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D.5.2 Answers Analysis Report – Projects survey

tesla 

Transferring
Energy Save
Laid on Agroindustry

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About this report

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1. Introduction

This task aims to provide a feedback of companies already audited on their energy consumptions within previous European projects. The main goal is in particular to identify the keys of success of such audits or the barriers to the implementation of measures to reduce their consumptions.

A brief questionnaire was then designed and translated in the languages of the countries involved in the TESLA project (Annex). It was then sent to the coordinators of the projects (Table 1) either to send directly it to the companies or to provide their addresses. But the coordinators didn't collaborate as well as initially expected, in particular due to data confidentiality issues. Despite several e-mails sent to them, only 20 answers have been received.

It was thus decided to complete this task with a survey of the deliverables of these projects to analyze the results of realized audits, when they were exposed, and the lessons learnt on the reasons of success and failure of energy audits.

8 European projects and the ComptIAA French project have been reviewed, both of them (EINSTEIN/EINSTEIN II, BESS/ ExBESS) being constituted by two parts, the one following the other one. Most of them focused on the SMEs whose energy issues are not the core business and need to be helped to improve their energy efficiency.

These results will provide some elements to analyze the answers of the audited companies in the second part of this document.

Acronym	Full Title	Duration	Target Group	Partners	Objective	Notes
EINSTEIN [1]	Expert-system for an Intelligent Supply of Thermal Energy in industry	2007-2009	Companies with a high thermal energy demand from 7 different sectors (breweries, food industry, pharma/cosmetic, laundries, manufacturing, offices and spas).	12 (6 countries)	Contribute to a widespread implementation of integrated energy-efficient solutions for thermal energy supply in industrial companies	Development of a methodology for thermal energy auditing supported by a software tool More than 500 energy auditors trained in 13 countries Realization of :
EINSTEIN II [1]	Expert-system for an Intelligent Supply of Thermal Energy in Industry and other large scale applications (EINSTEIN II)	2010 - 2012	Extension to non-industrial uses with similar demand profiles (hospitals, commercial centers...)	13 (10 countries)	Consolidate the EINSTEIN tool kit Extend to non-industrial uses and to 3 additional countries Contribution to standardization activities	90 audits (EINSTEIN) 72 audits (EINSTEIN 2)
BESS [2]	Benchmarking and Energy management schemes in SMEs	2005-2007	SMEs with particular focus on the food and drink industry (Dairies, Meat processing, Bakeries)	12 (11 countries)	Develop and implement in EU member states a web based toolkit and e-learning scheme for benchmarking and energy management in SMEs	Development and test of tools by 53 SMEs of 11 countries.

Acronym	Full Title	Duration	Target Group	Partners	Objective	Notes
EXBESS [2]	Expanding the Benchmarking and Energy management schemes in SMEs to more Member States and candidate countries	2007-2009	Expansion of the BESS Toolkit and e-learning system to new member states and new SME sectors (Dairies, Meat processing, Bakeries, Textile, Small breweries, industrial laundry)	15 (15 countries)		213 SMEs participating in the BESS benchmark scheme (BESS+ExBESS)
ENGINE [3]	Energy Efficiency in SMEs	2007-2010	SMEs in the sector of metal fabrication and processing, automotive, wood working and food processing industry	8 (5 countries)	Motivate SMEs to implement energy efficiency measures and train auditors and build up expert pools	Engine Guidebook A manual for staff and auditors. 52 checks (energy survey/mapping) realized
AMETHYST [4]	Integrated benchmarking and self-assessment tool	2007-2008	Wine industry SME's wine producers	5 (5 countries)	Develop a benchmarking and self-assessment tool for small and mid-scale wine producers. Evaluate the energy and water efficiency of a winery by benchmarking energy and water intensity against an efficient reference winery	More than 8 workshops have been organized to train over 125 wineries in the use of the tool.

Acronym	Full Title	Duration	Target Group	Partners	Objective	Notes
M.O.R.E [5]	Market of Olive Residues for Energy	2007-2010	Olive oil producers	5 (5 countries)	Solve the problem of wastes by using them for energy purposes. Develop a methodology to identify and implement the best solutions for using olive residues for the production of energy Create a stable olive-residues-to-energy market.	7 business plans for the establishment of power plants for the production of energy from olive oil waste have been realized
CO2OP [6]	Energy Efficiency in cooperative agro-food production	2010	Cooperatives - Wineries, Olive oil mills, F&V processing plants, Animal feed factories		Develop good practices related to energy use and disseminate sectorial handbooks on energy efficiency	30 cooperatives audited from 5 Spanish regions. 4 sectorial handbooks on line.
ComptIAA Energie	Energy Efficiency in SMEs	2011-2013	20 SME's of agro-food sector	1 country - France	To help agro-food companies to record their energy flux and to implement energy efficiency measures with an adequate counting plan	Guidance to foster the implementation of energetic counting plans in agro-food industry

2. Survey of the previous projects

All the projects reviewed are summarized in the table 1 above.

The twin projects BESS/ExBESS and EINSTEIN/EINSTEIN II are treated simultaneously in the remainder of this report the second one including all the results of the first one.

