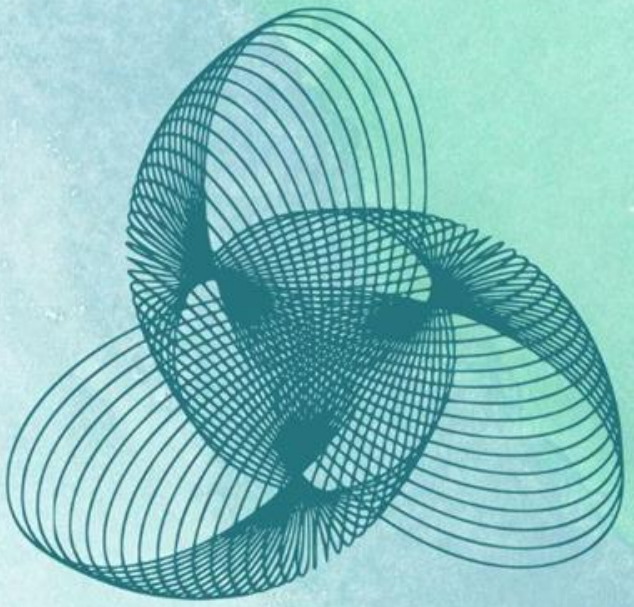

SEANERGY

the Sustainability EducationAl programme for greeNER fuels and enerGY on ports

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Module #1: Energy management in ports - PART 1

Course coordinator:

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Introduction

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Course contents:

PART 1

- Key concepts
- EU Directives & Standards
- Energy transition definition, context and solutions
- Energy management in ports
- Energy transition in ports
- Case study – Port of Valencia

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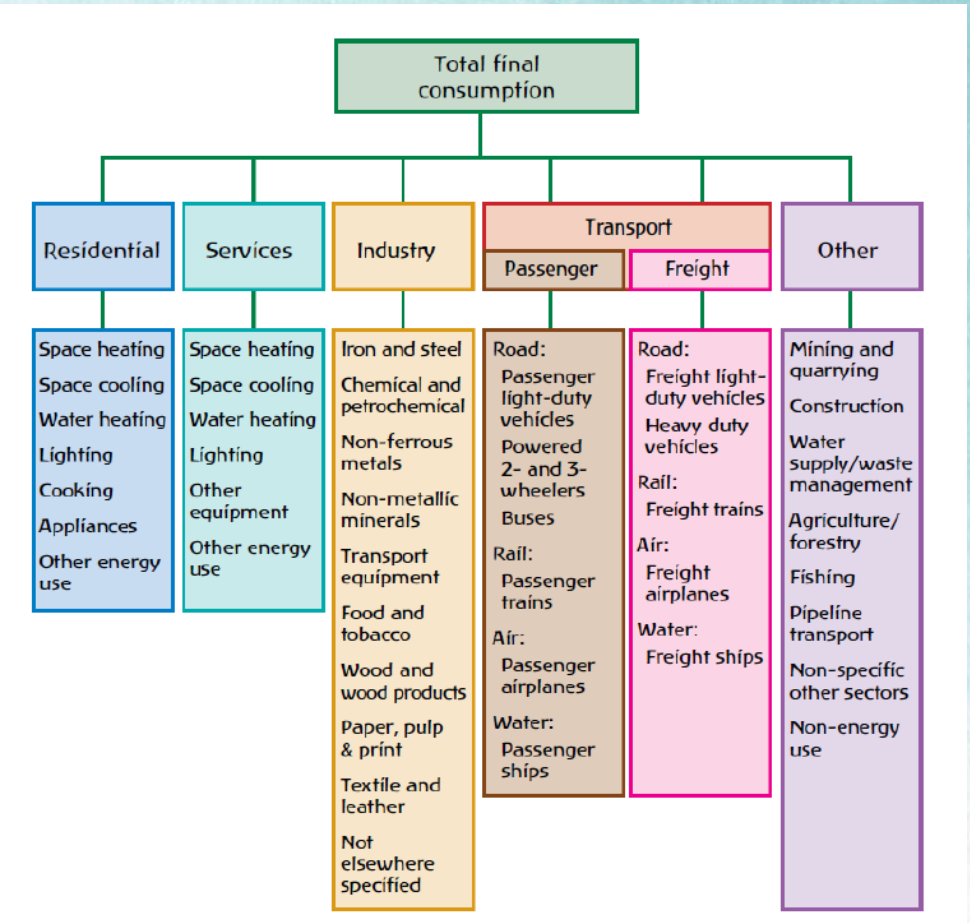
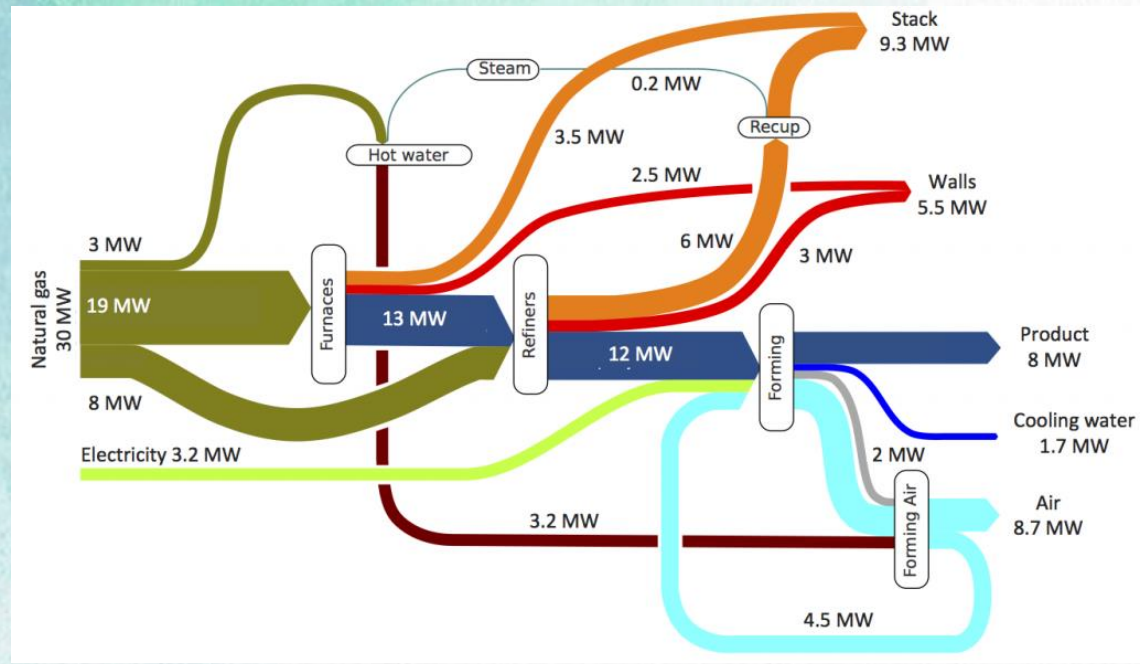
Key concepts – Energy flow and consumption



