetto;
- acquisto e installazione, adeguamento di macchinari, impianti, attrezzature, hardware;
- acquisizione di software e licenze;
- consulenze e spese tecniche non ammissibili al contributo a fondo perduto.

6

6

5.1.2 Prospettive future

La nuova **Direttiva (UE) 2023/1791** sull'efficienza energetica prevede che gli Stati membri elaborino programmi intesi ad incoraggiare e sostenere le PMI a sottoporsi a audit energetici e ad attuare le raccomandazioni che scaturiscono da tali audit energetici.

Gli Stati membri possono istituire meccanismi, quali i centri per gli audit energetici per le PMI e le microimprese, a condizione che tali meccanismi non siano in concorrenza con gli auditor privati, al fine di fornire audit energetici. **Possono inoltre mettere a disposizione altri regimi di sostegno per le PMI**, anche se tali PMI hanno concluso accordi volontari, per coprire i costi di audit energetici e i costi dell'attuazione di interventi altamente efficaci in termini di costi suggeriti nelle raccomandazioni risultanti dagli audit energetici, se le misure proposte in tali raccomandazioni sono attuate.

7

7

AUDIT2MEASURE

5. Financiación de auditorías energéticas y asistencia técnica en España

Cofinanciado por la Unión Europea bajo el proyecto ID 101075785. Los puntos de vista y opiniones expresados son únicamente los del autor o autores y no reflejan necesariamente los de la Unión Europea o CINEA. Ni la Unión Europea ni la autoridad que concede la ayuda pueden ser consideradas responsables de ellas.

1

Contenidos

Tema 5

Los tres apartados incluidos en este tema son:

- 5.1 Financiación de auditorías energéticas
- 5.2 Financiación de la asistencia técnica
- 5.3 Oportunidades de asistencia A2M

2

2

5.1 Financiación de auditorias enérgeticas

3

3

5.1
Financiación
de auditorías

Objetivo y contenido

Objetivo: informar a los participantes de las distintas alternativas para financiar una auditoría energética.

Está dirigido principalmente a directivos de mandos superiores e intermedios, contables, responsables financieros, así como asociaciones de empresas, auditores energéticos y profesionales del sector

4

4

5.1
Financiación de auditorías

Auditoría energética

Una auditoría energética consiste en la realización de un estudio que analiza la eficiencia energética de los equipos que consumen electricidad, combustibles fósiles, las condiciones de utilización de las instalaciones, así como consumos energéticos. Identifica medidas de ahorro y eficiencia enérgica con el objetivo de optimizar energéticamente los procesos e instalaciones existentes.

Ayuda a las empresas a reducir su consumo de energía, costes energéticos y mejorar su sostenibilidad medioambiental (entre otros).

5

5

5.1
Financiación de auditorías

Auditoría energética

Tras identificar el potencial de ahorro, la auditoría establece las soluciones más apropiadas y realiza su valoración técnico – económica, así como la posible diversificación energética para satisfacer los consumos energéticos.

Las medidas de eficiencia energética que se incluyen en el plan de acción son muy diversas. Desde pequeñas actuaciones sin coste hasta otras que requieren inversión para su implementación.

6

6

5.1
Financiación de auditorías

Auditoría energética

El Real Decreto 56/2016, transpone al ordenamiento jurídico español la Directiva 2012/27/UE y obliga a **grandes empresas a realizar una auditoría energética cada 4 años**

La nueva Directiva 1791/2023 propone que la obligatoriedad de auditoria energética sea a las empresas de mayores consumos energéticos:

- Las **empresas con un consumo medio anual superior a 2,78 GWh** (sumando todas las fuentes de energía) durante los tres años anteriores y que no apliquen un sistema de gestión de la energía, están **obligadas a realizar una auditoría energética**.
- Las **empresas con un consumo medio anual superior a 23,6 GWh** (sumando todas las fuentes de energía) durante los tres años anteriores, están **obligadas a realizar una auditoría energética cada 4 años**.

7

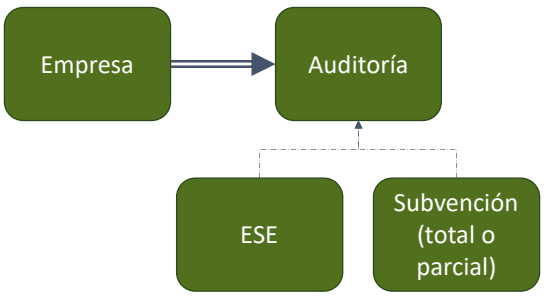
7

5.1
Financiación de auditorías

Tipos de financiación para hacer la auditoria energética

Normalmente el coste de la auditoria es por parte de la empresa, en algunas ocasiones hay ayudas disponibles que gestionan las CCAA.

Además, algunas ESEs realizan una auditoria completa o de una parte de las instalaciones.



8

8

5.1 Financiación de auditorías

Ejemplos de financiación de auditorías energéticas

EVE - Programa de ayudas a la realización de auditorías energéticas integrales en pyme de los sectores industrial y terciario.

El plazo de solicitud estará abierto durante un año.

País vasco - auditorías desarrolladas bajo la norma UNE-EN 16247, o sus modificaciones o mejoras posteriores que tengan un efecto sobre la potencial implementación de energías renovables, el ahorro energético y eficiencia energética y las instalaciones para las que se solicitan las ayudas deberán estar ubicadas en el territorio de la Comunidad Autónoma de Euskadi. Hasta 29 Marzo 2024.

9

9

5.1 Financiación de auditorías

Ejemplo de financiación de auditorías energéticas

Las actuaciones tendrán una ayuda del 50% del coste subvencionable.

Se establece un límite máximo al coste subvencionable en función del consumo de energía por lo que, en ningún caso, el coste subvencionable sobre el que aplicar el porcentaje de ayuda superará dichos máximos:

Consumo de energía (tep/año)		Coste subvencionable máximo (€)
300	<500	9.800
150	<300	7.700
50	<150	6.600
30	<50	5.300
20	<30	4.400
10	<20	3.800
0	<10	3.300

10

10

5.2 Financiación de la asistencia técnica

11

Objetivo y contenido

Objetivo: informar a las empresas sobre distintas opciones de apoyo técnico para implantar las MEEs recomendadas en las auditorías energéticas.

Contenido:

- Formas de asistencia técnica
- Agentes que pueden proveer asistencia técnica
- Financiación de asistencia técnica
- Estudio de viabilidad

12

5.2 Financiación de la asistencia técnica

Formas de asistencia técnica

- Información y explicación sobre la MEE específica detectada
- Asesoramiento sobre cómo medir y/o calcular el ahorro de eficiencia energética logrado por la medida en comparación con la situación actual
- Cursos y jornadas de capacitación personalizados; Guías sobre diferentes tecnologías, sistemas…)
- Contacto con otras empresas que han aplicado una MEE específica, para ampliar información y aclarar posibles dudas

13

13

5.2 Financiación de la asistencia técnica

Agentes que pueden proveer asistencia técnica

- Consultores y auditores energéticos
- Asociaciones empresariales
- Centros tecnológicos y universidades
- Asociaciones profesionales
- Empresas de Servicios Energéticos (ESEs)
- Agencias de energía (información)

14

14

5.2 Financiación de la asistencia técnica

Financiación de asistencia técnica

En la actualidad, existen escasas ayudas económicas directas para financiar la asistencia técnica. Sin embargo, existen otras alternativas:

- Algunas empresas fabricantes/instaladoras, ofrecen de forma gratuita un estudio de viabilidad técnica previo.
- Las ESEs suelen analizar la viabilidad técnica de forma integrada dentro del proyecto propuesto.
- Ayudas a la iniciativa Industria Conectada 4.0
- Para la formación de las empresas existen algunas bonificaciones, ofrecidas, por ejemplo, por la Fundación Estatal para la formación en el Empleo o la Cámara de comercio de España
- Algunos bancos ofrecen financiación o recursos para la formación de los trabajadores.

- IDAEA Ayudas a PYMES y grandes empresas gestionadas por las CCAA. https://www.idae.es/ayudas-y-financiacion/para-eficiencia-energetica-en-la-industria/concesion-directa-ccaa-de-las

15

15

5.2 Financiación de la asistencia técnica

Estudio de viabilidad

Los estudios de viabilidad analizan diferentes aspectos para determinar si se realiza o no un proyecto. Estos se dividen en:

- Viabilidad técnica
- Viabilidad económica
- Viabilidad legal
- Viabilidad operativa
- Viabilidad temporal

16

16

5.2 Financiación de la asistencia técnica

Estudio de viabilidad técnica

Consiste en revisar los recursos disponibles, determinando si se cuenta con el equipamiento correcto y suficiente y los conocimientos necesarios.