As already pointed, a majority of these projects target the SMEs (Bess, Engine, Amethyst, M.O.R.E) due to the costs of such deep audits and the time and knowledge necessary to achieve such actions, rendering difficult to disseminate the good practices in these structures.

One of these projects (EINSTEIN) specially focuses on the thermal energy efficiency in various sectors and size of companies. The other projects deal both with electric and thermal issues. In addition AMETHYST also focuses on the water efficiency issues.

During EINSTEIN and BESS, deep energy audits have been carried out in several companies. In ENGINE just “checks” (energy survey/mapping) have been realized, the level of investigation being lighter. In AMETHYST, the goal was rather to develop a benchmark tool in order the companies can evaluate them than perform real audits and in MORE, the main objective was to use olive oil production residues for renewable energy issues.

Several industrials sectors have been targeted, agro-food companies being concerned in most of them. This task will focus as much as possible of the results on these sectors. AMETHYST and M.O.R.E specially deal with the sectors of TESLA (wineries and Olive oil producers) but haven’t realized any audits.

For each project, this document aims to summarize the main results of energy audits. It focuses on the measures effectively implemented or not and identify the reasons given to explain these success or failure

2.1. EINSTEIN / EINSTEIN II

These projects were dedicated to the thermal energy efficiency in different sectors for relatively big consumers.

Within the 72 audits realized in the EINSTEIN II projects a potential of primary energy savings ranging from few percent up to more than 60% has been detected, with an average of about 20%. It's noted that in a typical SME, energy accounts for between 3% and 12% of the operational costs with an energy savings potential of between 15% and 30%.

The repartition of the different potential energy saving is presented in the chart on the Figure 1. A majority of companies has a potential comprises between 1 and 10%.

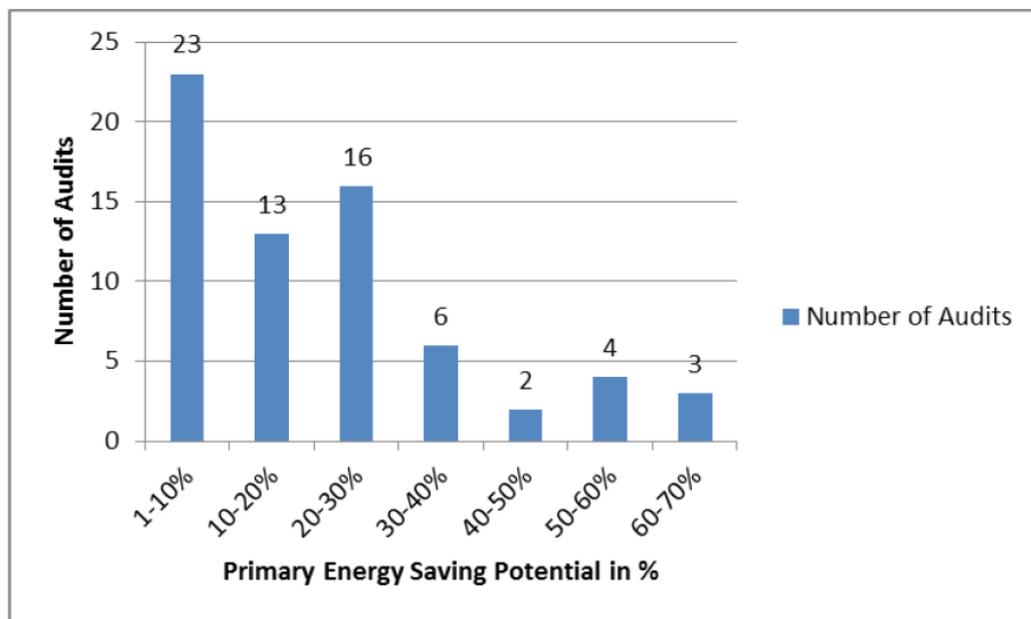


Figure 1: Number of audits as a function of primary energy saving potential

These measures include the process optimisation and especially heat recovery that is not realized in most of the companies. The substitution of the existing energy supply by more efficient technologies and renewable energy sources offers an even higher potential for the increase of energy efficiency and the reduction of fossil CO2 emissions.

However, the statement before the project was that corresponding investments are not realized due to some of the following reasons:

Lack of knowledge of the companies about possible energy efficient solutions

Energy costs, although being important, are not the first priority of the companies. Investments in energy compete with investments in the improvement of production and products; this leads to a situation where investments into energy conservation are not being done, although they are economic by themselves but lose competition for available money

- In addition, most industrial companies do not perceive energy as a discrete issue, but as a component of broader issues such as cost of manufacturing, environmental compliance, safety and productivity. Energy efficiency competes with other issues for limited resources within a company. While capital is the most often cited resource, **staff time may be of equal or greater importance. Corporate downsizing has resulted in less staff available to address all issues**
- **Little (zero) budget available for energy auditing**
- Even in the cases where energy audits are carried out, the **auditors often have only a limited knowledge of technological options** and do not dare or do not dispose of the means to propose non-conventional innovative solutions.

The agribusiness industries are well represented in the audits: 39% belong to the food industry (production and processing of meat products, fish processing, breweries...and 9 fruit and vegetables processing).

Finally, the average relative primary energy savings of 19% are close to the initial estimate of 20% (average size of the companies of 20 000 MWh of primary energy consumption).

