Towards to EU Energy Transition: The importance of Energy Efficiency in Industry

Costas G. Theofylaktos
Dipl. Mechanical Engineer, MSc
Energy Auditor C' class
Secretary General IENE

What this presentation is about

1. Definition of Energy Efficiency - Advantages
2. European Energy Policy towards Energy Efficiency
3. European Legislation for Energy Efficiency
4. Industry: The crucial role of Energy Efficiency
5. European Policy for Industry: «*Net – Zero Industry Act*»
6. The role of Energy Audits in Industry
7. Performing Energy Audits in Industry
8. Energy Audit Report from an Energy Audit in Industry
9. Conclusions

1. Define Energy Efficiency

*«Energy efficiency improvements refer to a **reduction in the energy used for a given service or level of activity»***

World Energy Council

*«Energy efficiency encompasses all changes that result in decreasing the **amount of energy used to produce one unit of economic activity.** Energy efficiency is associated with economic efficiency and includes technological, behavioral and economic changes»*

World Energy Council

*«Energy efficiency is **the use of technology that requires less energy to perform the same function»***

Energy Information Administration

*«Energy efficiency is the process of **substituting energy by capital**, usually to generate profit after a certain amount of time»*
M. Pehnt, Energieeffizienz

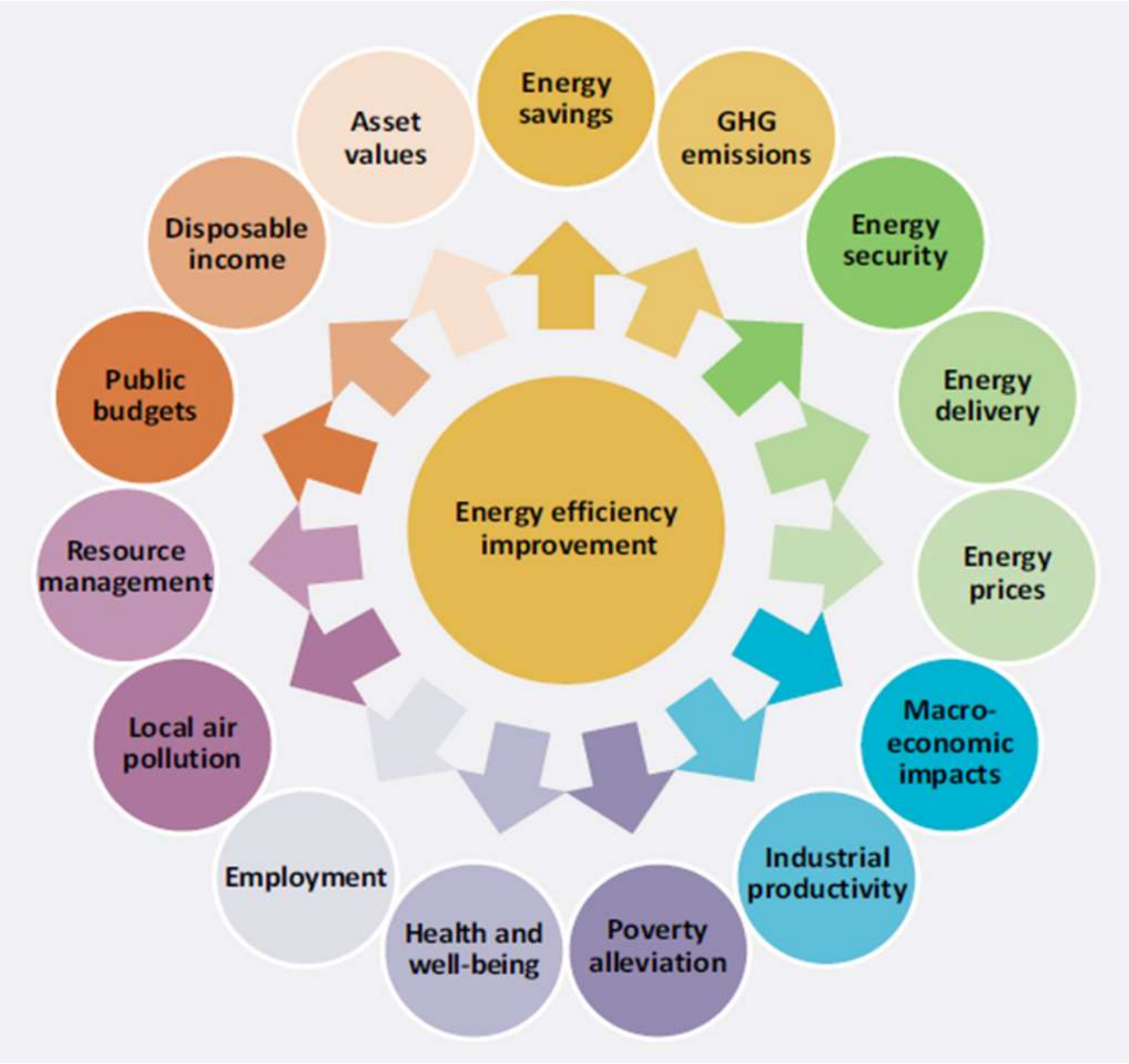
«Energy efficiency means the ratio of output of performance, service, goods or energy, to input of energy»