En este proceso, pueden ayudar:

- La propia empresa
- Expertos en energía (ej. asesorías/ingenierías)
- Fabricantes/instaladores
- Empresas de servicios energéticos

17

17

5.2 Financiación de la asistencia técnica

Bibliografía y herramientas técnicas

Calculadora de huella de carbono gratuita

Sistema de Información fotovoltaica geográfica – PVGIS

Calculadoras ahorro aire comprimido – KAESER

Calculadoras dimensionamiento y ahorro motor - WEG

18

18

5.3 Oportunidades de asistencia del A2M

19

Objetivo y contenido

Objetivo: mostrar el aporte del proyecto A2M, vinculándolo al asesoramiento así como el KES (Knowledge Exchange Space) y otras recomendaciones generales.

Contenido:

- Apoyo proporcionado por A2M
- Apoyo técnico
- Apoyo económico-financiero
- Apoyo legal
- Espacio de intercambio de información (KES)
- Recomendaciones generales

20

5·3 Oportunidades de asistencia del A2M

Apoyo proporcionado por A2M

Técnico

Económico-financiero

Legal

Cambio cultural

21

21

5·3 Oportunidades de asistencia del A2M

Apoyo técnico

- Información y explicación sobre cada medida específica, haciendo uso de folletos, vídeos, reuniones, además de la información preparada como parte de A2M (KPIs, hojas de MEEs, etc.).
- Asesoramiento para medir y/o calcular los ahorros de eficiencia energética logrados por la medida implementada en comparación con la situación actual.
- Desarrollo de capacidades proporcionados por los expertos en energía, fabricantes de equipos o instaladores.
- Contacto con otras empresas que han aplicado una MEE específica, para identificar y aclarar problemas sobre la misma y evitar errores comunes con el intercambio de conocimientos.

22

22

5·3 Oportunidades de asistencia del A2M

Apoyo económico-financiero

- Ofrecer información y explicación por parte de expertos sobre la inversión necesaria y cómo calcular la viabilidad económica
- Asesorar sobre los costes (CAPEX y OPEX) de la MEE y apoyo para calcular la viabilidad económica de esta. Evaluación en la priorización de medidas de acuerdo con los resultados económicos.
- Asesorar sobre los programas de financiación, esto incluye fondos públicos, financiación privada, ESE y CRE.

23

23

5·3 Oportunidades de asistencia del A2M

Apoyo legal

- Visión general del marco normativo y político en el país como primer paso general.
- Información sobre la regulación y las leyes que afectan a las MEEs que están siendo evaluadas.
- Asesoramiento y explicación por parte de expertos en energía sobre la regulación y las leyes que afectan a una MEE específica.
- Para un asesoramiento muy especializado, recibir contacto de expertos legales en energía.

24

24

5·3 Oportunidades de asistencia del A2M

Fomento de un cambio cultural

- Información sobre qué es el cambio cultural energético y los errores más actuales en las industrias en relación con este aspecto.
- Información específica de los posibles cambios de comportamiento energético y cómo conseguirlos (evento, folleto-cartel con consejos, folletos para los trabajadores, etc.);
- Requisitos específicos para cambiar el comportamiento, por ejemplo, la reticencia a instalar una nueva máquina o sistema
- Será necesario informar sobre los beneficios de la nueva medida y puede necesitar algunos posibles cambios por parte de los trabajadores.

25

25

5·3 Oportunidades de asistencia del A2M

Espacio de intercambio de información (KES)

26

26

5·3 Oportunidades de asistencia del A2M

Espacio de intercambio de información (KES)

Este espacio virtual permitirá a las empresas compartir conocimientos, experiencias e ideas sobre MEEs. De esta manera, esta plataforma aportará recursos de valor tanto a empresas que comiencen a implementar MEEs, como veteranas.

- El área pública, disponible en la web de A2M, dispone de artículos, informes, casos de estudio y una base de datos con MEEs.
- El área privada, es accesible solo para algunos participantes seleccionados y se llevarán a cabo debates y apoyo ad-hoc.

27

27

5·3 Oportunidades de asistencia del A2M

Recomendaciones generales

- Dedicar personal a tiempo parcial para que gestione temas de financiación tanto para realizar auditoría, como implementar las medidas
- Formación dedicada a este personal mediante cursos y jornadas.
- Solicitar las ayudas y su gestión interna mediante los recursos necesarios; una vez obtenida la ayuda se aconseja llevar un sistema digitalizado y ordenado de gastos, junto con todos los documentos necesarios para su justificación
- Investigar también con los proveedores de equipos y sistemas, empresas de mantenimiento externas y ESEs o asociaciones correspondientes
- Mantener contacto con algunas instituciones/organizaciones clave como CCAA, cámaras de comercio e industria

28

28

AUDIT2MEASURE

Muchas gracias

Para más información, visite nuestra web o contáctenos:

www.escansa.com

escan@escansa.com; aedhe@aedhe.com

#AUDIT2MEASURE

Cofinanciado por la Unión Europea bajo el proyecto ID 101075785. Los puntos de vista y opiniones expresados son únicamente los del autor o autores y no reflejan necesariamente los de la Unión Europea o CINEA. Ni la Unión Europea ni la autoridad que concede la ayuda pueden ser consideradas responsables de ellas.

29

AUDIT2MEASURE

T6 modules

RSE

Co-funded by the European Union under project ID101075785. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

1

Modulo 6 – Supporto e finanziamento verso le misure di efficienza energetica

6.1. Supporto e finanziamento pubblico verso le misure di efficienza energetica

6.2 Supporto e finanziamento privato verso le misure di efficienza energetica

6.3 Meccanismi di finanziamento alternativi verso le misure di efficienza energetica

2

2

STRUMENTI DIRETTI: CERTIFICATI BIANCHI, CONTO TERMICO, SUPPORTO ALLA COGENERAZIONE AD ALTO RENDIMENTO

6.1 Schemi di supporto pubblici per l'efficienza energetica in Italia 1/4

https://www.gse.it/servizi-per-te/efficienza-energetica

3

3

6.1 Schemi di supporto pubblici per l'efficienza energetica in Italia 2/4

CERTIFICATI BIANCI: *conosciuti anche come "Titoli di Efficienza Energetica", vengono rilasciati in seguito alla consuntivazione di risparmi energetici conseguiti attraverso progetti volti ad aumentare l'efficienza energetica negli usi finali.*

"CONTO TERMICO": *lo schema mira a sostenere la produzione di energia termica da fonti rinnovabili, nonché piccoli interventi di efficienza energetica per soggetti privati (come famiglie ma anche piccole imprese) e le Pubbliche Amministrazioni.*

SUPPORTO ALLA COGENERAZIONE AD ALTO RENDIMENTO: *la cogenerazione è la produzione combinata, in un unico processo, di energia elettrica e calore, utilizzabili per il riscaldamento&raffrescamento e/o per processi produttivi e industriali. Questo approccio consente agli impianti di raggiungere livelli di efficienza estremamente elevati, sfruttando al meglio le risorse energetiche. Le unità di cogenerazione ad alto rendimento riconosciute hanno accesso ai Certificati Bianchi.*

4

4

STRUMENTI INDIRETTI: DETRAZIONI FISCALI, OBBLIGO SUGLI AUDIT ENERGETICI

6.1 Schemi di supporto pubblici per l'efficienza energetica in Italia 3/4

https://www.efficienzaenergetica.enea.it/

5

5

6.1 Schemi di supporto pubblici per l'efficienza energetica in italia 4/4

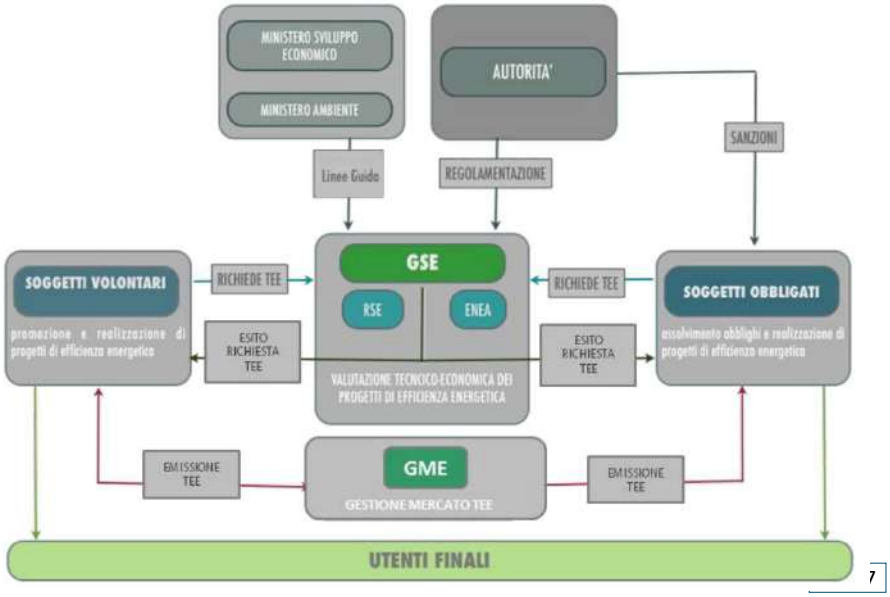
ALTRI STRUMENTI:

- FONDO NAZIONALE PER L'EFFICIENZA ENERGETICA;
- PIANO DI TRANSIZIONE 4.0 E 5.0;
- RINNOVAMENTO ENERGETICO DEGLI EDIFICI DELLA PUBBLICA AMMINISTRAZIONE;
- ALCUNE MISURE CONTENUTE NEL PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR).

