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The ICCEE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 847040.

Project information

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|------------------------|---|
| Project Title | Improving Cold Chain Energy Efficiency |
| Project Acronym | ICCEE |
| Project Number | 847040 |
| Project dates | September 2019 – August 2022 |
| Abstract | <p>The ICCEE (Improving Cold Chain Energy Efficiency) project will facilitate Small and Medium Enterprises (SMEs) in the cold chains of the food and beverage sector to undertake energy efficiency measures (EEMs) after carrying out supply chain energy audits. The focus on the cold chains of the sector is due to the significant energy requirements (refrigerated transport, processing and storage) with large potentials for savings. The implementation of the holistic approach, shifting from the single company perspective to the chain assessment, lead to increased opportunities for EEMs. To enable the update of EEMs, ICCEE will a) implement and apply an analytical energy efficiency tool to support and facilitate decision-making at different company organisational levels and b) launch a capacity building program towards staff and relevant stakeholders and a community dedicated to support a change in energy culture of the sector. The feasibility of EEMs will be evaluated by considering economic, environmental and social impacts encompassing their entire life cycle and the entire supply chain. Non-energy benefits and behavioural aspects will also be addressed and recommendations on financing schemes for SMEs will be assessed. The first part of the trainings will reach 300 companies through 20 national workshops thanks to the collaboration of associations in the consortium.</p> <p>32 companies will be trained for the use of the tool in 4 EU workshops. At a final step, ICCEE will launch e-learning courses, which will be available also beyond the project's lifetime reaching at least additional 64 companies. ICCEE will introduce primary energy savings (118 GWh/year), increase invested capital in sustainable energy (64 million €), and reduce GHG emissions (40,376 tonCO₂/year). Capacity building activities allow to increase stakeholders' knowledge and enhance their energy culture (2000 people).</p> <p>Outcomes from ICCEE will also support policymakers in defining tailored policies for the sector.</p> |

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About

The project Improving Cold Chain Energy Efficiency (ICCEE) will accelerate turning energy efficiency opportunities of small and medium sized enterprises (SMEs) of the sector into actual investments and create a clear understanding of the opportunities offered by improving energy efficiency for companies' staff.

The specific objectives of ICCEE are:

- 1) Implement and apply an analytical energy efficiency tool to support and facilitate the decision-making processes of the companies in the supply chains in assessing their current energy performance of the supply chain,
- 2) Identify the energy saving potential of companies and support investments in viable energy efficiency improvement measures,
- 3) Create a capacity building programme and a community dedicated to support the change in the energy culture of organizations improving their energy performance through direct training and the development of an e-module.

ICCEE will make it easier for SMEs in the cold chains of the food and beverage sector to undertake energy efficiency measures (EEMs) after carrying out supply chain energy audits.

Focus on the cold chains was decided due to the significant energy requirements (refrigerated transport, processing and storage) of the sector, with large potential for savings. The cold supply chain is among the most energy-intensive systems within the food and beverage sector whilst there is limited understanding of its large energy efficiency potential and the economic advantages that can be obtained from energy saving measures.

The implementation of a holistic approach, shifting from the single company perspective to the chain assessment, leads to increased opportunities for EEMs.

ICCEE is coordinated by the University of Brescia with 12 partners: IEECP, FIRE (Federazione Italiana per l'uso razionale dell'energia), Adelphi Research Gemeinnützige, ATEE (Association Technique Energie Environnement), Fraunhofer, Riga Technical University, ESCAN, SPES GEIE, ECSLA, Chamber of Korinthia, University of Stuttgart, and Romalimenta.



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Project partners



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1. Introduction

This task aims to perform and produce a comprehensive report with an executive summary and key conclusions obtained from the ICCEE capacity building activities, which include the national trainings providing overall capacities on energy efficiency in the food and beverage cold supply chains (in the 8 partner languages), the EU workshops focused on the project tools application in real cold supply chains (provided in English as there was participation of several EU countries) and the e-learning including similar contents and languages to the national trainings.