EC Directive 27/2012/EC

*«**Energy efficiency is the fuel of the future**»*

Unknown

1. Advantages of implementing Energy Efficient Measures

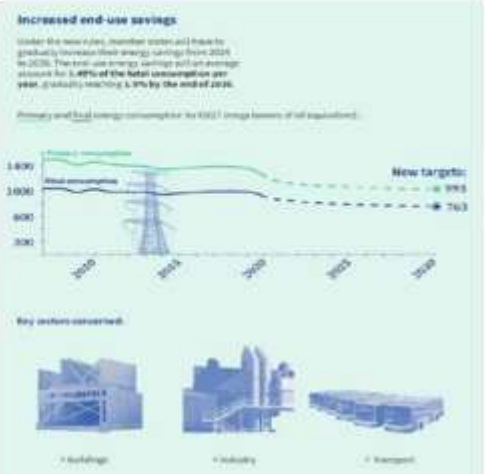


Source: IEA 2014

2. European Energy Policy

"Saving energy is a key step to saving the planet. In recent months, Europeans have shown that they are ready and able to face this challenge, and our industry has proven that it can optimise its energy use and production processes. We now need energy efficiency to become an even more systemic part of our society, and this revised directive helps us to do that."

Frans Timmermans, Executive Vice-President for the European Green Deal - 10/03/2023



EU's commitment to global climate action under the Paris Agreement

Greenhouse Gas Emissions

2020	2030
-20%	≥40%

≥-55%

(EU Climate Law)

Renewable Energy

2020	2030
20%	32%

≥40%

Energy Efficiency

2020	2030
20%	32.5%

≥36%

Adapt to meet commitment
'**Fit for 55%**' package

The first Directive for Energy Efficiency, No 2012/27/EU, known as EED, was approved in 2012.
Until today, it was recasted twice: in 2018 and in 2023 «***setting rules and responsibilities for the achievement of the ambitious targets of Energy Efficiency of EU***».

Both Directives 2012/27 and 2018/2002 used the same framework for mandatory **Energy Audits** to all responsible companies and industries, as follows:

- those that the enrolled employees are >250 and the annual turnover >50 mil.€ or
- the total annual balance sheet >43 mil.€.

* https://eur-lex.europa.eu/legal-content/EL/TXT/HTML/?uri=CELEX:32023L1791

EED 2023/1791/EU

The last recast, occurred in October 2023, as EED 2023/1791/EU, introduces *«Energy Efficiency First»*, as a fundamental principle of the European Energy Policy providing legal status for the first time.

Important: the new EED is giving emphasis to "**Energy Poverty**".

To optimize Energy Efficiency in the industrial sector, Directive 2023/1791/EU - Article 11 - extends the scope of energy audit obligations to include all those companies, regardless of their size, that consume energy above a certain threshold .

In detail, businesses that have:

Average annual energy consumption >85 TJ (23,611 MWh/yr) during the previous three years are required to implement an Energy Management system (ISO 50001),

Average annual energy consumption >10 TJ (2,778 MWh/yr), during the previous three years, and do not implement an Energy Management system, are subject to an **energy audit**.

Energy Audits: The status today

The current Directive, 2018/2002/EU makes **energy audit** a mandatory requirement for large industrial energy consumers.

In all EU MS, from 2018 until today, there have been performed many energy audits in industries and in large consumers (i.e. large buildings of tertiary sector) and propose numerous of Energy Efficiency measures.

However, an important issue remains, the "non-obligation" of the audited company to implement "all or part" of the Energy Efficiency Measures, proposed by the Energy Auditor in the Energy Audit Report. This situation is a common situation in many EU-MS.