Source: Implementation of the Energy Efficiency Directive (2012/27/EU): Energy Efficiency Obligation Schemes



http://www.waterandenergysolutions.nl/our-approach/

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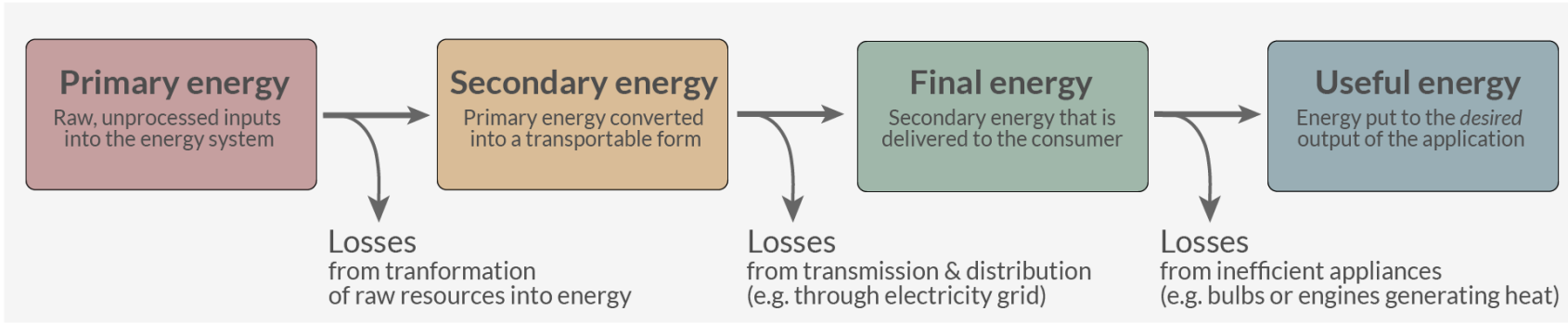
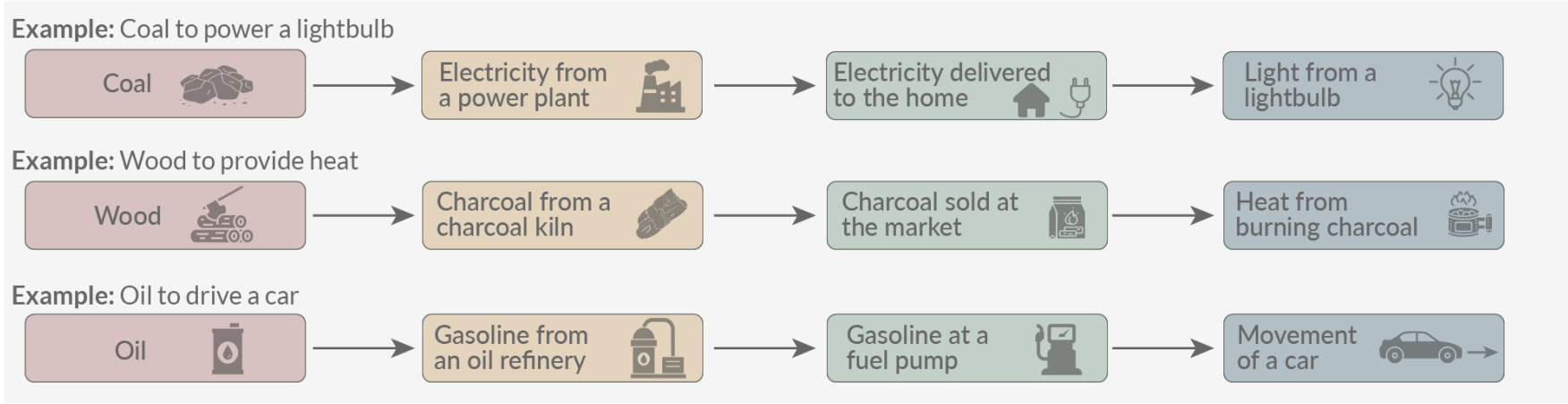
Key concepts – Type of energy