6

6

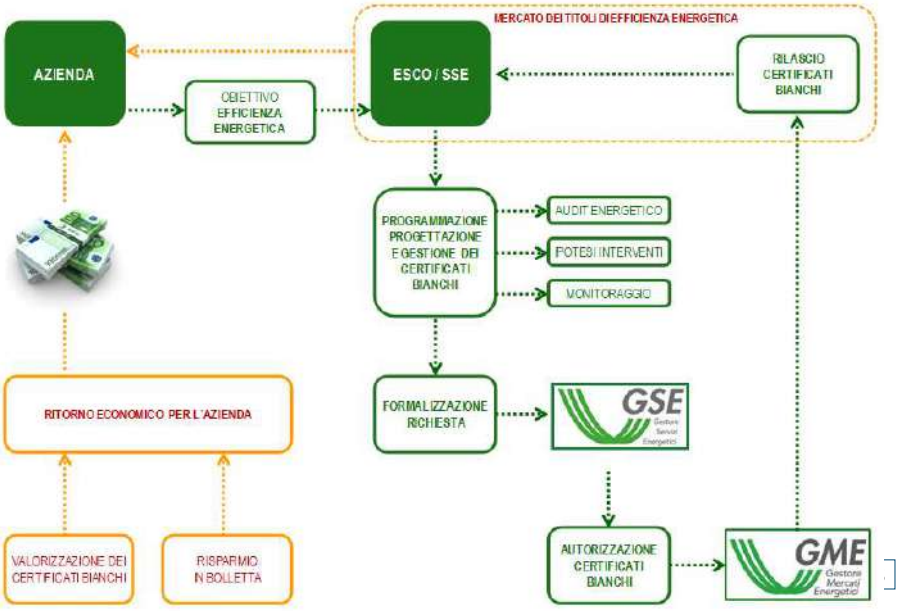
6.1 Il meccanismo dei Certificati Bianchi 1/5



7

7

6.1 Il meccanismo dei Certificati Bianchi 2/5



8

6.1 Il meccanismo dei Certificati Bianchi 3/5

I progetti di efficienza energetica che possono essere ammessi al meccanismo sono progetti non ancora realizzati e in grado di generare risparmi energetici addizionali. Il consumo normalizzato (ovvero a parità di servizio reso) dopo l'intervento (ex-post) deve essere inferiore rispetto al consumo prima dell'intervento (ex-ante) oppure, nel caso di nuove installazioni, inferiore rispetto ad un consumo di riferimento.

1 TEE = 1 TEP (Tonnellata Equivalente di Petrolio)

Per accedere al meccanismo dei Certificati Bianchi (per un periodo pari alla vita utile del progetto) è necessario inviare una richiesta al GSE accompagnata da idonea documentazione che consenta di verificare la conformità del progetto ai requisiti stabiliti dalla normativa.

È possibile presentare domanda di accesso agli incentivi, prima della data di inizio della realizzazione di un progetto di efficienza energetica, in due modalità:

1 – progetti a consuntivo: forniscono una misurazione precisa delle quantità caratteristiche sia nella configurazione ex ante che in quella ex-post;

2 – progetti standardizzati: prevedono, al verificarsi di specifiche condizioni di ripetitività, la possibilità di misurare le quantità caratteristiche di un idoneo campione rappresentativo dei parametri operativi del progetto.

9

9

6.1 Il meccanismo dei Certificati Bianchi 4/5

Risparmi energetici addizionali: la differenza, in termini di energia primaria (espressa in tep), tra il consumo di baseline (ovvero il valore di consumo pre-attuazione del progetto di efficienza energetica o, nel caso di nuovi impianti, edifici o siti, il valore di riferimento consumo per il mercato) e il consumo energetico derivante dalla realizzazione del progetto, sempre a parità di servizio reso (adottando pertanto gli opportuni coefficienti di normalizzazione).

Non possono essere ammessi al meccanismo gli interventi di efficienza energetica realizzati esclusivamente per rispettare vincoli normativi o adempimenti amministrativi.

Per accedere al meccanismo, i progetti devono utilizzare solo componenti nuovi o rigenerati e devono essere in grado di generare risparmi energetici addizionali nei primi 12 mesi del periodo di monitoraggio di almeno 5 o 10 tep a seconda del tipo di progetto.

Nel caso di interventi di sostituzione di macchinari e attrezzature, per accedere all'incentivo è necessario effettuare la misurazione dei consumi e delle variabili operative per un periodo di almeno 12 mesi precedenti la realizzazione del progetto, con frequenza di campionamento almeno giornaliera.*

**A meno di condizioni particolari in cui sia la durata che la frequenza possono essere inferiori, sempre garantendo la rappresentatività delle misure*

10

10

MANUALE D'USO GSE APPLICATIVO: EFFICIENZA ENERGETICA

https://www.gse.it/documenti_site/Documenti%20GSE/Servizi%20per%20te/CERTIFICATI%20BIANCHI/MANUALI/Manuale%20d%20uso%20Certificati%20Bianchi%20APPLICATIVO%20EFFICIENZA%20ENERGETICA.PDF

6.1 Il meccanismo dei Certificati Bianchi 5/5

Per inviare inviare una richiesta al GSE è necessario utilizzare l'Applicativo di Efficienza Energetica accessibile dall'Area Clienti GSE.

È disponibile un Manuale applicativo che ne spiega tutte le funzionalità.

11

11

6.1 Il Conto Termico 1/2

Il «Conto Termico» incentiva gli interventi di incremento dell'efficienza energetica e della produzione di energia termica da fonti rinnovabili per impianti di piccola taglia.

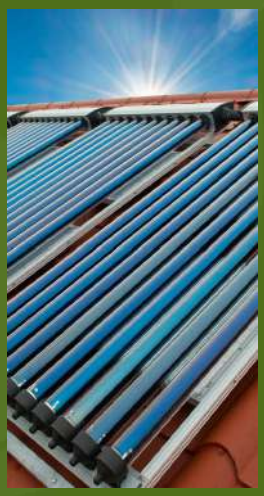
Il sistema, gestito dal GSE, finanzia fino al 65% dei costi di investimento con un budget annuo disponibile di 900 milioni di euro.

I beneficiari sono principalmente le pubbliche amministrazioni e le famiglie, ma anche le imprese che sostituiscono vecchi componenti o ne installano di nuovi (ad esempio collettori termici).

Nel sito del GSE sono pubblicati i cataloghi degli interventi ammissibili.

12

12



6.1 Il Conto Termico 2/2

Per presentare una domanda di incentivo è necessario:

- *Individuare il Soggetto Responsabile, il Soggetto Ammesso e gli eventuali Soggetti Delegati;*
- *Registrare un account nell'Area Clienti GSE;*
- *Firmare il PortaleTermico nella sezione "Richiesta Servizio" dell'Area Clienti;*
- *Inserire i dati dei soggetti coinvolti nella domanda;*
- *Inserire i dati dell'edificio;*
- *Selezionare gli interventi da incentivare e i rispettivi dati tecnici;*
- *Inserire i dati amministrativi, fiscali e informazioni per la corrispondenza;*
- *Allegare la documentazione richiesta (schede tecniche, foto pre e post,..);*
- *Generare ed inviare la richiesta.*

https://www.gse.it/documenti_site/Documenti%20GSE/Servizi%20per%20te/CONTO%20TERMICO/Guide/Mappe_imprese.pdf

13

13

6.1 Supporto alla Cogenerazione ad alto rendimento 1/2

La Direttiva 2004/8/CE, recepita dal Dl 20/07, e dal successivo Dl 11/09/2011, ha stabilito che la condizione per cui la produzione combinata di energia elettrica e calore può ottenere la qualifica di "cogenerazione ad alto rendimento" (CAR) si basa sul parametro PES (Risparmio Energetico Primario).

$$PES = \frac{\Delta E_c}{\frac{E_t}{\eta_t} + \frac{E_e}{\eta_e}} = 1 - \frac{1}{\frac{E_t}{\eta_t E_c} + \frac{E_e}{\eta_e E_c}}$$