But, there was a small - but - important change, from May 2023…

DIRECTIVE (EU) 2023/959 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 10 May 2023

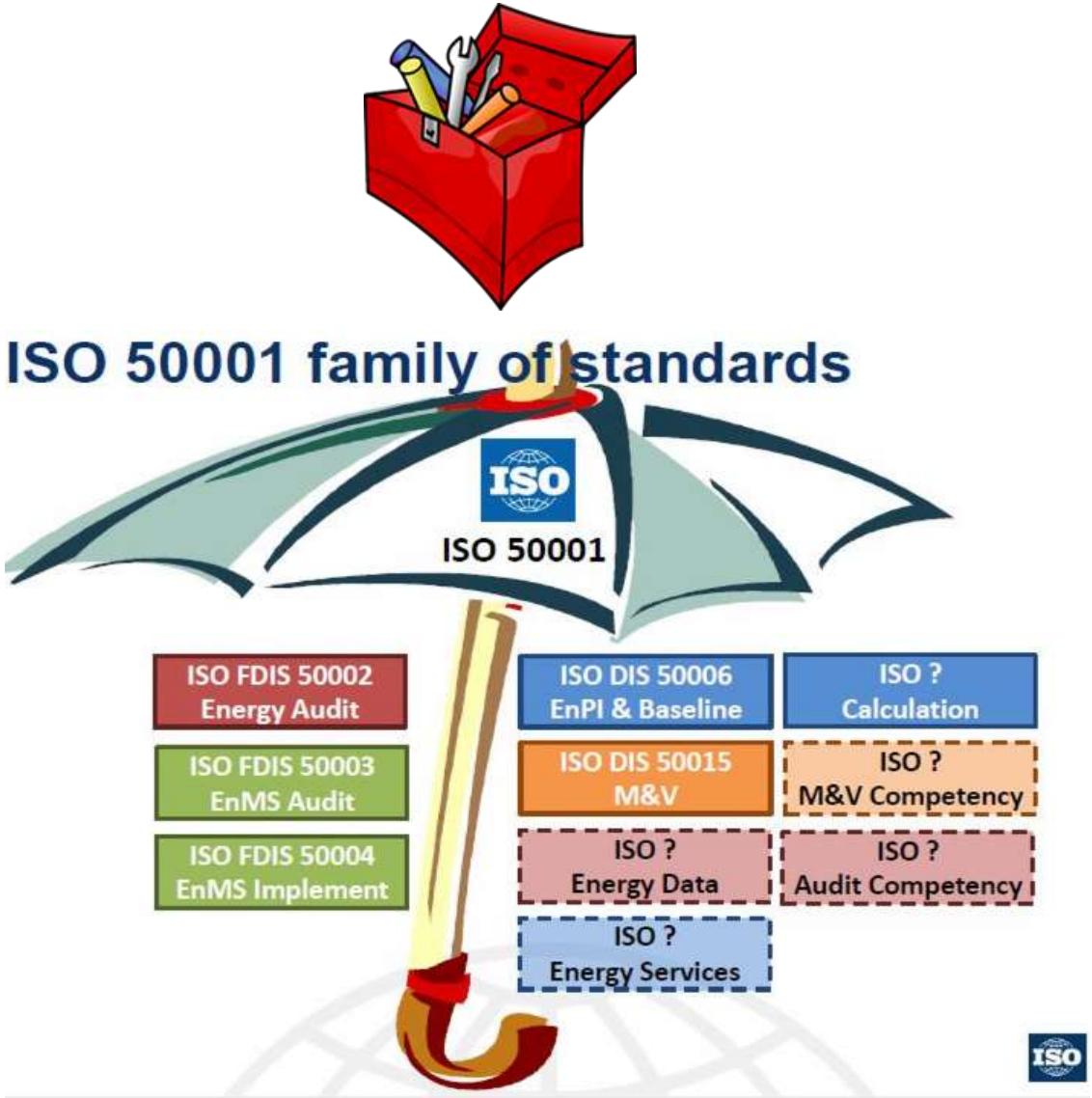
amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system

(i) the following subparagraphs are inserted after the second subparagraph:

'If an installation is covered by the obligation to conduct an energy audit or to implement a certified energy management system under Article 8 of Directive 2012/27/EU of the European Parliament and of the Council ([*14]) and if the recommendations of the audit report or of the certified energy management system are not implemented, unless the pay-back time for the relevant investments exceeds three years or unless the costs of those investments are disproportionate, then the amount of free allocation shall be reduced by 20 %. The amount of free allocation shall not be reduced if an operator demonstrates that it has implemented other measures which lead to greenhouse gas emission reductions equivalent to those recommended by the audit report or by the certified energy management system for the installation concerned.