These actions were developed by project partners during 2020 to 2022. Due to the coincidence for a long period of the COVID-19 pandemic with the project activities, most of the trainings originally foreseen in-class had to be developed by video conference in real time (using Teams, Google meet or similar platforms), which didn't affect the final positive results and impact of the project aims and targets.

2. Conclusions

2.1. Overall

The capacity building activities within the ICCEE project have fulfilled the aims and indicators foreseen, attracting over 1,889 non experts and experts from approximately 755 organizations (considering average 2.5 participants for each company) of the cold supply chains in the food and beverage sector, supporting the start and implementation of energy efficiency measurements along this chain. The number of participants is larger than the overall target which was of 1,520 professionals attending the project capacity building.

The capacity building actions have been based on a holistic approach, including not only technical aspects but also, economic, management and non-energy benefits topics. The involvement of the operational staff and the participation also of the management level staff supports the improvement of the corporate policies, the change in the energy culture in the organizations and the direct support to the sustainable supply chain initiatives.

The capacity building tasks have included the development of practical cases and best practice, complementing the theoretical contents, to provide support in practice to the real needs of the organizations in terms of their energy efficiency improvement. In particular, the European Workshops have been based on the information provided by specific cold supply chains and developed based on this information and the ICCEE project tools. In the national trainings and e-learning real examples and cases were presented as an important part of the contents.

Also, it should be mentioned that the capacity building included a quality control and improvement process, both by the own experiences gained by the partners and also by feedback information provided by the attendees and users. A more detailed description of each capacity building task and its outcomes is explained in different sections of this report.

2.2. National trainings

The aim of the ICCEE trainings is to provide non energy experts and energy experts with knowledge on food and beverage sector cold supply chains, which can be easily used to gain energy efficiency in their organizations or chains, thus improving their processes and their economic balance.

The national training courses were held by each partner in their countries and own national language, during one or several days duration. They were originally scheduled in-class training, but due to COVID-19 pandemic and the restrictions in partner countries it was agreed with the Commission to develop real time training webinars with a similar scope and contents. Thus, no deviation was originated for the project and the other tasks linked to these trainings.

Even when the training course duration could vary from country to country, the training programme required a minimum of 5 hours of time in order to be adequately presented and comprehensively worked through, including the participants feedback. Also, considering the practical sense of these trainings, it was decided that partners could focus on the specific contents of larger interest for their audience and administered at different lengths or intervals (as one longer day or several shorter parts of the day) as appropriate for their individual groups and/or country.

The National training programme included the following contents, which provide a complete view of the ICCEE aims:

- Energy outlook in the food and beverage sector
- ISO 50001 – Energy Management System
- Energy Performance Indicators (EnPIs)
- IPMVP - Measurement and Verification Protocol
- Holistic approach
- Supply chain management and industrial symbiosis

- Energy saving opportunities on all the process from raw materials to final customer
- Financial analyses, funding opportunities and LCCA
- NEBs and behavioural aspects of energy efficiency
- Tool's introduction

The number of attendees to the ICCEE national trainings was of 1,489, which compared to the original target of 1,200 indicates that the interest created by the project Team in this topic was in line with the needs of the research community and the market. A reason for this success were also the marketing developed by partners, both through direct actions (emails and phone calls) and indirect ones (media partners, social networks, project website, announcement in Newsletter, etc.).

Related to the quality of the trainings, a specific quality process was followed to obtain feedback before, during and after the trainings. One remarkable outcome was that, in general, all courses received very satisfactory scores from the attendees, with a great majority of national trainings having an average over 4 points (from maximum 5) in the overall mark for the training received.

More in detail, the team of trainers and the quality of the material distributed was highly appreciated by the participants according to their feedback, with very few deviations. Furthermore, the organization of the trainings was also outstanding.

Summary of key findings for the overall training:

- The general feedback provided by the attendees for the ICCEE National trainings was good or very good, which indicates that the trainings were successful and fulfilled the training aims in number of attendees, materials scope and quality, level of the speakers, platform used or trainings management.
- The audience of the training courses covered the aims of ICCEE, namely heads and engineers from industries, auditors and consultants, research and academia, energy managers and energy related experts, wholesale staff, food technologists, public and policy sector.
- When comparing one-day trainings with 2 half-day training, the conclusion is that one-day training keeps the attendees to complete the overall contents, thus it is in principle more favourable for trainings with a duration of 4-6 hours. Longer trainings might vary.