The four ways of measuring energy

Our World in Data





Icon source: Noun Project.
OurWorldinData.org – Research and data to make progress against the world's largest problems.

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Key concepts – Energy Management

Energy management is the **proactive and systematic** monitoring, control, and optimization of an organization's energy consumption to conserve use and decrease energy costs.

Objectives:

- to **minimize energy costs/waste** without affecting production & quality
- to **minimize environmental effects**, reduce carbon emission and climate protection
- to **increase energy efficiency** and reduce import dependency
- to enhance energy security, economic competitiveness and environmental quality

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Key concepts – Energy Efficiency

"The world's first fuel."

International Energy Agency, 2013

"The easiest way to save money is to waste less energy."

Barack Obama, US President, 2012

"Energy efficiency measures are becoming big business."

The Guardian, 2013

"Investing in energy efficiency makes economic sense and the current financing gap represents a huge business opportunity."

Josué Tanaka, Managing Director for Energy Efficiency and Climate Change at the EBRD, 2015

"Energy Conservation is the first solution to stop rising temperature. This is everyone's responsibility."

Narendra Modi, Indian Prime Minister, 2015

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Key concepts – Energy efficiency

Energy efficiency simply means **using less energy to perform the same task**. Energy efficiency brings a variety of benefits: reducing GHG emissions, reducing demand for energy imports, and lowering costs.

Energy efficiency

- Saving energy, but keeping the same level of service
- Focuses on: using energy more efficiently
- Action for energy efficiency: replace traditional lamps with LED lamps

vs

Energy conservation

- Saving energy by reducing service
- Focuses on: cutting back on the usage
- More willing to ask consumers to change behavior: for example turning light off when you leave a room

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Key concepts – Energy intensity

Energy intensity is a measure of the energy inefficiency of an economy. It is calculated as units of energy per unit of GDP (Gross Domestic Product) or some other measure of economic output. High energy intensities indicate a high price or cost of converting energy into GDP. On the other hand, low energy intensity indicates a lower price or cost of converting energy into GDP.

The energy intensity of a country or region differs from its energy efficiency. Energy intensity is affected by climate, economic structure (e.g. services vs. manufacturing), trade, as well as the energy efficiency of buildings, vehicles, and industry.