ISO 50001:2018 is referring to all industries and companies aiming to reduce their energy consumption and improve their energy efficiency.

Emphasis is placed on "heavy" industries, which are part of the Greenhouse Gas Trading System, based on EU Regulations 2066 and 2067 of 2018, but also on any other business that applies GHG processes.



Energy Management System - ISO5001:2011 Και 2018

2018

- **ISO 50001:~~2011~~** Energy Management Systems – Requirements with guidance for use
- **ISO 50002:2014** Energy audits - Requirements with guidance for use
- **ISO 50003:2014** Energy management systems - Requirements for bodies providing audit and certification of energy management systems
- **ISO 50004:2014** Energy management systems - Guidance for the implementation, maintenance and improvement of an energy management system
- **ISO 50006:2014** Energy management systems - Measuring energy performance using energy baselines (EnB) and energy performance indicators (EnPI) - General principles and guidance
- **ISO 50015:2014** Energy management systems - Measurement and verification of energy performance of organizations - General principles and guidance

ISO 50001

ISO 50001

- ISO/TC 242 developed ISO 50001 (49 countries participated)
- ISO/TC 257 is working on to develop further guidance and standards

4. Industry: The important role of the Energy Efficiency

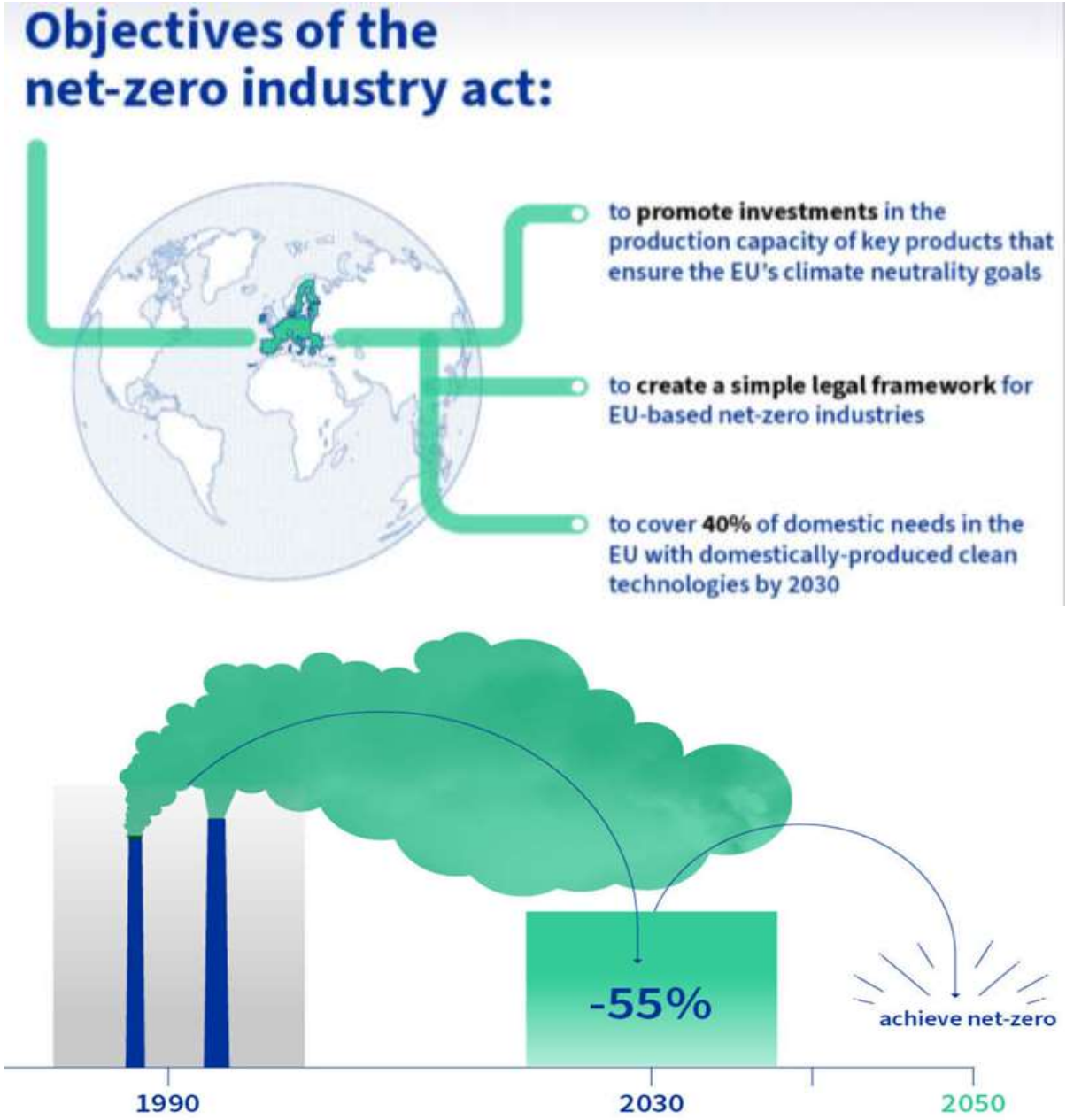
- Energy Efficiency in Industry plays a key role in improving Energy Security, environmental sustainability and economic performance. It has an important role in strategies to reduce Climate Change.
- Industries in the European Union (EU) account for 9% of global industrial energy demand (13.3 EJ in 2020). To comply with agreed policies, European industry will need, over the next 30 years, to reduce energy consumption to 11.7 EJ in order to meet the climate targets of 9.6 EJ (IEA, 2021).
- The Energy consumption of Greek industry decreased by 42%, from 2000 to 2021, mainly due to Energy Savings (-1.83Mtoe), resulting from the implementation of measures to improve energy efficiency as well as reduced activity (-1.62Mtoe) and structural changes (0.44Mtoe).