- In training webinars, it is more difficult to obtain feedback from all attendees compared to face to face. Even considering this fact, there was a high feedback rate in the ICCEE training courses, allowing the assessment of each individual course.
- Marketing actions (direct and indirect) focused to the action are needed to gain the interest and reach the target audience, particularly in trainings with a very specific scope as ICCEE.

2.3. EU Workshops

The aim of the EU workshops is to provide participants the main principles of the tools, as well as the way outputs of the model can interfere with their own activities.

Moreover, at each EU workshop, the three main energy efficiency measures resulting from the application of the tool will in-depth defined, as the funding opportunities to finance them. Optionally, Step 2 might include a visit to companies belonging to cold chains in the food and beverage industry, showing already implemented and potential energy efficiency measures.

The workshops were designed by the Task leader and the local partner. The logistics of organizing the workshops will be undertaken by the local partners. Optionally, they might have included a visit of companies to show energy efficiency measures (but, actually, this was comprised due to covid-19 restrictions).

As the workshops were organized in activity sectors, the participants could have been competitors between each other. So, it was important to make a confidentiality agreement in order to obtain the information from the SMEs in advance: the partner involving the SME, retrieving the information signed it, but the agreement also permitted the use of the data within the project. Plus, if there were any problems with the confidentiality of data, a solution was agreed of presenting another tool (e.g., NEB tools should be less sensitive).

Following the development of a pedagogical concept for the programme, the content of the trainings provides specialized and technical knowledge about energy savings and economic evaluation in the food and beverage supply chain cooling, focused on storages and distribution, but also including the relevant parts of the industry (as raw or final product storage in the own industry).

To keep track of all the information relating to the different workshop, some quality check forms were elaborated by the partners. Those forms are fully inspired by the ones developed for the national trainings in regard to the evaluation by the participants and the report of the event, including the agendas, conclusions, images, and recommendations.

The number of attendees to the EU workshops was 121, which compared to the original target of 120 indicates a high interest by cold supply chain companies in the food and beverage sector. The participants represented overall 49 different companies, averaging around 2.5 companies per sector (meat, seafood, fruit...). A great part of the success of this activity is due to the marketing done by the responsible partners, reaching all stages of different European cold chains to come together and discuss energy efficiency measures, even if the companies were from different countries.

2.4. E-learning

The e-learning is aimed at providing capacity building to a broader audience than those ones attending the face-to-face actions, as professionals with different backgrounds, professionals coming from countries not participating in the project and other professionals not being able to travel to the training venues. There were used similar materials than ICCEE face to face trainings and including additional contents.

The platform selected for the e-learning has been Moodle as it provides several advantages versus other platforms, as the possibility to use mobile devices. At present this is a critical issue as many people use their smartphones or tables instead of computers to attend trainings)

The user manual provided has facilitated the registering process and the use of the Moodle platform. With the feedback received, some materials can be updated to slightly improve the existing content and also the course can be further disseminated as it can be widely be used as for self-learning.

The e-learning training course was attended by 279 users (target 200) from European organizations within the food and beverage sector. The platform chosen to host the course, "Moodle", has been adequate considering the opinion of the project partners and also the general acceptance by the users in all countries. Overall, 97% of the users found the training useful for them and satisfactory and more than 95% indicated that materials were of high quality.

This e-learning complements other actions of the project as the tools developed which include YouTube videos (on how to use them), that can be beneficial to the users. Reaching a wider audience, means more people aware of the energy efficiency in cold chains of the food and beverage industry, thus being able to apply efficiency measures in their industries to achieve bigger energy and economic savings at the same time that the industry transforms into a more sustainable one.