It's however underlined that the results vary strongly from case to case due to the great variety of sectors and depend from the country (the available national subsidies) and can't thus be extrapolated.

To evaluate the status of possible realization of the suggested measures, a template questionnaire was sent after several months. The detailed results are shown in Figure 2.

From the 69 companies evaluated 9 cancelled the implementation of the proposed saving measures, 25 postponed their decision. 15 companies believe that further investigation is necessary, 4 already contracted further analysis, 7 are inviting offers for equipment and 5 already implemented the proposed (or at least some of the proposed) saving measures. More than 50 % have the intention to apply some or all of the recommended measures in the future after necessary further investigation.

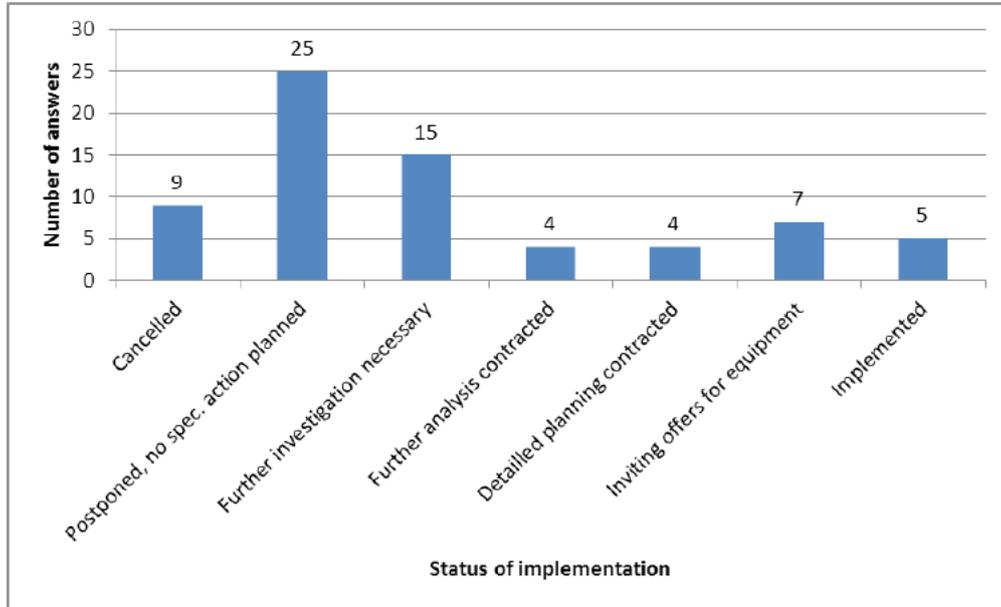


Figure 2: Status of implementation of the proposed EINSTEIN energy saving measures

Concerning the main reasons for not implementing the energy savings measures, **financial reasons** rank foremost (38% in total : in **8 cases financial risk**, in **5 cases too long pay-back** and in **3 cases too high initial costs for equipment was stated**), followed by “**not the right time**” (in 13 cases or **31% of the answers**). Other reasons such as too high technical risks and lack of time (each one two answers) were not seen as the main issues.

For the reasons for (planned) implementation of the savings measures proposed within the project EINSTEIN reports, 22 companies answered that **the high expected energy savings** and the **corresponding monetary savings** are the main reasons.

2.2. BESS / ExBESS Project

These projects targeted the SME’s in different sectors. The Figure 3 shows the breakdown of participating SME’s to sectors

Sector breakdown pilots

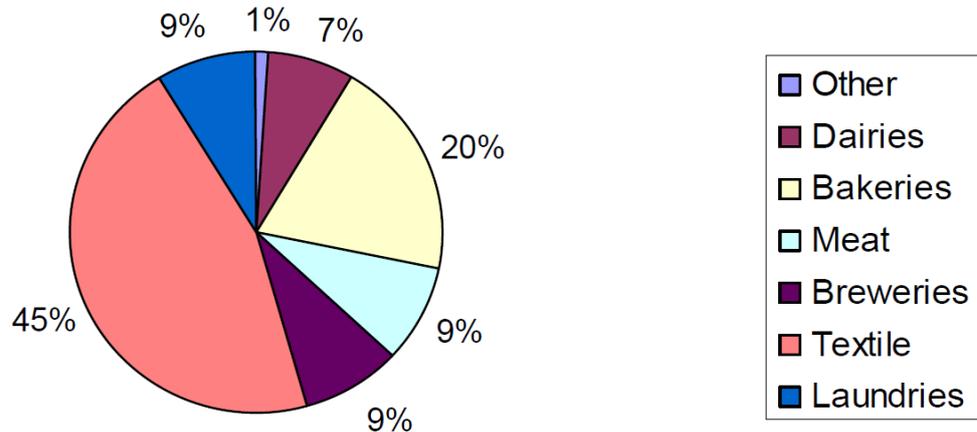


Figure 3: Sector breakdown pilots - ExBESS

A questionnaire was submitted to the participating SMEs in order to evaluate the BESS toolkit. Of all participants 35 % expected or realized concrete reductions in their energy consumption as a result of the measures taken. The global **energy savings achieved were between 2% and 10%**. In the agro-food sector (Dairies and slaughterhouse), **the rate moves from 4 to 10 %**.