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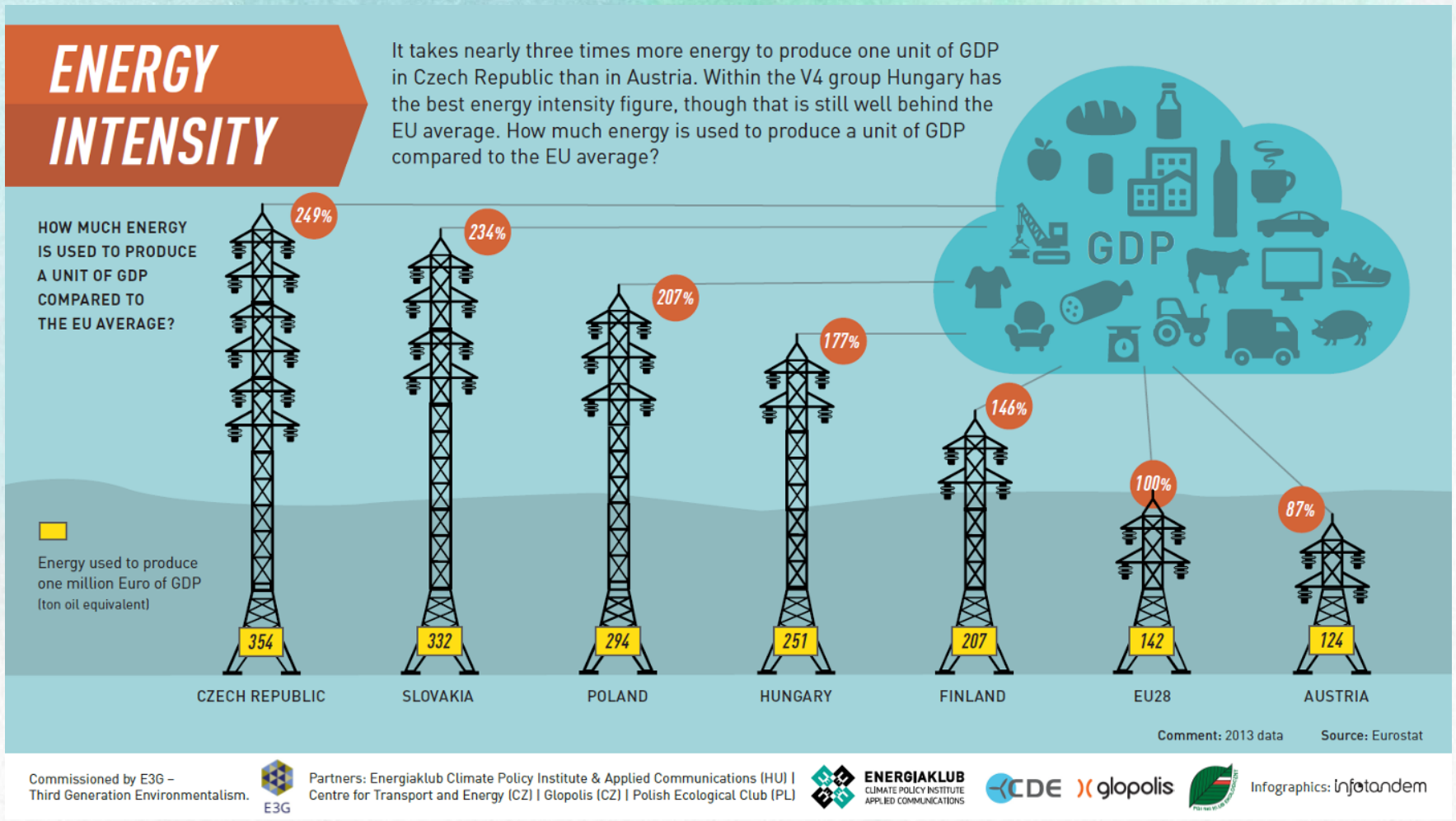
Key concepts – Energy intensity



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ISO 50001 – Energy Management System

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«Set of interrelated or interacting elements to establish an energy policy and energy objectives, and processes and procedures to achieve those objectives.»

ISO 50001 Standard

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The history and Evolution of ISO 50001

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2007

United Nations Industrial Development Organisation (UNIDO) decided to proposed to ISO

2008

Project committee called ISO/PC 242 Energy Management declared by ISO

2011

17 June 2011, ISO 50001 published by ISO

2018

Revised version of ISO 50001 with ISO's high level structured incorporated was released

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ISO 50001 – Principles

Continual improvement of energy performance

- **"Breaking"** with old management standards objectives and targets concepts

Applicable to all variables affecting energy performance:

- looking for the **future**, including vision for general aspects of energy, not only local application

Applicable to **all kind of organizations** and aligned with other management systems

- all **people can contribute** with rational energy use and it's need to be simple

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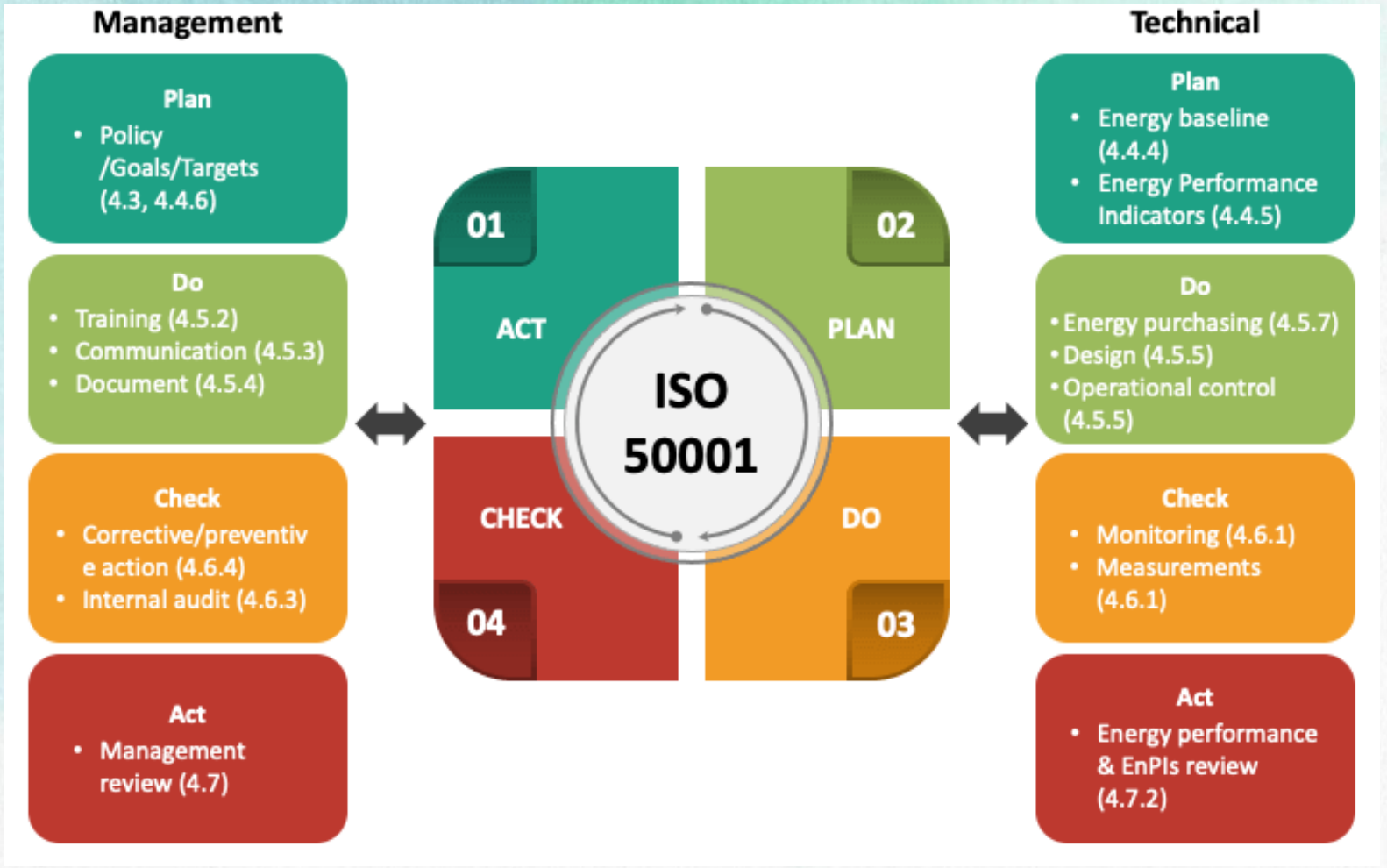
ISO 50001 – Principles