https://www.odyssee-mure.eu/publications/efficiency-trends-policies-profiles/greece.html

5. Net-Zero Industry Act

The EU is scaling up policies to produce clean technologies in the EU.

On 6 February 2024, the European Council and the European Parliament reached an Agreement on a net-zero industry Act, based on the EU's 2030 Energy and Climate goals and the transition to Climate Neutrality, to 2050. This agreement 1) strengthens the competitiveness of European industry, 2) creates quality jobs and 3) supports the EU's efforts to become energy independent.



https://www.consilium.europa.eu/en/infographics/net-zero-industry-act/

Why is Energy Audit important to Industry? What does it offer?

- ❑ Complete knowledge – scientifically proven – of the existing energy situation of the industry
- ❑ Solid Proposals to reduce energy consumption and therefore greenhouse gas emissions
- ❑ Better quality of final product

Which industries are obliged to undergo an Energy Audit?

- According to Article 8 of Directive 2012/27, the obliged industries are responsible to an Energy Audit every 4 years.
- Those industries implementing ISO 50001 procedures, the obligation is annual.

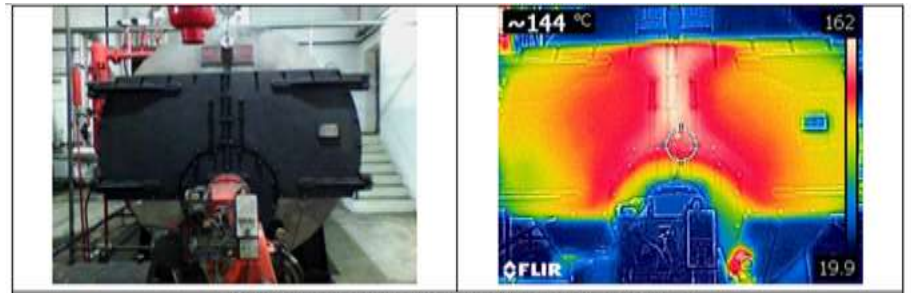
The moto is: If you don't measure Energy, you don't control it!

What is audited in an Industry?

Energy and water consumption.