It's pointed out than the success is closely related to the additional individual support offered to SMEs, as energy issues are not in their core business.

The following issues were identified during these projects, which need a special attention to the success of the future audits:

- ✓ If SME's management lack awareness of their energy consumption and how to benefit from energy efficiency, **top management has to be approached and convinced of the benefits of dealing with energy aspects** on a regular basis. When the top management decides to improve the energy situation of the company, allocation of personnel and financial resources will follow.
- ✓ SME's are triggered by energy management in relation to cost reductions. Consequently promotion of energy efficiency aiming at management of SME's **needs business like terminology**. Address management in terms of Euros and sales profitability and internal rate of

interest. The costs of each saved Kilowatt-hour increases directly the profits. Expressed this way energy saving becomes much more appealing than expressed usually as saving on total production costs. This can be illustrated by calculating the turnover the company must make to have a profit equal to the saved energy costs. **If the sales profitability is e.g. 10% and the possible energy cost savings 1000 EUR, the company must make a turnover of 10.000 EUR to get the same profit as the cost savings by reduced energy consumption.**

- ✓ The possibility should be considered where credit institutions are able (or enabled) **to finance energy saving measures at lower rates**. SME's priority is to keep day to day business running with limited time and resources not considered to be related directly to the core business. A systematic approach to energy consumption, either simple or elaborated, results in routine and habituation, and thus becomes part of day to day business management. The implementation needs some extra effort in the beginning, the management has to be willing to make this investment.

2.3. Engine

52 checks (energy survey/mapping) in SMEs were realized. The total amount of energy used by all the industries was 1,373 GWh/year with an identified profitable saving potential of about 49 GWh/year, **which represents an annual saving of 4%.**

If the figures of saw mills and wood working companies are excluded, because their large energy use and very low potential of energy saving, the total energy saving potential is then **12 % of all used energy.**

In the field of **food processing**, the saving potential is **21 %.**

In the food processing industry, the energy use is 21.6 GWh/year and the proposed energy saving is 4.5 GWh/year for all the 8 companies in this area analysed (Winery and dairy farmers). The highest saving potential lies **within the industrial processes** (56% of the proposed measures).

The breakdown of the proposed measures in the food processing industry is shown in Figure 4.

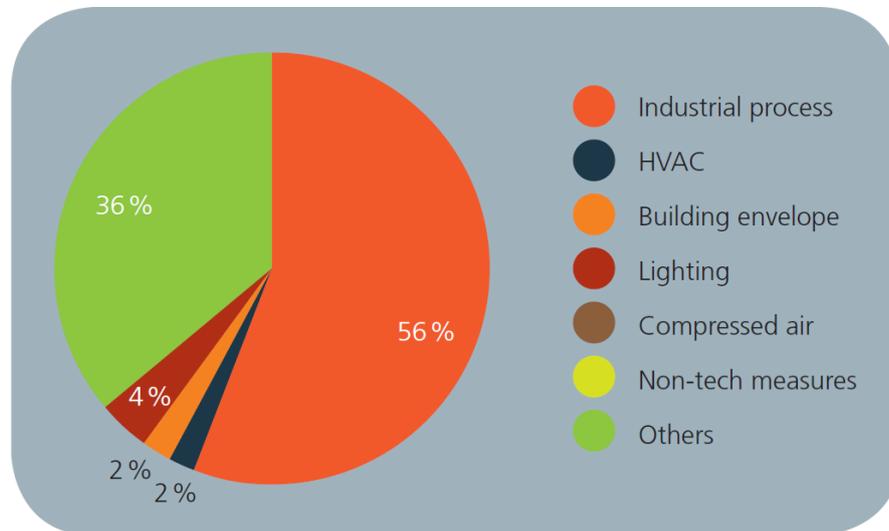


Figure 4: Distribution of the proposed measures in the food processing industry

The problems and the associated solutions to the development of the energy efficiency in the SMEs were identified at the beginning of the project. They are listed below.

Problems

- SMEs find it difficult to finance the investment, either due to a lack of liquidity or difficulty or reluctance to borrow for non-core business purposes
- Micro businesses can be hard pressed to spare the resources to implement projects saving 15 % of an energy bill of only hundreds of Euros
- In SME, few staff and no knowledge of energy efficiency make it necessary to invest either valuable time or depend of external experts
- In many companies, there is no relation between those who have control over energy use, either by specifying or using energy consuming equipment, and those who pay the energy bills
- SMEs usually rent their premises, often on short contracts, and so have no incentive to invest in the building fabric, even if there is great potential to improve energy efficiency

Solutions

- Most EU Member States have government supported programmes designed to provide advice to businesses through a variety of media including telephone advice lines, websites, publications, training, and consultancy sessions

- Often, expert networks and support – such as have been established via ENGINE – exist at regional levels
- Product labels help to identify efficient equipment, also for SME. Nowadays, modern heating, lighting and cooling technologies are significantly more efficient than older models
- Finance has become increasingly difficult to obtain, however there are several sources of low cost funding available
- The most important steps, however, are some of the simplest: In any company, regardless of size, someone should be responsible for energy use and assessment of their performance in managing energy should be made
- One of the first tasks for whoever is responsible for energy will almost certainly be to establish a system for measuring energy
- SME might consider establishing a dialogue with the landlord to improve the efficiency of their buildings
- Changes and low cost upgrades of equipment are often worthwhile

In the lessons learnt, it's underlined that **it was more difficult that initially expected to convince the companies to agree to the checks** mainly due to unfavourable economic conditions for the key target group of SMEs. Moreover, some companies who participated didn't carried out the proposed measures due to restraints in investment potential.