The e-learning methodology and contents has been successful considering the results obtained, which include:

- A larger number of users that the original indicator target: reached 279 (target 200)
- The use of the e-learning in all partner countries without exceptions, as well as the English version in other EU countries. This also validates the user manual provided as it was needed to register in the training and use its contents
- The general very high satisfaction with the training provided in the quality test completed by users, as overall 97% of the users found the training useful for them and satisfactory and more than 95% indicated that materials were of high quality
- The low number of contacts with partners to register and use the e-learning, considering it was designed for self-learning
- The origin of the users, with high participation of the project target groups. Almost half of the users (46%) come from the food and beverage industry and processes related, 19% from research and universities and 11% from logistics and storage. Retail and wholesale, media, investors were other users of this training.

Some conclusions on how the training could be improved are related to:

- Revision of the training materials to update the information and review of the ones with a slightly lower mark by the users.
- Assessment on innovative ways to promote the training to a wider audience to reach a larger number of users, particularly in those countries with less users.
- In a next version, once the project tools are issued and tested, some of them could be included in the training (maybe a soft and friendly version which can be easily used by oneself and obtain some first results).

Related to the e-learning sustainability, the following measures were found useful:

- To better link the e-learning with the other project results available online, as the tools developed within the project. There has to be found a good balance on the amount of overall contents (project results) and

the time available by the audience, as too much information might reduce the final use of the materials.

- Find databases or places in the EU where e-learning for the ICCEE target audience can be announced, providing a link to the e-learning
- Keep informing the food and beverage associations about the availability of the ICCEE e-learning, so they can expand it to a wider number of users
- Find new EU initiatives and projects to update, improve and exploit the e-learning, as the contents developed in ICCEE cover a number of topics of interests for this industry sector, but also for others (as cold is used in many other industries, as chemical, pharma and others).

3. National trainings

3.1. Objectives

The aim of the ICCEE trainings is to provide non energy experts and energy experts with knowledge on food and beverage sector cold supply chains energy efficiency, which can be easily used to gain energy efficiency in their organizations or chains.

Following the development of a pedagogical concept for the training programme, the content of the trainings provides specialized knowledge about energy savings and economic evaluation in the food and beverage supply chain cooling, focused on storages and distribution, but also including the relevant parts of the industry (as raw or final product storage in the own industry).

The following organizations conducted the ICCEE national training workshops in the respective countries listed, with the foreseen targets described in the table:

| Country | Organizations involved | | Workshops | KPI Target audience |
|-----------------|------------------------|------------------|-----------|---------------------|
| Italy | SPES (FEDERAL) | UNIBS | 4 to 8 | 240 |
| Italy | FIRE | UNIBS | 2 to 4 | 120 |
| The Netherlands | IECCP | Contact FNLI | 2 to 4 | 120 |
| Germany | ADELPHI | Fraunh./UniStutt | 4 to 8 | 240 |
| Greece | SPES (SEVT) | ANEPKO | 3 to 6 | 180 |
| Spain | SPES (FIAB) | ESCAN | 2 to 4 | 120 |
| France | SPES (ANIA) | ATEE | 2 to 4 | 120 |
| Romania | Romalimenta | UNIBS | 2 to 4 | 120 |
| Latvia | RTU | | 2 to 4 | 120 |
| Overall | | | 20 to 40 | >= 1.200 |

Table 1 National training target audience

A precondition for ICCEE success is the existence of mutual trust among the project team and the stakeholders. This is based on the know-how and the experience of the project team and on the involvement of key stakeholders. ICCEE partners enjoys the support of SPES member federations (if existing in the country) or other food and beverage or supply chain associations.

The trainings were originally meant to be conducted in the classroom, because of the restrictions due to the Covid-19 pandemic many of the courses were held online using platform like ZOOM or GoTo Webinar.

At the end of each training, a final test was submitted to the participants to evaluate the skills acquired during the training session. Participants who compiled the final test received the certificate of attendance via email, together with documents used by speakers during the webinar.

The first one or two trainings in each Member State are the pilot training for testing how the training works. From the results of the pilot trainings, each member state then standardized and developed the procedures it considered most successful.

3.2. Results and conclusions

The courses were held by each partner in their own national language, with one day duration. It was originally scheduled in-class training, but due to COVID-19 pandemic and the restrictions in partner countries it was agreed with the Commission to develop real time training webinars with a similar scope. Thus, no deviation was originated for the project and the other tasks linked to these trainings.