In detail, the auditors are checking with or without the use of instruments:

- the production process
- the thermal system
- the cooling and AC system
- the lighting system
- the building envelope of the industrial facility
- Any RES and/or CHP system

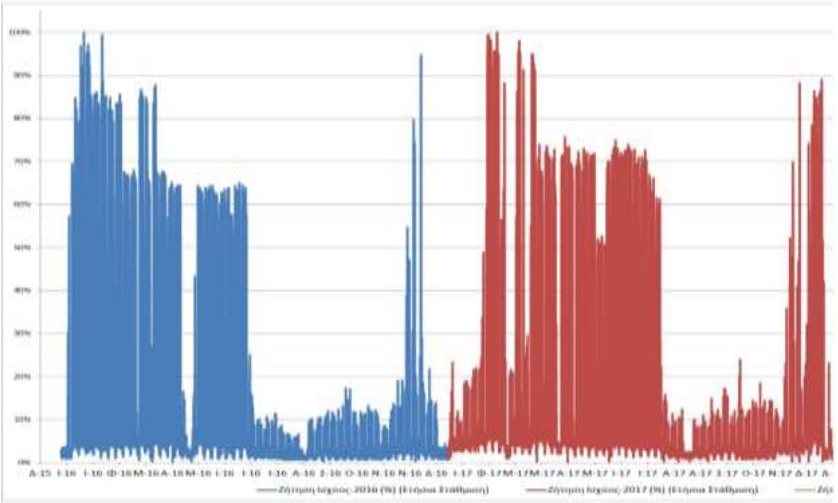


Σχ.4.20 Θερμοφωτογραφία ατμογεννήτριας No.3

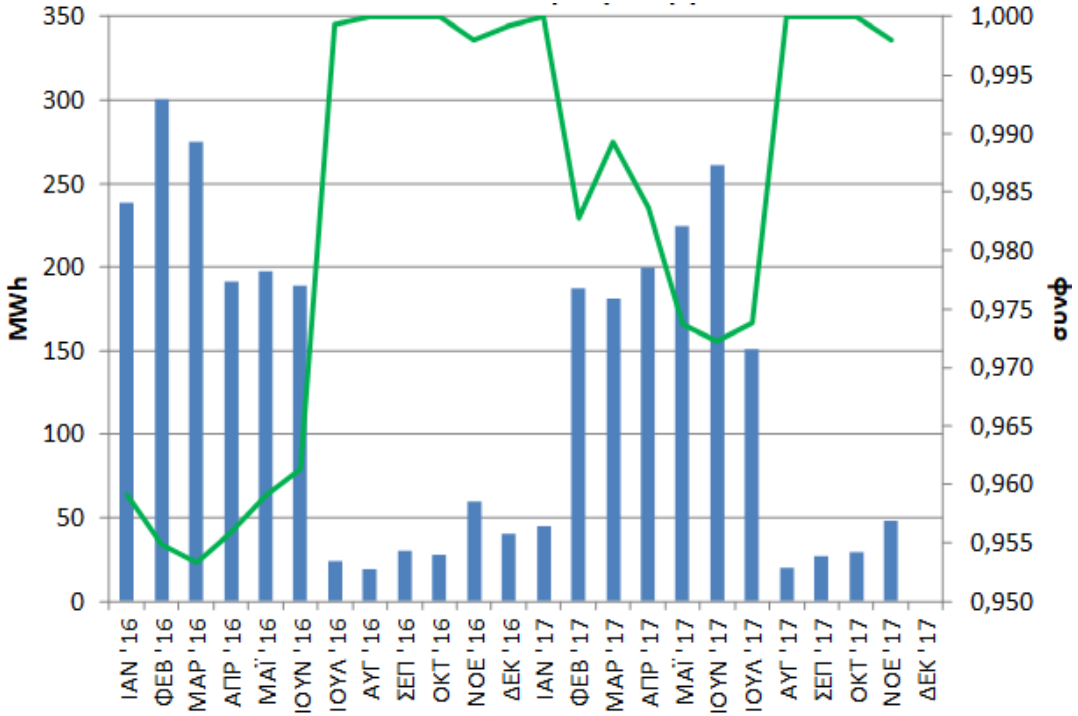
A complete inventory is made of all energy-intensive machinery and processes in the industry.