2.4. AMETHYST

This project aimed to evaluate the energy and water efficiency of a winery by benchmarking energy and water intensity, which are relative indications of the performance, against an efficient reference winery. The reference winery was based on existing and proven practices and technologies.

The companies targeted were very close from those of TESLA but unfortunately the deliverable available in the literature doesn't give many results on the project. For example, there isn't any figure on the energy savings and measures effectively implemented during or after the project. It was **estimated** at the beginning of the **project that savings of more than 20% could be obtained in a cost-effective way.**

The main lesson learnt were :

- Energy is generally not a real problem for winemakers, as **the cost is relatively low compared to overall costs**. Therefore the main issue in energy and water optimization **is often not money but image**. So the main interests of the participants were in terms of benchmark and comparison with the results of their competitors rather than their global energy and water consumption
- Results depend on the characteristics of the user: **generally big wineries had better results than smaller ones**, partly because of size, but also because **big wineries are more recent**, and therefore often more optimized in terms of energy and water consumption.

2.5. M.O.R.E

This project aimed **to create a supply chains for energy from olive residues**, by involving the key public and private players, identifying the problems and the possible solutions and promoting concrete actions. The main objective was to create a stable olive-residues-to-energy market.

The main expected outcome of the project was a **general methodology to identify and implement the best solutions for using olive residues for the production of energy**.

Thus aside this last aspect in order to identify some substitution measures and the sector of the olive industry, the targets of this project were strongly different from those of TESLA.

Moreover the website is now closed and no document is yet available on line.

Nevertheless, the lesson learnt are summarized below:

- Olive solid residues represent a **great biomass energy potential for Europe** – in the Mediterranean every year more than 7 million tons of virgin pomace are produced
- **Legislative aspects are the main issue**, not only because of their diversity among the partner regions, but also because in each region olive-residues-to energy is affected by different, **sometimes conflicting, norms**, such as those on waste, on biomass, on environmental pollution, on chemicals, etc.
- International cooperation is very important to learn from foreign best practices

2.6. CO2OP

This Spanish project aimed at assess the energetic performances of the same sectors than those targeted in TESLA, wineries, animal feed factories, olive oil mills and fruit and vegetables processing plants.

30 agro-industry cooperatives were audited and the data about proposed measures finally implemented are given in the Table 2 below.

	Consumption reference kWh	Achieved savings %	Investments €
Wineries	300,000	5	7,500
Olive oil mills	300,000	15	62,500
F&V processing plants	500,000	7	15,000
Animal feed factories	500,000	15	9,000

Table 1: energy savings achieved in the CO2OP project

Concerning the investments, an estimation based on the expertise of the auditors with the cooperatives is that **1 € investment in energy efficiency results in 2 kWh of energy savings.**

2.7. ComptIAA Energy

This project which is dedicated to deploy energy counting plans in 20 pilots companies from agro-food sector is not finished. The deployment of the counting plans just started in 2013 and hence there isn't any result available at this stage of the project.

3. Answers Analysis

The questionnaire sent to the audited companies within the European projects listed above is in Annex. It's a brief questionnaire designed to avoid being time-consuming for the managers. To complete the results, this questionnaire was sent too to the cooperatives involved in the Spanish project CO2OP "energy Savings on coop agro-food production".

Only 20 answers were received from agro-food companies for the reasons mentioned above, issued from the projects EINSTEIN II and in majority, from CO2OP. It's obviously a sample too small to carry out a deep analysis of the results. However it's enough to establish the major trends which emerge.

Moreover, it's important to take into account that most of the answers are from only one country (Spain), and could be then affected by the national situation (energy prices, subsidies, rules, ...). On the other hand, these answers are provided by the same sectors that are focused in TESLA, agro-food companies SMEs.

The responding companies are involved in a various field of activities and cover a broad range of energy consumption (Figure 5 and Table 3). However a majority of the companies have a relatively small consumption, with 10 answers below 1 MWh, corresponding to SMEs.