$E_c = \boldsymbol{energia\ primaria\ immessa}$ $\eta_t = \boldsymbol{rendimento\ termico\ di\ riferimento}$

$E_t = \boldsymbol{energia\ termica\ prodotta}$ $\eta_e = \boldsymbol{rendimento\ elettrico\ di\ riferimento}$

$E_e = \boldsymbol{energia\ elettrica\ prodotta}$

14

14

6.1 Supporto alla Cogenerazione ad alto rendimento 2/2

La cogenerazione è definita ad alto rendimento se il valore del PES è:

- *PES ≥ 0,1 (10%)*
- *PES > 0 nel caso di micro-cogenerazioni (< 50 kWe) o piccola cogenerazione (< 1 MWe)*

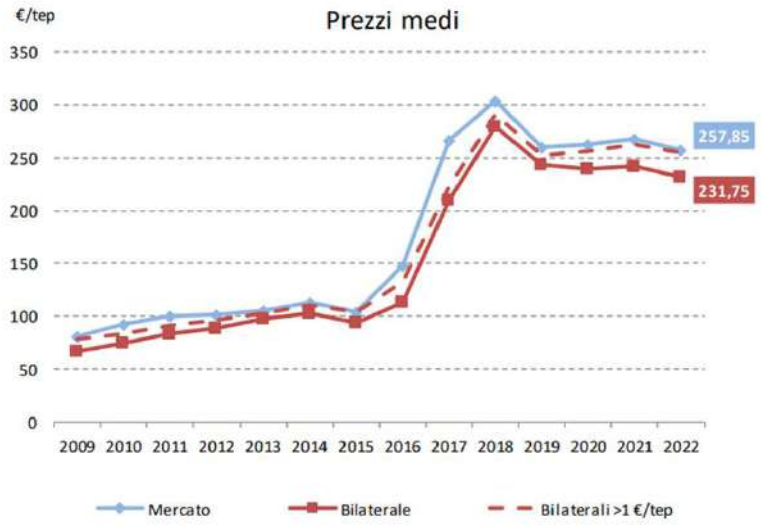
Le unità di cogenerazione riconosciute a consuntivo come CAR, possono accedere al meccanismo dei Certificati Bianchi se entrate in esercizio a seguito di nuova costruzione o ristrutturazione successivamente alla data del 6 marzo 2007, per un periodo di 10 anni solari (15 anni solari se abbinate ad una rete di teleriscaldamento).

15

15

6.1 Valore TEE e CB-CAR

1 TEE
=
1 tep
≈
5.300 kWh elettrici
≈
11.600 kWh termici



16

16

6.1 Detrazioni fiscali 1/2

https://www.efficienzaenergetica.enea.it/servizi-per/imprese.html

Per agevolare la ristrutturazione degli edifici residenziali, sono attualmente in vigore in Italia una serie di misure incentivanti gestite dall'ENEA: Ecobonus, Superbonus, Bonus Facciata, Bonus Sismico, ecc.

Anche le piccole imprese possono usufruire del credito d'imposta per le loro ristrutturazioni

17

17

6.1 Detrazioni fiscali 2/2

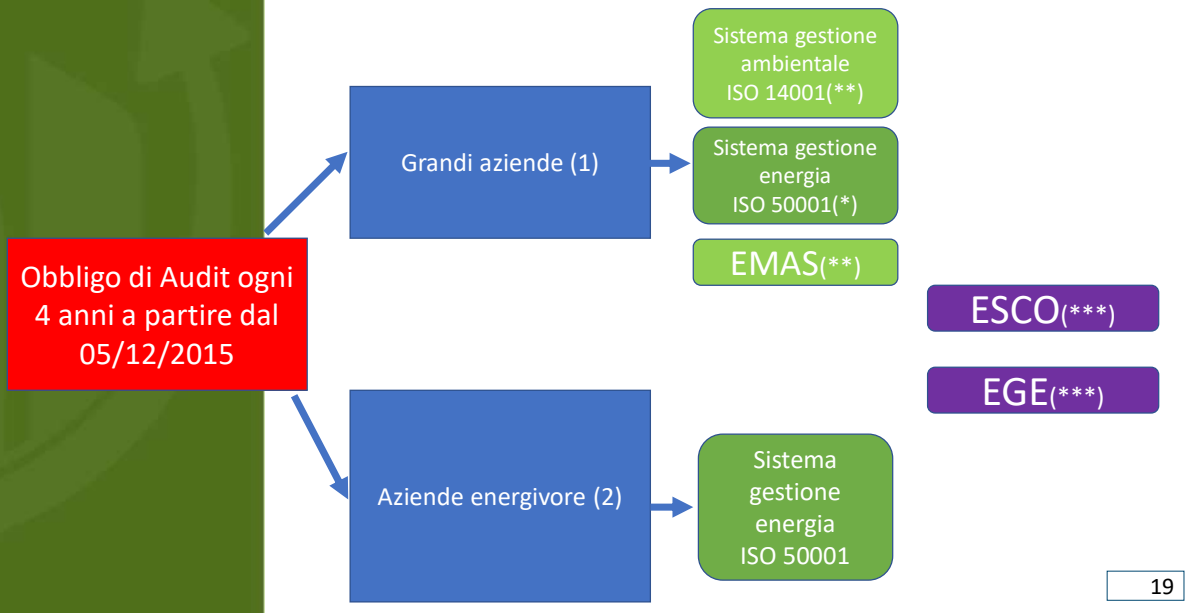
Nel campo dell'efficienza energetica le aziende possono essere osservate da due punti di vista:

- *da un lato come beneficiari dell'efficienza e degli obblighi e benefici previsti dalla normativa: è, ad esempio, il caso delle grandi aziende con gli obblighi previsti dall'articolo 8 del D.Lgs. 102/14 (sottoposte a diagnosi energetica), oppure come piccole imprese beneficiarie di agevolazioni d'imposta, o ancora di aziende dotate di sistema di gestione dell'energia ISO 50001 partecipanti al meccanismo dei certificati bianchi sugli interventi di efficienza realizzati nei propri impianti.*
- *Alcune categorie di imprese, invece, rappresentano promotori di efficienza presso terzi: Società di Servizi Energetici, società di consulenza, società multiservizi e altre.*

18

18

6.1 Obbligo sugli audit energetici 1/3



19

19

6.1 Obbligo sugli audit energetici 2/3

Tutti i Sistemi di Gestione devono essere conformi all'Allegato II del D.Lgs. 102/2014

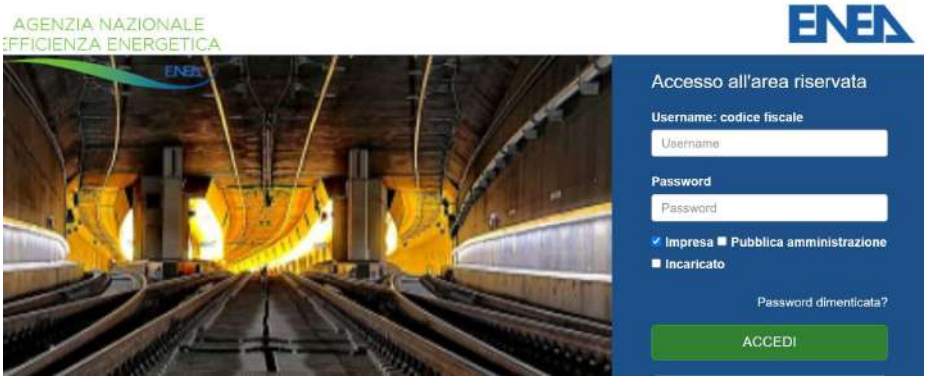
Nel sito web ENEA è disponibile un portale web (chiamato Audit 102) per l'invio degli Audit Energetici.

Le imprese obbligate che non effettueranno la Diagnosi Energetica nel rispetto dell'Allegato II del Decreto, sono soggette a sanzioni amministrative pecuniarie.

20

20

6.1 Obbligo sugli audit energetici 3/3



https://audit102.enea.it/

21

21

6.1 Energy audit – requisiti minimi 1/2

Si basano su dati aggiornati, misurati e tracciabili sui consumi energetici operativi e (per l'energia elettrica) sui profili di carico;

Prevedono un esame dettagliato del profilo di consumo energetico di edifici o gruppi di edifici, attività o impianti industriali, compresi i trasporti;

Ove possibile, si basano sull'analisi del costo del ciclo di vita, al fine di tenere conto dei risparmi a lungo termine, dei valori residui degli investimenti a lungo termine e dei tassi di sconto;

Sono proporzionati e sufficientemente rappresentativi da consentire una panoramica della prestazione energetica complessiva e identificare le opportunità con i miglioramenti più significativi;

L'audit energetico consente calcoli dettagliati e validati per le misure proposte al fine di fornire informazioni chiare sui potenziali risparmi;

I dati utilizzati per l'audit energetico possono essere conservati per analisi storiche e per monitorare le prestazioni nel tempo.