The training programme required a minimum of 5 hours of time in order to be adequately presented and comprehensively worked through, including participant assessment. Segments of the training can be divided and administered at different lengths or intervals as appropriate for individual groups and/or countries.



Illustration 1 Image of national training in Spain

The training material developed by the partners within ICCEE and specific for the National trainings consists of general sections valid for each selected sub-sector

on topics related to the supply chain energy efficiency, and specific sections tailored to the sub-sectors to facilitate sector specific learnings, providing ways to overcome the main barriers, identifying existing funding opportunities, and addressing other peculiarities to support the implementation of energy efficiency measures.

The National training programme was structured as follows, i.e. the general topics of the training valid for every supply chain and subsector have been:

- Energy outlook in the food and beverage sector
- ISO 50001 – Energy Management System
- Energy Performance Indicators (EnPIs)
- IPMVP - Measurement and Verification Protocol
- Holistic approach
- Supply chain management and industrial symbiosis
- Energy saving opportunities on all the process from raw materials to final customer
- Financial analyses, funding opportunities and LCCA
- NEBs and behavioural aspects of energy efficiency
- Tool's introduction

At the end of training program, participants responded to a test to demonstrate the knowledge gained and increased awareness of the topics and received a certificate of participation. Each partner has chosen the modality in which to submit the final test to the respective participants.



Illustration 2 Marketing the national trainings

Some partners have structured the first training courses, the pilot ones, in a full day and others in two half-days, the latter option to avoid being too demanding for the participants. Both options have shown to be possible and in general with good results, but, the two half-days solution leads to have some participants following just one day (only the first or only the second one), with a reduction of the number of participants completing the whole course compared to the number of participants following each day, thus making this option less effective.

In several editions of the courses external speakers who do not belong to the project partners were included, which provided a greater practical sense and updated information to the attendees. In all trainings there was a special effort in showing case studies and good practices.

Apmācību semināra plāns

11. novembris, 2020

| Laiks | Tēmas | Lektors |
|---------------|---|------------------------------|
| 16:30 - 16:40 | Semināra atklāšana | Dagnija Blumberga |
| 16:40 - 17:00 | Ievads par saldētu produktu uzglabāšanu, piegādes ķēžu energoefektivitāti un pētniecības projektu ICCEE | Agris Kamenders |
| 17:00 - 17:50 | Energoefektivitātes indikatori un energopārvaldības sistēma uzņēmumos | Gatis Žogla |
| 17:50 - 18:00 | Pārtraukums | |
| 18:00 - 18:50 | Energoefektivitātes pasākumi. Ieviesto pasākumu kvalitātes mērījumu un verifikācijas procedūras | Gatis Žogla |
| 18:50 - 19:00 | Konsultācijas un kopsavilkums | Agris Kamenders, Gatis Žogla |

12. novembris, 2020

| Laiks | Tēmas | Lektors |
|---------------|--|---|
| 16:30 - 16:55 | Energoefektivitātes pasākumu ekonomiskā analīze | Agris Kamenders |
| 16:55 - 17:45 | Energoefektivitātes pasākumu dzīves cikla analīze. Aprēķina rīks uzņēmumiem dzīves cikla (vides snieguma) novērtējumam | Agris Kamenders un Maksims Feofilovs |
| 17:45 - 17:55 | Pārtraukums | |
| 17:55 - 18:35 | Noslēguma pārbaudījums (tests) un atsauksmes forma | Maksims Feofilovs un Agris Kamenders |
| 18:35 - 19:00 | Konsultācijas, kopsavilkums un semināra noslēgums | Agris Kamenders, Gatis Žogla, Maksims Feofilovs |