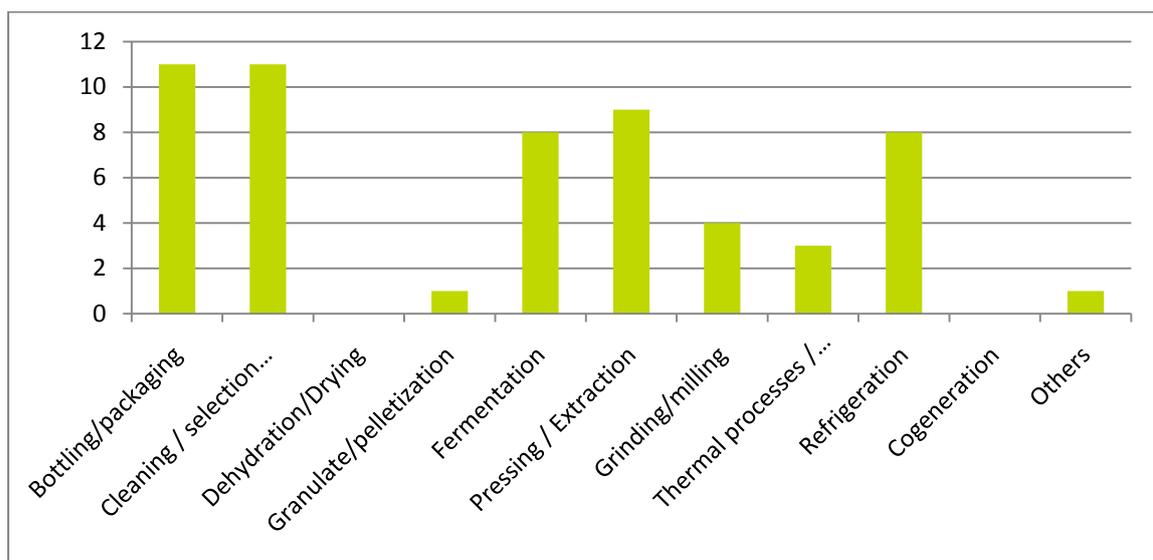


Figure 5: Processes

Annual electricity consumption	Number of companies	Thermal consumption	Number of companies
>2GWh	2	Gasoil	10
1GWh - 2 Gwh	3	Biomass	3
500 MWh - 1 GWh	1	Natural gas	2
100 MWh - 500 MWh	2	coal	0
1 MWh - 100 MWh	0		
500 kWh-1 MWh	3	From 57 MWh to 4240 MWh	
100 kWh - 500 kWh	6		
< 100 kWh	1		

Table 2: Annual electricity and thermal consumptions

The audited companies are moderately to entirely satisfied with the recommendations addressed to reduce or improve their energy consumption (Table 4). Around one third of them (7 on 18) have a “medium” satisfaction of these recommendations. Even if it’s difficult to analyze this result without any written comment, the survey of the previous projects (§2) in addition of the other results of this questionnaire provides some perspectives to try to understand the reasons: as mentioned in the projects there is a real lack of knowledge about possible energy efficient solutions in the SME’s and these audits allow them to benefit from a lot of informations of this topic and a better understanding of their facilities operations. However the proposed solutions are often considered as too expensive or the return period of investment too long (Figure 10). As it’s noted Energy costs are not the first priority of the companies and investments in energy compete with investments in the improvement of production and products.

Satisfaction with the recommendations	Number of companies
very high	3
high	6
medium	7
low	2
very low	0

Table 3: Satisfaction with the recommendations addressed to reduce or improve the energy consumption

The different measures effectively implemented are shown in the diagram in the Figure 8. All the measures proposed in the list have been implemented at least once. Nevertheless, the most implemented are the less expensive as changing the light bulb for LED (9 on 14 companies which answered on this question) which generate the less energy savings. Then the electricity bill optimization and battery condensers have been realized (8 and 6 times). The electricity bill optimization doesn't correspond to an energy saving but to a cost reduction measure which can be effective, but has a great dependency on the field of activity and of the prices available on the market.

It can be pointed out that the potential most efficient measures, which are also the most expensive with long-term returns of investment are just once implemented (improvement of heating equipment, replacements with more efficient equipments, implementation of renewable, implementation of Energy Management Systems...). Then it's possible that the little disappointment observed comes from the discrepancy between the preconized measures and those which can be effectively achieved due to the economic constraints. It's consistent with the previous projects analysis: to achieve better rates of energy savings (> 10%), it's necessary to make some adaptations to the core process.