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ISO 50001 – Main definitions

- **ENERGY BASELINE (EnBs)**

Quantitative reference(s) providing a basis for comparison of energy performance

- **SIGNIFICANT ENERGY USE (SEU)**

An energy use that accounts for substantial energy consumption and/or offers considerable potential for energy performance improvement

- **ENERGY PERFORMANCE INDICATOR (EnPI)**

Quantitative value or measure of energy performance, as defined by the organization

NOTE: EnPIs could be expressed as a simple metric, ratio or a more complex model

- **ENERGY REVIEW**

Determination of the organization's energy performance based on data and other information, leading to identification of opportunities for improvement

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The 4 principal Energy Efficiency EU Directives

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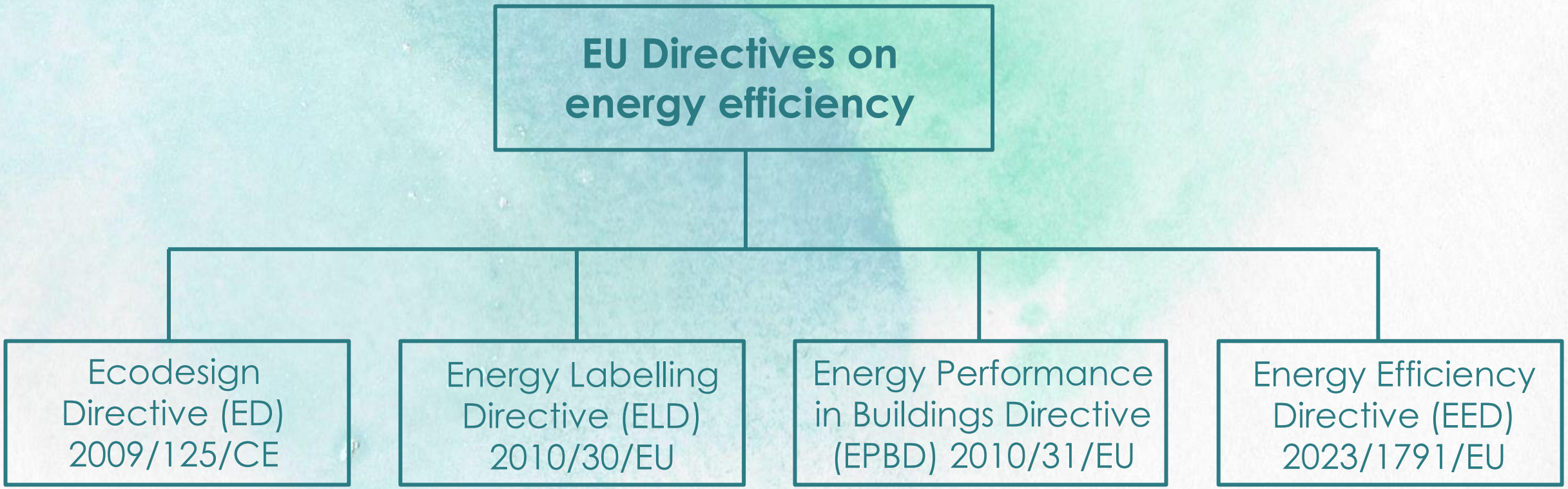

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EED – Mandatory EMS (ISO 50001)

The Article 1 of the EEC Treaty 11 of Directive (EU) 2023/1791 defines the **obligation to adopt an energy management system (EMS), compliant with the ISO 50001 standard**, for all companies with an average annual **energy consumption for more than 2030 toes, estimates in the previous 3 years.**

The EMS must be certified by third party bodies **by 11/10/2027**.