Co-funded by the Horizon 2020 programme of the European Union

Each of the partner regions have filled a quality check form with the statistics for each of the workshops completed. All this data is compiled in the following tables

filled up by the partners. For the European and National trainings, each of the partners have indicated the number of workshops that have taken place, the number of attendees, the company that the attendees work for, the number of these attendees that are expert or not in the topics taught, and a checkbox for the event report. In the following table the distribution of participants per region can be observed:

| Country | Responsible | Supported by | Workshops | Overall participants |
|-----------------|-------------|----------------------|-----------|----------------------|
| Italy | SPES/GEIE | UNIBS | 1 | 299 |
| The Netherlands | IEECP | Contact FNLI | 2 | 86 |
| Germany | ADELPHI | Fraunh. /UniStutt | 4 | 199 |
| Greece | ANEPKO | SPES (SEVT) | 3 | 236 |
| Spain | ESCAN | SPES (FIAB) | 2 | 143 |
| Italy | FIRE | UNIBS | 2 | 174 |
| France | ATEE | SPES (ANIA) | 1 | 94 |
| Romania | Romalimenta | UNIBS | 1 | 88 |
| Latvia | RTU | | 2 | 170 |
| TOTAL | | | | 1.489 |

Table 2 National training result in number of attendees

The number of attendees to the ICCEE national trainings was close to 1.500, which compared to the original target of 1.200 indicates that the interest created by the project Team in this topic was in line with the needs of the research community and the market. A reason for this success were also the marketing developed by partners, both through direct actions (emails and phone calls) and indirect ones (media partners, social networks, project website, announcement in Newsletter, etc.).

Related to the quality of the trainings, a specific quality process was followed to obtain feedback before, during and after the trainings. One remarkable outcome

was that, in general, all courses received very satisfactory scores from the attendees, with a great majority of national trainings having an average over 4 points (from maximum 5) in the overall mark for the training received.

More in detail, the team of trainers and the quality of the material distributed was highly appreciated by the participants according to their feedback, with very few deviations. Furthermore, the organization of the trainings was also outstanding.

Summary of key findings for the overall training:

- The general feedback provided by the attendees for the ICCEE National trainings was good or very good, which indicates that the trainings were successful and fulfilled the training aims in number of attendees, materials scope and quality, level of the speakers, platform used or trainings management.
- The audience of the training courses covered the aims of ICCEE, namely heads and engineers from industries, auditors and consultants, research and academia, energy managers and energy related experts, wholesale staff, food technologists, public and policy sector.
- When comparing one-day trainings with 2 half-day training, the conclusion is that one-day training keeps the attendees to complete the overall contents, thus it is in principle more favourable for trainings with a duration of 4-6 hours. Longer trainings might vary.
- In training webinars, it is more difficult to obtain feedback from all attendees compared to face to face. Even considering this fact, there was a high feedback rate in the ICCEE training courses, allowing the assessment of each individual course.
- Marketing actions (direct and indirect) focused to the action are needed to gain the interest and reach the target audience, particularly in trainings with a very specific scope as ICCEE.

4. European workshops

4.1. Objectives

The ICCEE EU workshops was developed after the implementation of ICCEE tools, as their use is a core part of this task. The aim of the EU workshops is to provide participants the main principles of the tool, as well as the way outputs of

the model can interfere with their own activities, gaining conclusions to improve the energy efficiency in their cold supply chains.

Following the development and testing of the tools and their fine-tuning carried, several european workshops were organized considering the results of the previous national trainings and the feedback provided by experts coming from different areas of the energy sector.

Moreover, at each EU workshop, the aim is to define and in-depth assess the three main energy efficiency measures resulting from the application of the tool, as well as the possible funding opportunities to finance them. Optionally, a Step 2 was to include a visit to companies belonging to cold chains in the food and beverage industry, showing already implemented and potential energy efficiency measures.

The workshops were be designed by the task leader and the national partners. The logistics of organizing the workshops was be undertaken by different groups of partners with one leader organization. Optionally, they might include a visit of companies to show energy efficiency measures (but, actually, this was not possible due to COVID-19 restrictions).

The organizations responsible for the EU workshops and target number of participants are the following:

| COUNTRY | RESPONSIBLE | Supported by | Workshops | KPI Target audience |
|----------|-------------|--------------|-----------|---------------------|
| European | SPES/GEIE | FIRE | 4 | 60 |
| European | ATEE | SPES (ANIA) | 2 | 30 |
| European | ECLSA | FEVIA | 2 | 30 |
| Overall | | | 8 | >= 120 |

Table 3 EU Workshops target number of attendees

4.2. Results and conclusions

It was originally scheduled in-class training, but due to COVID-19 pandemic and the restrictions in partner countries it was agreed with the Commission to develop real time training webinars with a similar scope. Thus, no deviation was originated for the project and the other tasks linked to these workshops.