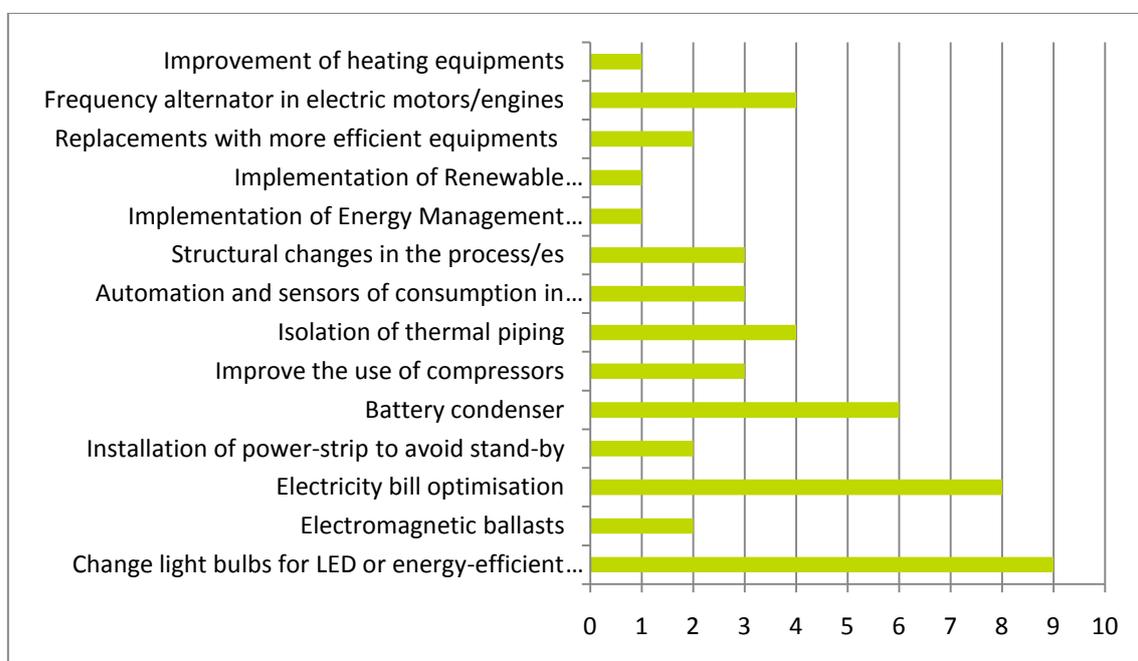


Figure 6: Implementation of the proposed measures

The estimation of the global energy savings achieved and the reasons of the non-implementation of some recommendations are shown on the Figures 9 and 10. The majority of the energy savings are below 5%, which correspond to the figures given in the project CO2OP, about 5% for the wineries and 7% for the F&V processing plants. There are 3 cases where these energy savings are between 10% and 20%. In both cases, the companies realized several proposed measures (respectively 5 and 6).

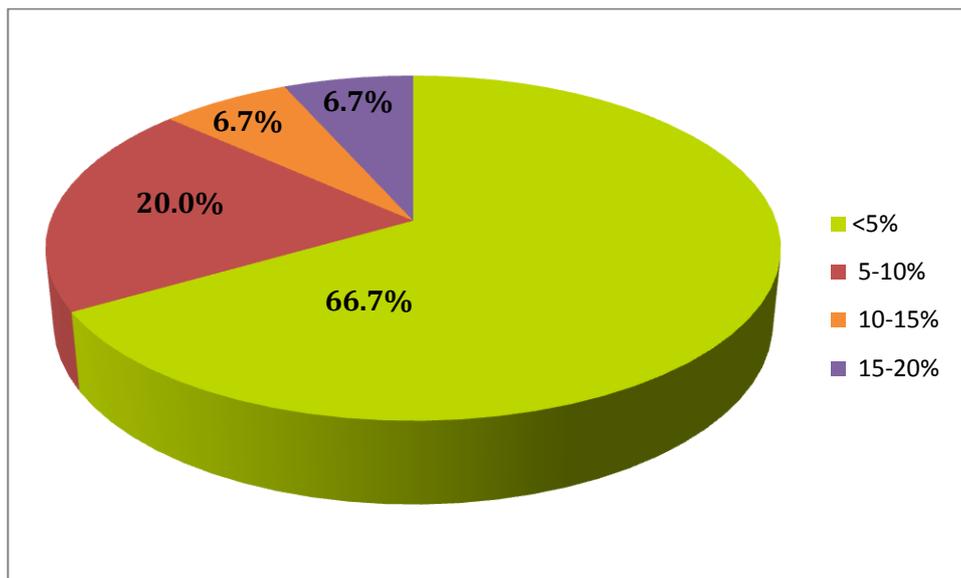


Figure 7: Estimation of the global energy savings achieved

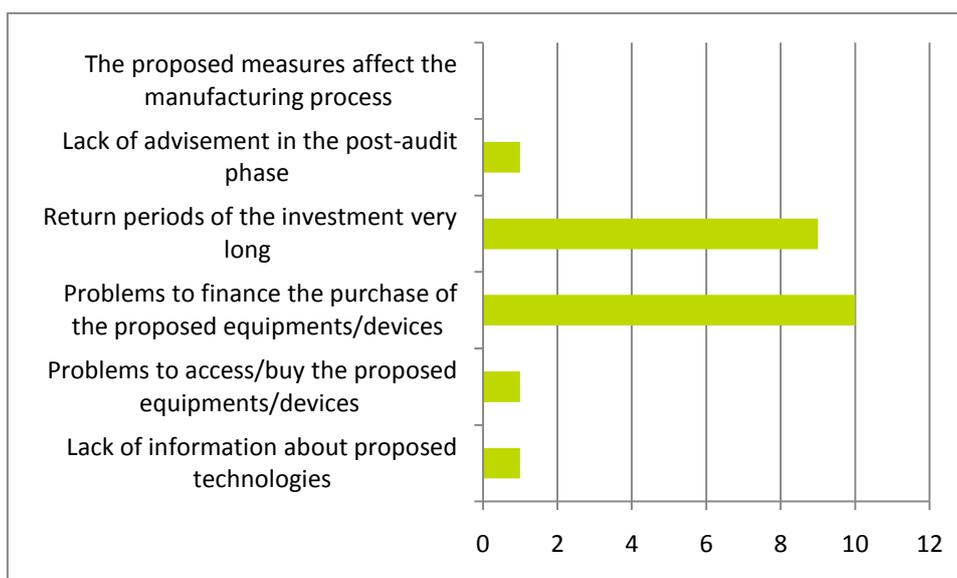


Figure 8: Reasons of the non-implementation of some recommendations

It appears clearly from these charts than the main reasons which justify the non-implementation of the measures are economic: problems to finance the purchase of the equipment and the return periods of the investment.