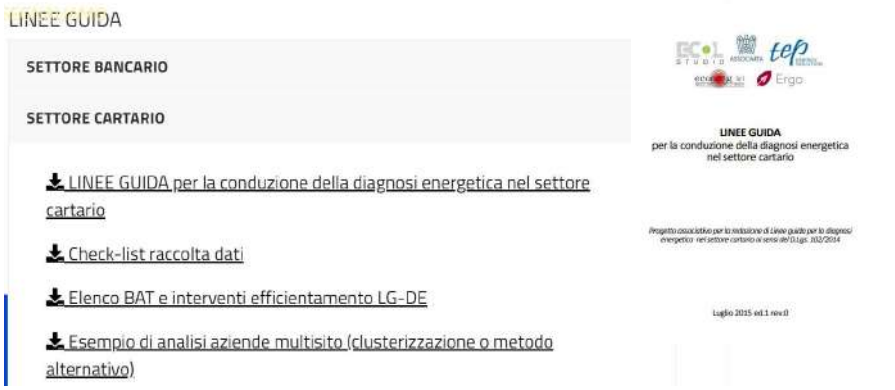
22

22

6.1 Energy audit – requisiti minimi 2/2

Maggiori informazioni operative possono essere reperite nelle Linee Guida Settoriali dell'ENEA per la Diagnosi Energetica.

https://www.efficienzaenergetica.enea.it/servizi-per/imprese/diagnosi-energetiche/linee-guida-settoriali.html



23

23

AUDIT2MEASURE

6. Financiación de las medidas de eficiencia energética - España

Cofinanciado por la Unión Europea bajo el proyecto ID 101075785. Los puntos de vista y opiniones expresados son únicamente los del autor o autores y no reflejan necesariamente los de la Unión Europea o CINEA. Ni la Unión Europea ni la autoridad que concede la ayuda pueden ser consideradas responsables de ellas.

1

Contenidos

Bloque 6

Los módulos incluidos en este tema son:

- 6.1 Métodos de financiación – público y privado
- 6.2 Contratos de rendimiento energético
- 6.3 Certificado de Ahorro Energético (CAE)
- Anexo - Fondo de recuperación de la UE

2

2

Bloque 6

Contenidos

Este tema 6 incluye información sobre los principales métodos de financiación para realizar las medidas de eficiencia energética.

Contiene financiación proveniente tanto a nivel público como privado e informa también sobre y los contratos de rendimiento energético.

3

3

6.1 Métodos de financiación

Público y privado

4

4

6.1 Métodos de financiación

Objetivo y contenido

Objetivo: informar a los participantes de las distintas alternativas para financiar medidas de eficiencia energética y energías renovables.

Así reducir o eliminar una de las barreras que en numerosas ocasiones se presenta a la hora de implementar las medidas.

Contenido:

- Financiación pública
- Financiación privada

5

5

6.1 Métodos de financiación

Financiación pública

Programas de la UE cofinanciados: garantizan la cofinanciación directa de las inversiones en proyectos de eficiencia energética y EERR. También apoyan la investigación, la innovación, el desarrollo tecnológico de entidades privadas y públicas.

1. Mecanismo de recuperación y resistencia
2. Políticas de cohesión
3. Mecanismo de transición justa
4. Fondo de modernización

6

6

6.1 Métodos de financiación

Financiación pública

Instrumentos financieros de la UE:

- Préstamos a empresas para que inviertan en investigación e innovación.
- Garantías para ayudar a los beneficiarios a obtener préstamos más fácilmente o en mejores condiciones de bancos y otros prestamistas.
- Participar financieramente en un proyecto siendo propietaria de partes del mismo.
- Pueden combinarse con subvenciones.

7

7

6.1 Métodos de financiación

Financiación pública

Los instrumentos financieros se ponen en práctica en colaboración con instituciones públicas y privadas, como bancos, inversores de capital riesgo o inversores de proximidad. Estas instituciones financieras determinan las condiciones exactas de financiación: importe, duración, tipos de interés y comisiones.

- Financiación en asociación con el Banco Europeo de Inversiones (BEI)
- ELENA - Asistencia Energética Local Europea

8

8

6.1 Métodos de financiación

Financiación pública

- Programas de investigación e innovación
- Financiación nacional para eficiena energética y renovables

  IDAE: controla y publica las subvenciones, pero cada gobierno autonómico determina las condiciones y entrega los fondos. Ej: Fondos FEDER.

  Existe una base de datos nacional de subvenciones con todas las convocatorias vigentes.

9

9

6.1 Métodos de financiación

Financiación pública –Ejemplo Comunidad Valenciana

Ejemplo: Ayudas a la industria para eficiencia energética en pyme y gran empresa

- Gestionado por el IVACE (Institut Valenciá de Competitivitat Empresarial)
- Disponible hasta el 30 de junio 2024

10

10

6.1 Métodos de financiación

Financiación pública- Ejemplo Cataluña

Ejemplo: Ayudas a la industria para la eficiencia energética Gestionado por el ICAEN (Instituto Catalán de Energía), disponible hasta el 30 de junio 2024

- Ejemplo Ayuntamiento de Madrid Area de Gob de Economía Innovación y Empleo
- Se convocan ayudas: Digitalización, **producción sostenible,** mejora productiva de industria 4,0 y respuesta al desafío tecnológico;
- Producción sostenible para empresas en CNAE C 10 a 32 y E 382, 383, 390: gastos de contratación de consultoría para sistemas SGE y SGA (ISO50001 14006 ISO . Sustitución de equipos consumidores de energía tanto de la cadena de producción, como generadores de calor o frío, instalación de puntos de recarga para automóviles eléctricos, iluminación interior…
- Subvención 80% (menos de 9 trabajadores), 10-49 70% y si son 50-249, el 50% siempre máximo 20.000 euros (Decreto 23 diciembre 2022 –BOAM)

11

11

6.1 Métodos de financiación

Finaciación pública-Nacional

PERTE industrial

Cada año se publica convocatoria – Diciembre 2023

Características específicas para proyectos de descarbonización

Desde 26-01-2024 has finales de abril 2024

Normalmente para grandes ahorros energéticos con medidas

12

12

6.1 Métodos de financiación

Financiación privada

Principalmente puede proveer de bancos, fondos de financiación o empresas privadas.

- Préstamos y garantías de bancos:

Por ejemplo, **préstamos bancarios:** constituyen una fuente de financiación para las empresas y permiten un reembolso prolongado en el tiempo con pagos mensuales fijos predecibles.

Un préstamo bancario puede permitir a las empresas financiar proyectos de inversión en medidas de ahorro energético.

13

13

6.1 Métodos de financiación

Financiación privada

- Préstamos y garantías de bancos:

Un inversor puede solicitar un préstamo bancario:

1. Banco nacional: han lanzado estrategias de sostenibilidad en los últimos años y entre ellas están las de servicios energéticos. *(ejemplos BBVA, Santander o Sabadell)*
2. Banco internacional: como el Banco Europeo de Inversiones

14

14

6.1 Métodos de financiación

Financiación privada

- Préstamos y garantías de bancos:

Garantías bancarias: Una garantía bancaria es el compromiso de una institución crediticia de cubrir una pérdida si una transacción comercial no se desarrolla según lo previsto. Facilitan a las empresas el acceso a los préstamos de inversión de los bancos comerciales y a las pequeñas empresas la obtención, por ejemplo, de préstamos de explotación.

15

15

6.1 Métodos de financiación

Financiación privada

Bonos verdes:

En los últimos años (2007 en Europa y en 2021 en España) han surgido los bonos verdes, que dan acceso especifico a financiación para proyectos de energía sostenible y permiten controlar que los estándares de sostenibilidad se cumplan. Al atraer a inversores concienciados con el medio ambiente, los bonos verdes pueden ayudar a las empresas a conseguir la financiación necesaria para estos proyectos a tipos de interés competitivos.

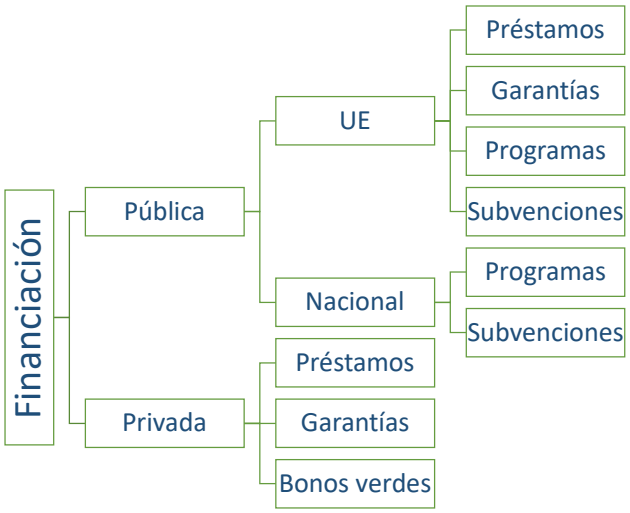
Estos bonos están diseñados para financiar proyectos con claros beneficios medioambientales, como las energías renovables, la eficiencia energética, el transporte limpio y la reducción de la contaminación.