The EU programme required a maximum of 3 hours of time in order to present adequately the tools and comprehensively worked on it. In order to facilitate the preparation of the workshop, it has been proposed a type of organization (partners are free to use it or not).

The global presentation of the ICCEE programme and of the tools was done in a main "room" (in English or in a common language) and for when participants work and discuss about their results, secondary "rooms" (in the language of the national partner as moderator) could be used. For example, Zoom offered multiple "room".

Each responsible partner participate and moderate the workshops with support from other ICCEE partners, experts in the tools or that have gained experience in them, thus can provide value to this events. The workshop organizer was also responsible of summarizing the conclusions, follow-up the missing information and providing the feedback report of the workshop.

During the workshops, recommendations about how to accelerate energy efficiency implementation were presented to support the energy efficiency measures. In addition, these workshops represent an opportunity to receive feedbacks from the target audience.

At the end of the capacity building, participants provided their feelings / feedback about the workshops in order to improve the following ones.

In order to facilitate the organization of the workshop, the task leader suggested the following agenda:

- Introduction of ICCEE and EU workshop. 10 minutes
- Short presentation of each partner and companies involved: 10 minutes
- Presentation of the first tool: ICCEE_Cold Supply Chain. The objective here, is to present the main principles of the tool and main outcomes. 10 minutes (participants are already familiar thanks to the tutorial videos)
- Parallel session: discussion in native language in the respective room. Each moderator (i.e. the national partners) works with the participants for presenting the outputs of the model of their own activities. 30 minutes
- (In the middle of the parallel session a 5 minute pause or just sharing via chat of the partners among them on how the sessions are going, questions, burning topics, etc. In this way interesting/fruitful topics can be proposed also in other parallel sessions)

- Global exchange and synthesis in English. Each partner will summarise the findings of each parallel session. 20 minutes
- Break of 10 minutes.
- Presentation of the second tool (same as for as the first tool, around 60 minutes)
- Break of 10 minutes.
- Conclusion. Here, the speakers need to present the three main energy efficiency measures resulting from the application of the tools and the funding opportunities to finance them. 20 minutes
- The end of the workshop could be done with a Q&A. 10 minutes

As an example, the summary of the seafood and frozen products workshop is shown in the table below:

| | |
|-------------------|--|
| Title | ICCEE Cold LAB #SEAFOOD |
| Sector | Seafood and frozen products |
| Country | Italy |
| Partners | SPES, FIRE |
| Date | 17/02/2022 |
| Assistants | 23 |
| Companies | 8 |
| Tool/s | CSC and LCA |
| Summary | The second EU workshop was organized in Italy but took place online. 23 participants from 8 different companies joined to better understand the seafood sector and how to improve their energy efficiency while not reducing their outputs. A brief explanation of the tools took place in the beginning, followed by a full explanation of the tools 1 and 2 for their specific cases. A discussion with the participants and a round table were organized at the end of the workshop with positive feedback. |

Illustration 3 EU Workshop summary table (example second EU workshop)

Some of the conclusions and considerations presented to the companies that participated in the workshop are the following:

- Longer supply chain (i.e., higher storage time) increases the refrigeration requirement (i.e., the SEC)
- To contrast quality losses lower temperature should be set inside the warehouse/transportation means à
- frozen fish)

- Higher utilization of the warehouses (material volume/storage size) leads to higher filling level and lower SEC
- Quality losses could highly increase the SEC (+17% for chilled fish)
- TRADE-OFF energy loads for refrigeration requirements vs quality losses
- Energy efficiency measures can be focused on:
 - Improving insulation of buildings/trucks/refrigeration equipment (e.g., freezer, portable refrigerated unit)
 - Improve performance/efficiency of equipment with support of sensors/automation
 - Optimization of the cold chain management
 - Replenishment cycle optimization: Reduce storage time, by reducing the lot size and fastening the replenishment cycle (smaller lots, higher replenishment frequency) but higher SEC for the transportation activities (increased amount of trip)
 - Monitoring and adjustment of cooling temperature avoiding temperature abuses, mismanagement of temperatures