One underlines the necessity to follow the audited company after the audit and to give some advisement to achieve the expected savings, another one on the lack of information about proposed technologies and one on the problems to access or buy the proposed equipments. It reinforces the necessity to accompany the companies in the post-audit phase and to help them to identify the available equipments and technologies.

4. Conclusion

The energy savings effectively achieved following the different reviewed projects are summarized in the table 5 below. In the companies targeted within TESLA, the energy savings effectively achieved are comprised between 5% and 15%.

	Energy Savings achieved	Sectors
BESS	4 – 10 %	Agro-food (Dairies, meat processing, bakeries)
EINSTEIN	15 – 30 % (Thermal Energy)	SMEs (several sectors)
Engine	12 % (without Saw Mills and wool working companies) 21 % (Food processing)	SMEs (several sectors) Food processing (Wineries; Dairy farmers)
AMETHYST	20 % (Expected)	SMEs (wine producers)
COZOP	5% (Wineries) 15% (Olive Oil Mills) 7 % (F&V Process) 15% (Animal Feed Factory)	Cooperatives

Table 4 : Energy savings achieved – Reviewed projects

The 20 answers from the questionnaire received show the same order of magnitude, with a majority of companies whose estimated energy savings are below 5%.

The measures implemented to reduce their energy consumptions are mainly the less expensive as changing light bulb for LED. The most potential efficient measures are also the most expensive with long-terms returns of investment: to obtain energy savings beyond 10 %, it's necessary to make some adaptations related to the core process or to the energy sources (use of Renewable energy, heat recovery....).

But it appears clearly than the financial issues (problems to finance the purchase of the proposed equipments and long return periods of the investment) are crucial in the decision making process from the companies.

It's thus necessary to accompany them in the post-phase audit to help them to make the most judicious investments and to identify the suppliers and key actors. The involvement of these key actors represents a great deal of interest in this work.

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Energy efficiency fruits & vegetables processing plants handbook <http://www.chil.org/agroindustria/group/eficiencia-energetica/document/manual-de-eficiencia-energetica-en-centrales-hortofructcolas>

Annex

Questionnaire

Dear Sir/Madam:

The coordinator of the Project _____ (¹) has provide us your contact details.

We are involved in the Project TESLA (Transferring Energy Save Laid on Agroindustries) which aims at promoting good practices on energy efficiency in the agro-food sector. For that reason, we are very interesting in YOUR EXPERIENCE AND RECOMMENDATIONS regarding your previous participation in the above mentioned project.

Please, if you would be so kind as to answer this brief questionnaire, you will help us in improving our project's efficiency and the design of its planned actions.

Thank you in advance.

Annual electricity consumption of your industry:

- 100.000 kWh-500.000 kWh
- 500.000-1MkWh
- 1MkWh-2MkWh
- >2MkWh
- <100.000 kWh

Thermal consumption of your industry:

- Gazole (diesel)
- Biomass
- Natural Gas
- Coal
- Propane/Kerosene

Annual Consumption..... (specify units)

¹ CO2OP----BESS-----EINSTEIN-----COMPT-IAA-----GERONIMO----AMETHYST----others

Processes:

- Bottling / Packaging
- Cleaning / selection / raw materials sizing
- Dehydration/Drying
- Granulate/pelletization
- Fermentation
- Pressing / Extraction
- Grinding/milling
- Thermal processes / pasteurization / UHT
- Refrigeration
- Cogeneration
- Others

In case you have received some recommendations addressed to reduce or improve your energy consumption. How would you define your satisfaction with these recommendations?

- very high
- high
- medium
- low
- very low

Did your company implement any of the proposed measures? Could you, please, identify them?

- Change light bulbs for LED or energy-efficient light bulbs.
- Electromagnetic ballasts
- Electricity bill optimisation
- Installation of power-strip to avoid stand-by
- Battery condenser
- Improve the use of compressors
- Isolation of thermal piping
- Automation and sensors of consumption in the equipments
- Structural changes in the process/es

- Implementation of Energy Management Systems
- Implementation of Renewable energies/Cogeneration
- Replacements with more efficient equipments
- Frequency alternator in electric motors/engines
- Improvement of heating equipments

In case your company implemented some recommendations, do you have an estimation of your global energy savings achieved?

- <5%
- 5-10%
- 10-15%
- 15-20%
- >20%

In case your company does not implement some recommendations, could you please identify the reason/s why it happened?:

- Lack of information about proposed technologies
- Problems to access/buy the proposed equipments/devices
- Problems to finance the purchase of the proposed equipments/devices
- Return periods of the investment very long
- Lack of advisement in the post-audit phase
- The proposed measures affect the manufacturing process

1. Introduction.....	3
2. Survey of the previous projects.....	7
2.1. EINSTEIN / EINSTEIN II.....	7
2.2. BESS / ExBESS Project.....	10
2.3. Engine	12
2.4. AMETHYST	14
2.5. M.O.R.E.....	15
2.6. CO2OP	15
2.7. ComptIAA Energy	16
3. Answers Analysis.....	17
4. Conclusion	21
References.....	23
Annex.....	24
Questionnaire	24