16

16

6.1 Métodos de financiación

Financiación - esquema resumen



17

17

6.2 Contratos de rendimiento energético

18

18

6.2 Contratos de rendimiento energético

Objetivo y contenido

El objetivo de este módulo es presentar los métodos de desarrollo, financiación e implementación de proyectos para mejorar la Eficiencia energética financiados a través de contratos de rendimiento energético (EPC – Energy Performance Contracting)

El módulo se divide en:

- El contrato de rendimiento energético
- Fases de un CRE
- Empresa de servicios energéticos
- Riesgo del rendimiento
- Financiación de proyectos
- Factores incluidos en un contrato según Eurostat
- Modelo de contrato del IDAE
- Criterios para la comparación de modelos de contrato

19

19

6.2 Contratos de rendimiento energético

El contrato de rendimiento energético

- CRE (siglas en español) o EPC (siglas en inglés)
- Mejora el rendimiento energético de una instalación
- Reduce los costes de funcionamiento
- La inversión inicial se amortiza mediante el ahorro de costes
- Útiles para instituciones públicas debido a que suelen necesitar procesos estandarizados

20

20

6.2 Contratos de rendimiento energético

Beneficios de un CRE

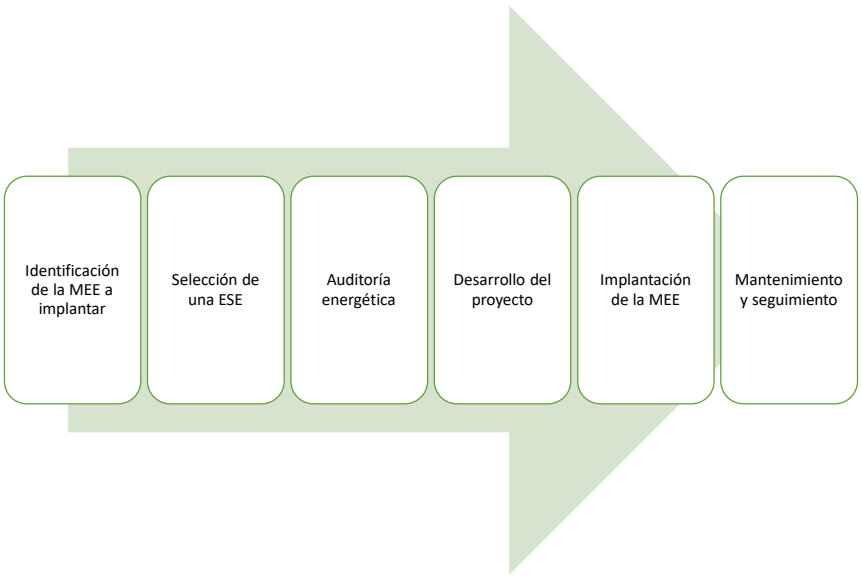
Clasificación	Oportunidades
1º	Ahorro energético
2º	El cliente no realiza la inversión inicial
3º	Renovación de las instalaciones
4º	Gestión energética
5º	Estabilidad económica con ingresos recurrentes

21

21

6.2 Contratos de rendimiento energético

Fases de un CRE



22

22

6.2 Contratos de rendimiento energético

Empresa de servicios energéticos

- Una Empresa de Servicios Energéticos (ESE) asume el riesgo del rendimiento del proyecto
- Ofrece un servicio que cubre todos los aspectos desde la auditoria inicial hasta la verificación de los ahorros conseguidos
- Garantiza el ahorro
- La remuneración de la ESE está ligada directamente al ahorro del proyecto
- Pueden financiar o asistir en la gestión de la financiación del proyecto

23

23

6.2 Contratos de rendimiento energético

Empresa de servicios energéticos

"Una Empresa de Servicios Energéticos es una persona física o jurídica que proporciona **servicios energéticos o de mejora de la eficiencia energética en las instalaciones** de un usuario y afronta cierto grado de riesgo económico al hacerlo. El pago de los servicios prestados se basará (en parte o totalmente) en la obtención de mejoras de la eficiencia energética y en el cumplimiento de los demás requisitos de rendimiento convenidos."

24

24

6.2 Contratos de rendimiento energético

Modelo ESE

25

25

• 6.2 Contratos de rendimiento energético

Marcos regulatorios

Table 2. Summary of ESCO associations' responses on ESCO-specific regulatory frameworks

Region	Country	ESCO definition	ESCO accreditation	Standard ESCO contracts	ESCO aggregator
Europe	Belgium	No	No	Yes	Yes
	Czech Republic	Yes	No	Yes	No
	France	No	No	Yes	Yes, until
	Germany	Yes	No	Yes	No
	Italy	Yes	Yes	Yes, until	No
	Poland	Yes	Yes, until	Yes	No
	Portugal	Yes	Yes, until	Yes, until	No
	Spain	Yes	Yes	Yes	No
	Switzerland	No	No	Yes	No
	UK*	No	Yes, until	Yes	Yes
Asia	Japan	Yes	No	No	No
	Republic of Korea	Yes	Yes	Yes	Yes, until
	Malaysia	Yes, until	Yes, until	No	No
	Philippines	Yes	Yes	Yes	Yes
	Taiwan (China)	Yes, until	No	Yes, until	No
	Thailand	Yes	Yes, until	Yes, until	No
Latin America	Chile	Yes, until	No	No	Yes, until
	Mexico	No	No	No	No
Africa	Uganda	No	No	No	No

*U.K of Great Britain & Northern Ireland

Table 3. Criteria for ESCO accreditation

Business criteria	
Longevity	Length of time that the ESCO business has been in operation
Project completion and investment amount	Total amount of projects in monetary value that have been completed
Staff capacities	Staff experience, competency, capacity and organizational structure
Insurance verification	General liability insurance on construction and business maintenance
References	References from clients to evaluate the perceptions of performance
Ethics agreement	Signature of ESCO Code of Ethics of the accrediting organization
Legal action description	Monitoring point of ESCO performance and issues with project fulfilment
Certifications	Potential certification requirements e.g. ISO9000 on quality management systems
Financial criteria	
Financial strength	Documentation of ESCO's profitability and evaluation of debts, timely payments, capital availability, general bookkeeping practices
Financial statements	Review of audited financial statements
Technical criteria	
Number of projects	The competency of the ESCO to deliver projects
Ability	The ability of the ESCO (staff) to perform certain aspects of project delivery e.g. minimum amount of staff being certified energy auditors or other
Audit equipment ownership	Availability of energy audit equipment for the staff to use in project development phases
Safety requirements	Conforming with governments safety requirements for workers
Measurement and Verification Demonstration	Competence to guarantee project's performance as predicted in detailed energy audit

Source: Inspired by (Langlois & Ureun, 2020)

26

26

- 6.2 Contratos de rendimiento energético

Riesgo del ahorro

La ESE asume el riesgo del rendimiento del proyecto. Existen dos tipologías de gestión del ahorro:

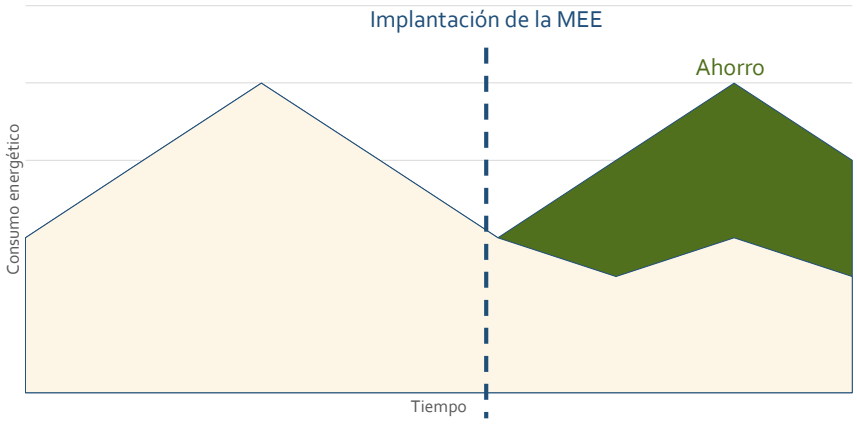
- Ahorros compartidos: acuerdo de compartir los beneficios acumulados a partir de ahorros. En los primeros años, la ESE suele beneficiarse de un mayor porcentaje para recuperar la inversión.
- Ahorros garantizados: la ESE garantiza un determinado porcentaje de ahorro. Esta está obligada a pagar a la empresa/industria si no alcanza el ahorro garantizado.