The monthly electric and thermal tariffs by the Providers are analyzed, for at least 3 years, in correspondence with the monthly production of the Industry, which give important information on the energy efficiency of the Industry:

- the average net-tax-exclusive El and/or Heating price, in €/kWh
- the energy required to produce 1 ton of final product, kWh/tn product
- Peaks & Lows both electric & thermal energy



Συντελεστής ζήτησης ηλεκτρικής ισχύος σε μηνιαία και ετήσια βάση αναφοράς

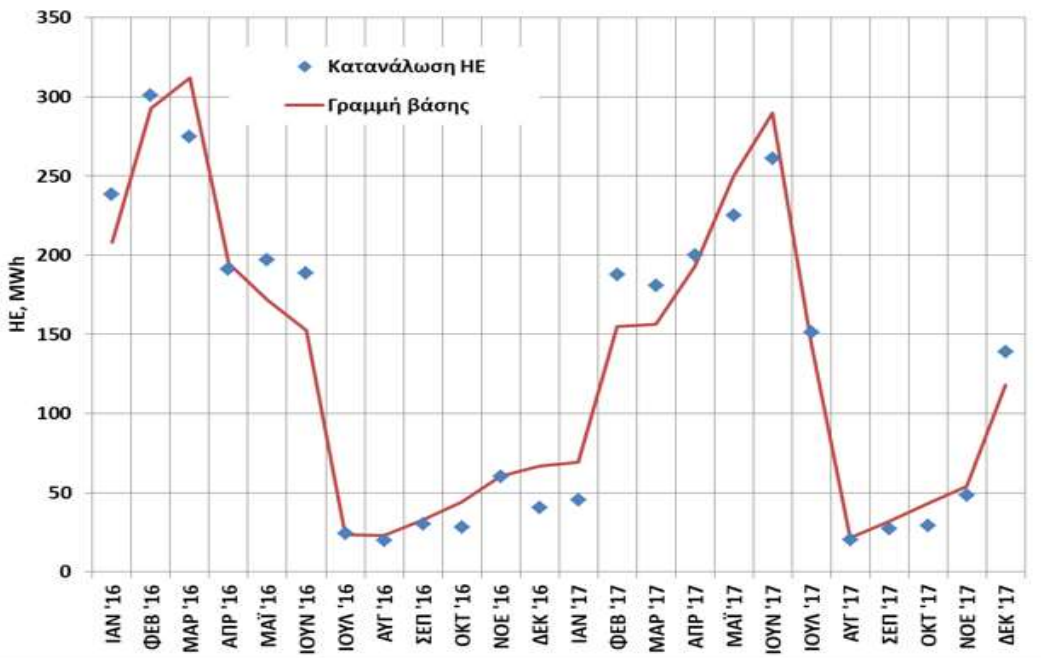


Διάγραμμα κατανάλωσης ΗΕ και συντελεστή ισχύος - Ζυγός

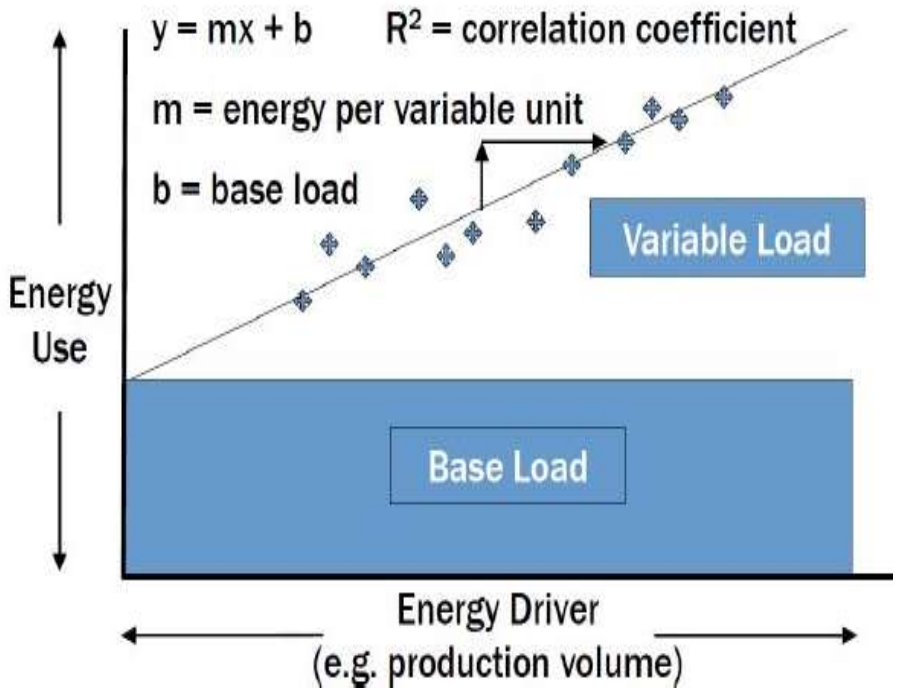
7. Energy Audit in Industry: Energy Baseline