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EED – Mandatory Energy Audits for Large Companies

Although the previous directive already required energy audits in buildings, the 2018 Directive becomes stricter and makes **regular audits mandatory for large companies.**

ITALY - Example

DLgs. 102/2014 – energy audit mandatory for:

- **Large companies**
  - N° employees ≥ 250
  - Annual turnover > 50 M€

Or

  - Annual budget > 43 M€
- **Energy-intensive sites**
  - Annual electricity consumption ≥ 1 GWh

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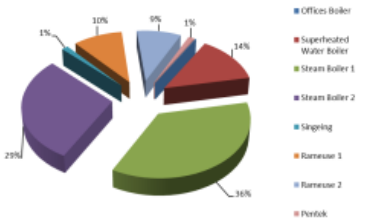
EN 16247 – Energy audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

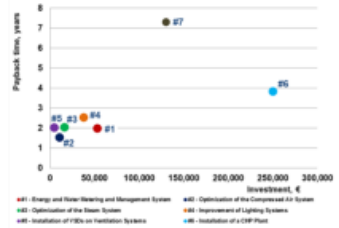
Energy audit procedure according to the EN 16247

Data collection

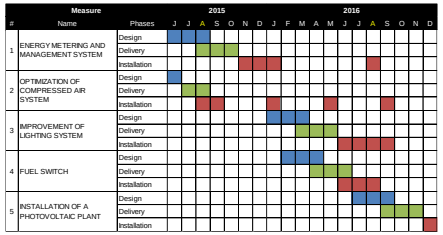
Site visit



Energy balances and analysis



Investment appraisal



Investment scheduling

Audit report

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EN 16247 – Energy audit: data collection

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Data must be complete and accurate, consider the following when collecting energy use data:

- **Appropriate level of detail:** some may choose to collect data from sub-meters on individual processes while others may only look ad a utility bill
- **Account for all energy sources:** inventory all energy purchased and generated on-site (electricity, gas, steam, waste, fuels) in physical units (kWh, mMBtu, kg of steam, etc.)
- **Document all energy uses:** for the sources identified above, assemble energy bills, meter readings and other use data
- **Gather at least three years of monthly data or a more frequent interval if available.** Use the most recent data available
- **Collect facility and operational data:** it may be necessary to collect non-energy related data for all facilities and operations, such as building size, operating hours, etc… and also detailed information on the characteristics: use and maintenance of the machinery installed, both related to the production activity and to the auxiliary systems.

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EN 16247 – Energy audit: monitoring campaign

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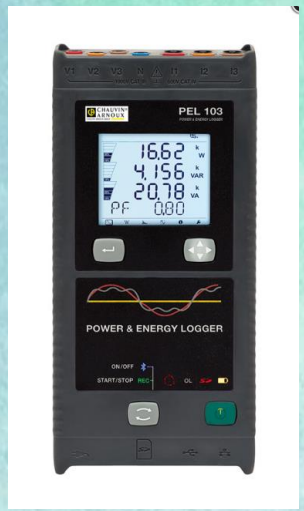