27

27

- 6.2 Contratos de rendimiento energético

Ahorro energético



28

28

- 6.2 Contratos de rendimiento energético

Tecnologías más usadas por las ESEs

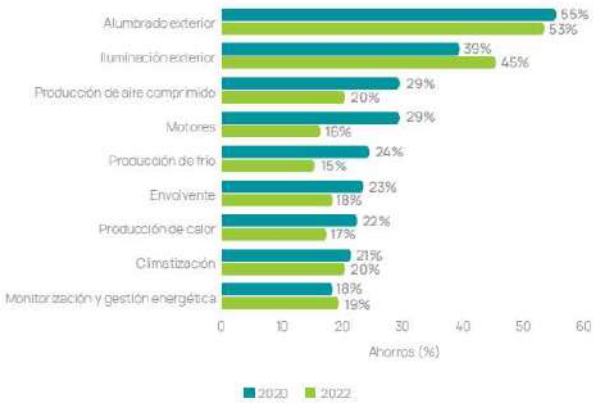
	2021	2022
Alumbrado exterior	29%	43%
Iluminación	32%	29%
Climatización	61%	57%
Monitorización y gestión energética	57%	57%
Motores	11%	11%
Envolvente	14%	14%
Producción de calor en industria	39%	43%
Producción de frío en industria	14%	21%
Producción de aire comprimido	11%	14%
Movilidad sostenible	18%	21%

29

29

- 6.2 Contratos de rendimiento energético

Tecnologías que generan mayor porcentaje de ahorro



30

30

- 6.2 Contratos de rendimiento energético

Financiación de proyectos

Existen distintas opciones de financiación:

- Por la empresa/industria
- Por la ESE
- Por terceros
- Una tercera entidad o subvención
- Gobierno o entidades públicas
- Una combinación de las anteriores

31

31

- 6.2 Contratos de rendimiento energético

Financiación de proyectos

- A nivel Europeo, Eurostat publicó modelo o normas de este tipo de contratos, y una guía sobre los CRE en 2018
- IDAE publica modelo de prescripciones técnicas (2007) y modelo de administrativas
- Proyecto Transparense 2018 de la CE elaboró un "Código de conducta" en el que se reflejaban los principales aspectos de estos contratos, pero sobre todo como las partes debían actuar al realizar proyectos de eficiencia energética tanto en el sector público como privado

32

32

- 6.2 Contratos de rendimiento energético

Factores incluidos en un contrato según Eurostat

Existen múltiples factores que se incluyen en el CRE, algunos de estos son:

- Propiedad y derechos de acceso
- Especificaciones, diseño e instalación
- Operación y mantenimiento
- Ahorro garantizado
- Método de pago
- Cambios en el contrato o normativa
- Seguro
- Garantías e indemnizaciones
- Finalización prematura del contrato

33

33

- 6.2 Contratos de rendimiento energético

Modelo contrato IDAE

Propuesta de modelo de contrato de servicios energéticos y mantenimiento en edificios de las Administraciones Públicas.

Contiene un pliego de cláusulas administrativas y otro de condiciones técnicas

34

34

- 6.2 Contratos de rendimiento energético

Modelo contrato IDAE

Claúsulas Administrativas

En estas, se incluyen el objeto del contrato, presupuesto, exposición del proyecto, selección de candidatos, formalización, ejecución, condiciones y resolución del contrato, plazo de garantía, ayudas y subvenciones, etc.

35

35

- 6.2 Contratos de rendimiento energético

Modelo contrato IDAE

Propiedad y derechos de acceso:

- Normalmente, la empresa contratante tiene la propiedad del nuevo equipo.
- Existe la posibilidad de que el sistema pertenezca a la ESE, y se transfiera la propiedad a la compañía tras finalizar el CRE.
- La tercera opción es que la ESE mantenga la propiedad y deba retirar el equipo tras terminar el contrato.

36

36

- 6.2 Contratos de rendimiento energético

Modelo contrato IDAE

Condiciones Técnicas

Estas incluyen las condiciones generales, el ámbito de actuación, requisitos mínimos, obligaciones en la ejecución, condiciones técnicas, prestaciones aseguradas, etc.

37

37

- 6.2 Contratos de rendimiento energético

Modelo contrato IDAE

Condiciones Técnicas – Condiciones generales

- Objeto del pliego
- Servicios a contratar. Prestaciones:

P1. Gestión energética

P2. Mantenimiento

P3. Garantía total

P4. Obras de mejora y renovación de las instalaciones consumidoras de energía

P5. Inversiones en ahorro energético y energías renovables

38

38

- 6.2 Contratos de rendimiento energético

Modelo contrato IDAE

Condiciones Técnicas

- Cumplimiento de la reglamentación
- Condiciones a garantizar. Ejemplos:
  - Rango de Tª para calefacción y refrigeración
  - Calidad del aire interior
  - Asegurar producción de ACS
  - Niveles de iluminación

39

39

- 6.2 Contratos de rendimiento energético

Otros modelos de contrato

- Eurocontract
  - Modelo de una etapa
  - Modelo de doble etapa
- Programa RE:FIT de la LDA
- Modelo de la BOMA (Asociación de Propietarios y Gestores de Edificios en EEUU) y CCI (Iniciativa Clinton por el Clima)

40

40

- 6.2 Contratos de rendimiento energético

Eurocontract – Modelo de una etapa

El Eurocontract fue un proyecto europeo con intención de promocionar y aumentar el uso de este tipo de contratos CRE.

En modelo de una etapa, el propietario:

- Recopila y valora la información del proyecto
- Determina los costes energéticos de un año de referencia
- Analiza el potencial de ahorro energético y costes

Los contratistas licitan en base al proyecto.

41

41

- 6.2 Contratos de rendimiento energético

Eurocontract – Modelo de doble etapa

En modelo de doble etapa, el propietario:

- Recopila y valora la información del proyecto
- Evalúa el potencial de ahorro

La ESE seleccionada debe:

- Incorporar un contrato de desarrollo de proyecto
- Realizar una auditoría integrada para verificar el coste y posibles ahorros

42

42

- 6.2 Contratos de rendimiento energético

Criterios para la comparación de modelos de contrato

1. Sistema de pago y programación
2. Términos y requisitos de financiación
3. Medida y verificación
4. Extinción

Otras cláusulas como:

- Proceso de resolución de disputas
- Asignación de responsabilidades de impuestos y conformidad
- Requisitos de documentación e informes
- Obligación de relaciones públicas para la ESE
- Garantía
- Indemnización
- Seguro

43

43

6.3 Certificado de Ahorro Energético (CAE)

44

44

6.3 Certificado de Ahorro Energético

¿Qué son los CAES?

- Documento que certifica el ahorro de una cantidad de energía
- Satisface las obligaciones de inversión en eficiencia energética de los sujetos obligados
- Es un activo que puede ser objeto de compra-venta
- Permite al mercado mejorar el rendimiento de las inversiones en eficiencia energética
- Permite a otros agentes del mercado activar las ofertas de eficiencia energética
- Potencialmente puede abrirse a otros productos/mercados (energía primaria, CO_2, derivados)

45

45

6.3 Certificado de Ahorro Energético

¿Por qué los Certificados de Ahorro Energético?

- Monetizar los ahorros energéticos obtenidos por los consumidores finales
- Flexibilizar el cumplimiento de parte de las obligaciones de ahorro de energía de los sujetos obligados
- Conseguir ahorros de energía al menor coste
- Aumentar los ahorros computables
- Aumentar el mercado de eficiencia energética
- Generar beneficios no energéticos impulsando el empleo, la competitividad y la productividad

46

46

6.3 Certificado de Ahorro Energético

¿Qué es el sistema CAES?

❖**Demanda:** sujetos obligados/ delegados, responsables de generar ahorros.

- •Empresas obligadas (o delegadas)
- •Voluntaria (alternativa a contribución al FNEE)
- •Interés en cumplir su obligación al menor precio (Mercado CAES)
- •Nivel de demanda (mínimo definido por la UE) fuertemente creciente
- •Equivalencia financiera (€/[MWh/año] bajo aplicación del fondo) fuertemente creciente

❖**Producto**: Certificados de Ahorro Energético(CAES).Oficializan la cantidad de energía ahorrada(kWh/año)de una determinada inversión.