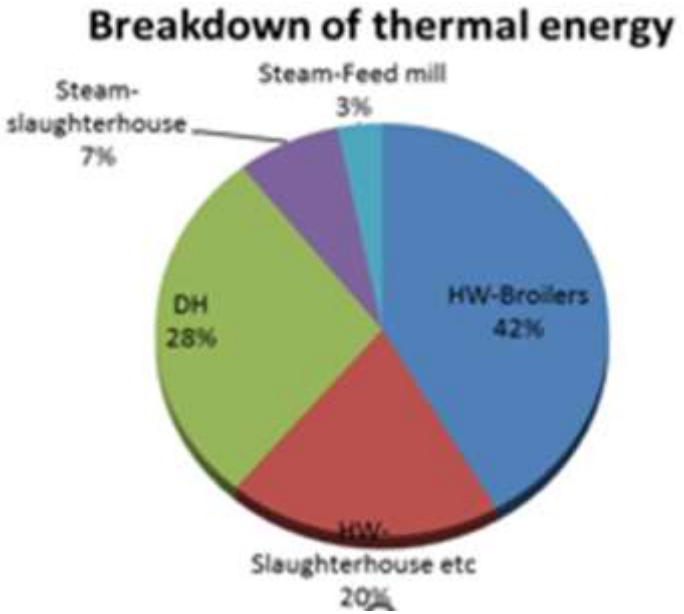
The Energy Baseline is calculated for: A. Electricity - B. Thermal Energy, based on:

either the **outside air temperature** for the area under consideration or the **heating and cooling degree days** (buildings), or **data from monthly production** (industry).



Διάγραμμα μετρημένης κατανάλωσης ΗΕ και γραμμής βάσης με τον αντίστοιχο μήνα





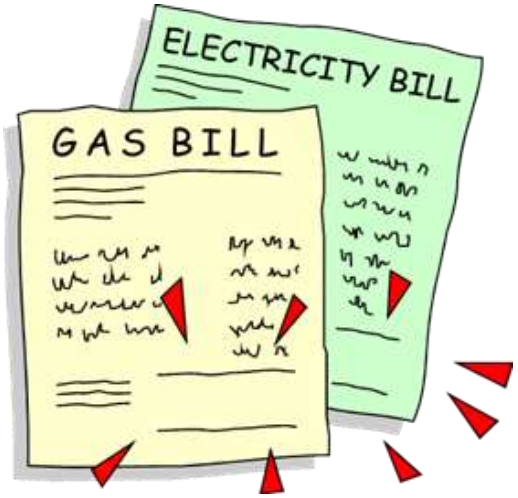
Energy & Environmental Indicators

Key Data	Description	Unit
Total energy consumption	Absolute	kWh, MWh, Euro
Specific energy consumption*	Total energy consumption [kWh] / Production quantity / Units	kWh / PQ, kWh / PU
Percentage of energy source	Consumption per energy source [kWh] / Total energy consumption [kWh]	%
Energy intensity	Energy of a process (field) [kWh] / Total energy consumption [kWh]	%
Percentage of energy from internal circuit	Energy from internal heat recovery [kWh] / Total energy consumption [kWh]	%
Percentage of renewable energy sources*	Use of renewable energy [kWh] / Total energy consumption [kWh]	%
Total energy costs	Absolute	Euro
Specific energy costs	Energy costs [kWh] / Production costs [Euro]	%
Industry-specific energy performance indicator	Total energy consumption [kWh] / Turnover [kEuro]	kWh / kEuro
Specific costs per energy source	Costs per energy source [Euro] / Consumption per energy source [kWh]	Euro / kWh
Cost savings	Absolute	Euro

9. Conclusions

- Energy Efficiency, EA, is the use of technology that requires **less** energy to perform the same function.
- There is, a continuous development for more than a decade, of the legislative framework for the promotion of EA, in EU
- ISO 50001:2018 also plays an important role.
- The EU's Net Zero Emissions Industry Agreement is the basis for Europe's 2050 Climate Neutrality target.
- Energy Audit is an important step in achieving Energy Efficiency in Industry - Article 8 of Directive 2012/27.
- The Energy Audit is performed by Certified Auditors, who collect data - analyze them - calculate KPIs – and propose financial viable measures analyzed through LCCA .

Thank you for your attention



Please don't forget:

Energy Efficiency First!

If you don't measure Energy
You don't control it!