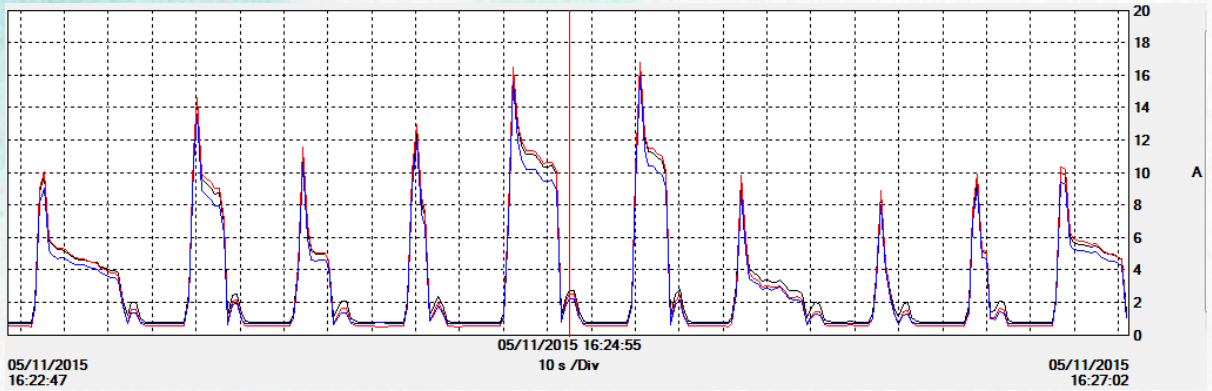

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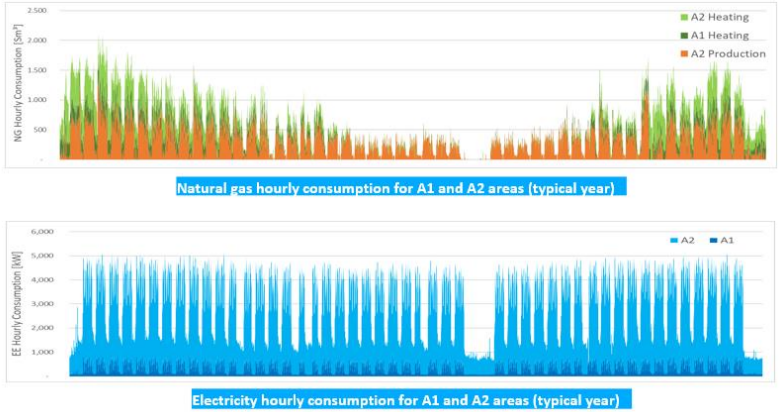
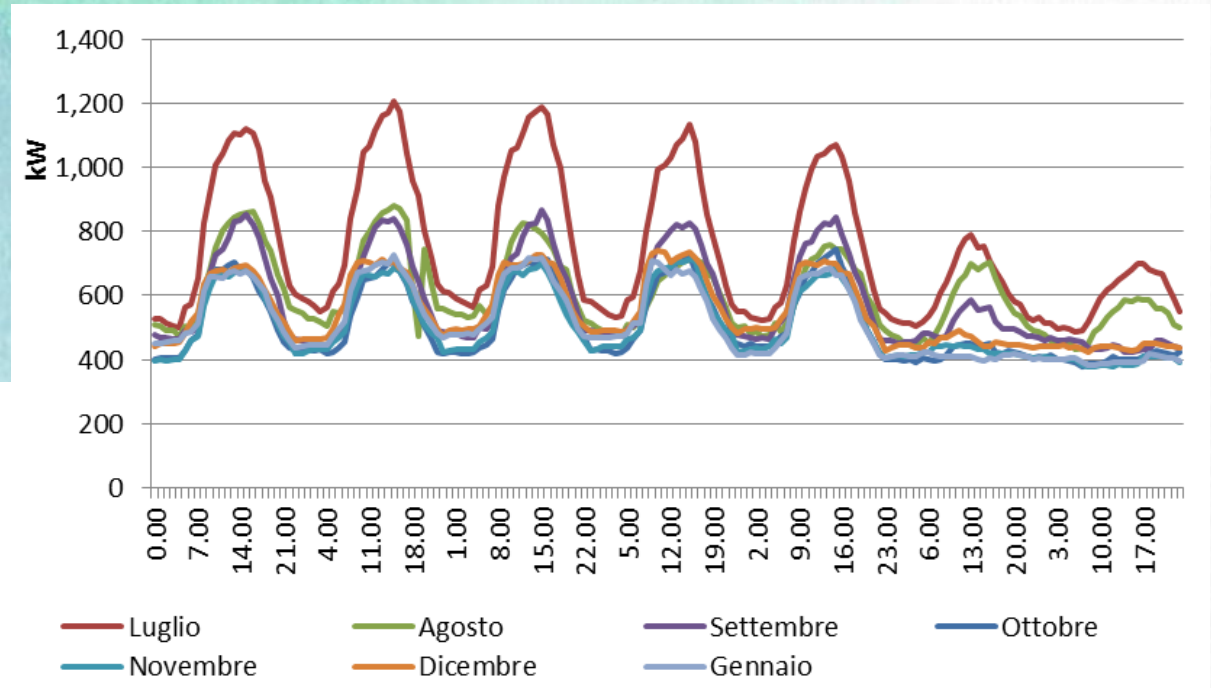
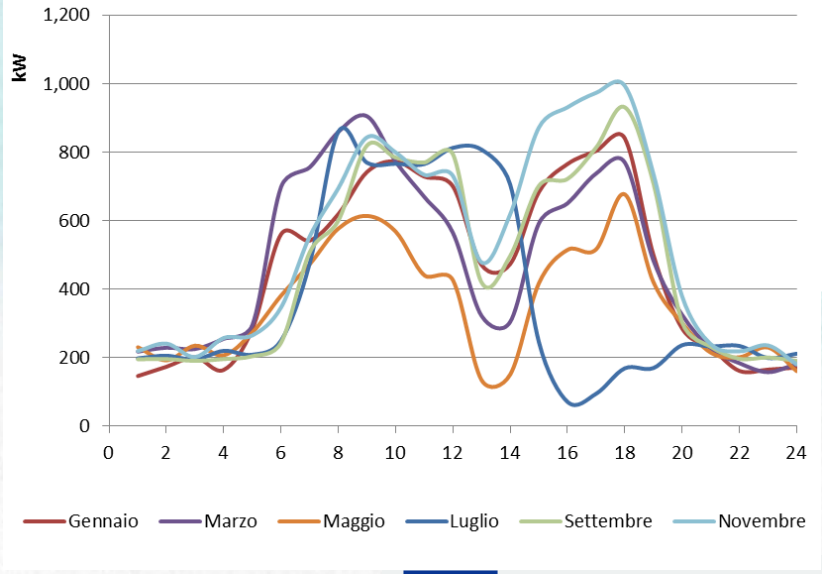
EN 16247 – Energy audit: monitoring campaign







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Energy transition - context

COP28 called on parties to **take action** on a global scale to triple renewable energy capacity and double progress in energy efficiency **by 2030.** It also called on them to put forward ambitious emission reduction targets, covering all GHGs, economic sectors and categories.