- •Unidad de medida: 1 CAE kWh/año de ahorro certificado
- •Precio: €/CAE (lo define el mercado)
- •Actuaciones elegibles: Virtualmente todas las que supongan un ahorro y estén enmarcadas en la Directica de Eficiencia Energética (para adquisiciones de los equipos para medidas de eficiencia energética según publicación MITMA 2023)

❖**Oferta**: Propietarios de los ahorros energéticos(responsables de la inversión para lograr una determinada actuación)

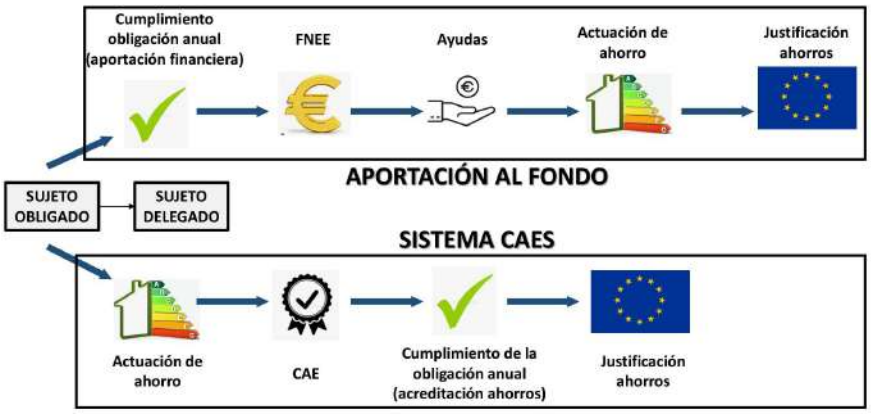
- •Invierte en actuaciones que generan ahorros energéticos. Hay un listado de 53 medidas

47

47

6.3 Certificado de Ahorro Energético

El sistema CAES



48

48

6.3 Certificado de Ahorro Energético

Marco regulatorio

Real Decreto 36/2023, de 24 de enero, por el que se establece un sistema de Certificados de Ahorro Energético

Orden TED/ 815 2023 de 18 de julio, por la que se desarrolla parcialmente el Real Decreto 36/2023, de 24 de enero, por el que se establece un Sistema de Certificados de Ahorro Energético.

Orden TED/845/2023, de 18 de julio, por la que se aprueba el catálogo de medidas estandarizadas de eficiencia energética.

49

49

6.3 Certificado de Ahorro Energético

Estructura CAE (fichas del catálogo)

1. Definición de la actuación de ahorro → *Título de la ficha*
   - Denominación de la ficha –Actuación
   - Código
   - Sector
2. Ámbito de aplicación → *Definición de la actuación*
3. Requisitos → *Requisitos a cumplir*
4. Cálculo de CAES → *Cuanto ahorro [kWh/año]*

Perspectiva estadística vs. individual

- Fórmula
- Tabla
- Mixta

50

50

6.3 Certificado de Ahorro Energético

Estructura CAE (fichas del catálogo)

5. Resultado del cálculo de CAES → *Cuanto ahorro [kWh/año]*

6. Justificación documental → *Prueba e identificación*

- Convenio CAE
- Resultado de la ficha
- Documentos de respalde del cálculo de CAES (para fórmula, tabla, etc.)
- Facturas
- Fotografías (antes/después) y geolocalización
- Declaración jurada –Ayudas recibidas o solicitadas (ANEXO)
- Otros

51

51

Bibliografía

- [1] *Observatorio de eficiencia energética 2023*, ANESE
- [2] *Regulatory barriers for energy service companies*, The global ESCO network, 2023
- [3] Propuesta de modelo de contrato de servicios energéticos y mantenimiento en edificios de las Administraciones Públicas , IDEA
- 4 PERTE industria 2024
  https://www.boe.es/boe/dias/2023/12/28/pdfs/BOE-B-2023-39164.pdf

52

52

Anexo – Fondo de recuperación de la UE

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

(NextGeneration EU)

Para paliar los efectos de la pandemia:

TOTAL	€ 750.000 millones
Ayudas	€ 390.000 “
Préstamos	€ 360.000 “
TOTAL ESPAÑA	€ 140.446 millones
Ayudas	€ 72.000 “
Préstamos	€ 67.000 “

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

- Para el Mecanismo de Recuperación y Resiliencia se destina el 90% del total del fondo.
- Cada país presenta **PNRR,** Plan Nacional de Recuperación y Resiliencia.
- La CE en colaboración con el consejo europeo → Evaluación.
- Concesión de fondos: evaluación + reformas.

55

55

55

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

"Plan Nacional de Recuperación y Resiliencia"

PNRR – 2021-2024

- Presentación de la CE : Abril 2021
- 70% de los fondos : 2021 - 2022
- 30% restante : 2023 - 2024
- Mecanismo de control o "freno de emergencia"

BLOQUEAR LAS AYUDAS

56

56

56

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

"Plan Nacional de Recuperación y Resiliencia"

PNRR – 2021-2024

1.- Transformación digital:	Promover inversión privada para mejorar la economía y la competitividad.
2.- Transición ecológica:	Movilizar inversión privada dirigida a proyectos energéticos y ecológicos.
3.- Cohesión social y territorial:	Promover reformas educativas y laborales.
4.- Igualdad:	Reducir la brecha hombres – mujeres y eliminar la violencia de género.

57

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

Transformación digital

Objetivo	• Promover la inversión privada en torno a la **transformación digital**
Programa de reformas (1)	• Profundizar en el uso de las **TIC en el ámbito educativo.** • Despliegue de **redes 5G** y mejora de la **conectividad del medio rural.** • Mejorar la **digitalización de servicios públicos** estratégicos como la sanidad, la justicia o el servicio de empleo público que eviten cuellos de botella. • **Digitalización de las empresas,** en particular las pymes. • Impulsar la **digitalización del sistema productivo** para permitir esquemas de flexibilidad laboral y mejoras de productividad.

(1) Plan de reformas sugeridas en el marco del semestre europeo y las recomendaciones del grupo de trabajo mixto COVID-19
Fuente: Monitor Deloitte

58

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

Transición ecológica

Objetivo	• Promover nuevas oportunidades económicas en torno a la **transición ecológica.**
Programa de reformas (1)	• Ampliar la inversión en **energías limpias** y rentables como la eólica y la fotovoltaica • Promover **energías complementarias e incipientes** como el hidrógeno • Inversión en **redes de energía** que permitan ahorros de costes al consumidor • Renovar el **equipamiento energético de los edificios** • **Descarbonizar el transporte** ampliando el parque de vehículos eléctricos • Instalación de **puntos de recarga** eléctricos • Mejorar los sistemas de **depuración de aguas**

(1) Plan de reformas sugeridas en el marco del semestre europeo y las recomendaciones del grupo de trabajo mixto COVID-19
Fuente: Monitor Deloitte

59

59

59

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

Cohesión social y territorial

Objetivo	• Promover reformas que eviten el **fracaso escolar** y favorezcan la **inserción laboral.**
Programa de reformas (1)	• Ampliar los sistemas de apoyo **financiero a las empresas** que garanticen su liquidez y solvencia • Ampliar la cobertura de los **ERTEs** • Facilitar la **reincorporación** al mercado laboral de los trabajadores cubiertos por ERTE • Favorecer la transición hacia **contratos indefinidos** • Reducir el **abandono escolar** prematuro • Reducir las **disparidades regionales** en el ámbito educativo • Facilitar **el acceso a vivienda** a jóvenes y otros colectivos vulnerables • Evitar el **corte de suministros** básicos por impago

(1) Plan de reformas sugeridas en el marco del semestre europeo y las recomendaciones del grupo de trabajo mixto COVID-19
Fuente: Monitor Deloitte

60

60

60

- Anexo – Fondo de recuperación de la UE

Fondo de recuperación UE (2021-2027)

Igualdad

Objetivo	• Reducir la **brecha entre hombres y mujeres** y eliminar la violencia de género.
Programa de reformas (1)	• Equiparar la **remuneración salarial** de hombres y mujeres. • Incrementar la presencia de **mujeres en puestos directivos.** • Implementar **planes de igualdad de género** en las empresas. • Aumentar los programas de **atención a víctimas** de violencia de género. • Fomentar la **co-responsabilidad en el cuidado de los hijos.** • Creación de mecanismos de **adaptación del trabajo** a la persona a cargo de niños pequeños.

(1) Plan de reformas sugeridas en el marco del semestre europeo y las recomendaciones del grupo de trabajo mixto COVID-19
Fuente: Monitor Deloitte

61

61

61

AUDIT2MEASURE

Muchas gracias

Para más información, visite nuestra web o contáctenos:

www.escansa.com

escan@escansa.com; aedhe@aedhe.com

#AUDIT2MEASURE

Cofinanciado por la Unión Europea bajo el proyecto ID 101075785. Los puntos de vista y opiniones expresados son únicamente los del autor o autores y no reflejan necesariamente los de la Unión Europea o CINEA. Ni la Unión Europea ni la autoridad que concede la ayuda pueden ser consideradas responsables de ellas.

62