The goal by 2050 is still to achieve so-called **Carbon Neutrality**, in other words, to reduce and avoid GHG emissions by offsetting the remaining emissions through the use of so-called carbon credits.
To achieve this goal, which was enshrined at COP26 in Glasgow, our main tool is the **energy transition**, i.e., the shift from an energy mix based on fossil fuels to one that produces very limited, if not zero, carbon emissions, based on renewable energy sources. A huge contribution to decarbonization comes from the **electrification of consumption**, replacing fossil fuel-generated electricity with energy generated from **renewable sources**, which also makes other sectors like transport cleaner; the digitalization of grids also contributes by **improving energy efficiency**.

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Energy transition

Advantage of energy efficiency measures

Micro

Competitiveness:
- Reduction of costs
- Amelioration of the margin / EBITDA

Better operational performance:
- Co-benefit: better organization / management of the processes

Macro

Environment:
- Global: Reduction of GHG emissions
- Local: Less air pollution

Energy security:
- Reduction of fossil fuels imports
- Reduction of price volatility

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Energy transition

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Technical and financing challenges of energy efficiency measures

Project challenges

Technical factors contributing to unsuccessful energy efficiency projects:

- Technical inexperience
- Neglecting operation & maintenance
- Bad assumptions
- Neglecting interactions of EE measures with other processes
- Reluctance to change
- One-size-fits-all solutions
- Wrong baseline
- Poor monitoring, reporting and verification

Investment challenges

- Economic viability, long pay-back periods
- Small size of projects & small investment costs
- Lack of information on energy consumption patterns
- High transaction costs: access to information insufficient, underdeveloped expertise
- Intangibility: Turning reduced cash outflow into cash inflow to pay interest rates
- Perceived higher risk due to lacking technical knowledge in FIs
- Lack of harmonized M&V approach
- Misaligned policy incentives: subsidies for fossil fuels, low or no carbon prices

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Energy transition

Technical and financing risks of energy efficiency measures

Technical Risks

(energy saving not achieved)

- Technologies not familiar to client
- Inadequate energy efficiency technology installed
- Inadequate usage of energy efficiency technology
- Tools (e.g. eligibility checking & monitoring tools)
- Justification of savings through registered energy auditors

Financial Risk

(recipient not able to repay loan, economic and financial difficulties of a firm etc.)

- No track record for energy efficiency projects
- Savings are not high enough/ lower than expected
- Energy price does not develop as anticipated
- Application of special financing models
- Cash flow-based lending
- Adjusting collateral policy

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Conclusions and take-home message

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Learning objective n° 1: understand key concepts related to energy audit, energy consumption, energy intensity and energy efficiency

These definitions are essential to improve energy management and exploit potential improvement opportunities.

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Conclusions and take-home message

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Learning objective n° 2: recognize the main standards (i.e. ISO 50001, EN 16247), guidelines and EU directives on energy

Standards and regulations indicate how to properly perform an energy audit and follow ISO 50001. In addition, the EU directives are important to achieve the targets of decarbonisation

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Conclusions and take-home message

Learning objective n° 3: analyse energy flow and sources, and distinguish type of energy and energy users that can be used

By identifying energy carriers, energy consumers and main sources, it is possible to identify areas on which to focus and analyse consumption in detail.

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Conclusions and take-home message

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Learning objective n° 4: identify techniques to plan correctly a data collection and a monitoring campaign, to support the energy audit process

A good measurement campaign does not measure all users, but the most important ones and with potential for improvement.

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References

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- Waide Strategic Efficiency
- Construction 21 – 4 key points of EED
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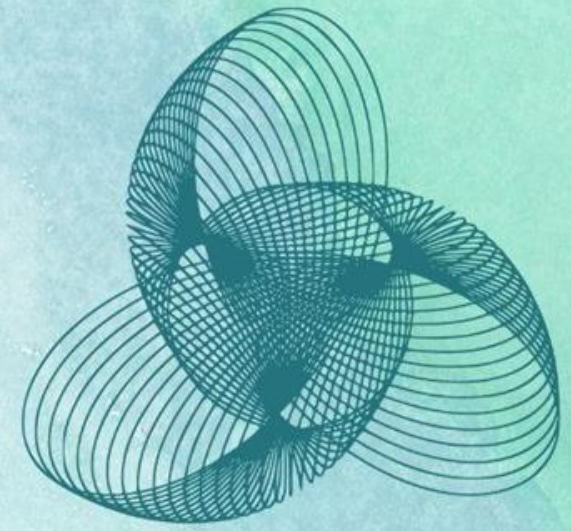

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