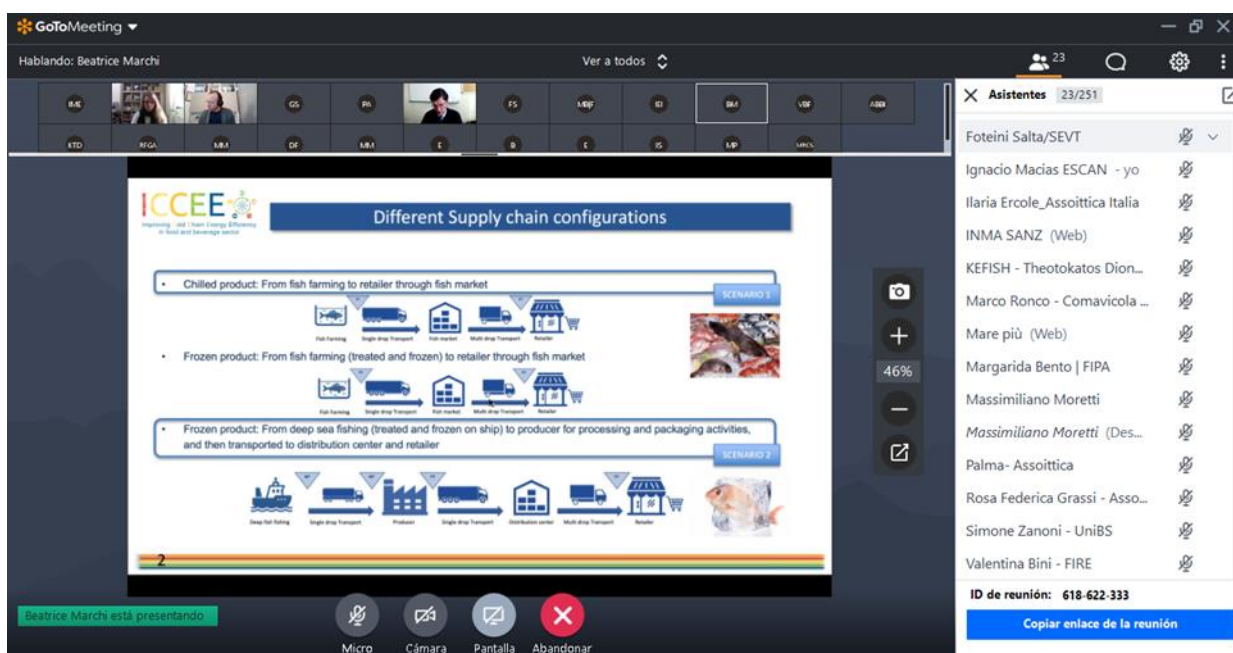


Illustration 4 Use of the cold supply chain tool during EU workshop

The number of attendees to the ICCEE European workshops was close to 121, which compared to the original target of 120 shows that the efforts done by the project Team in this topic was in line with the needs of the research community and the market. A great effort was done by the organizing partners with support from the overall consortium to be able to develop this task, as there was a challenge on organizing a practical workshop with participants from several EU

countries, using in practice the ICCEE project tools in real time to obtain results for the supply chain organizations.

5. E-learning

5.1. Objectives

The aim of the ICCEE capacity building programme is to provide non energy experts and energy experts with knowledge on energy efficiency in the food and beverage sector cold supply chains, which can be easily used to gain energy efficiency in their organizations or chains.

Similar to the national trainings, the content of the trainings provides specialized knowledge about energy savings and economic evaluation in the food and beverage supply chain cooling.

| Country | Responsible | Supported by | Workshops | KPI Target audience |
|-----------------|-------------|------------------|-----------|---------------------|
| Italy | FIRE | SPES/GEIE UNIBS | 1 | 30 |
| The Netherlands | IECCP | Contact FNLI | 1 | 30 |
| Germany | ADELPHI | Fraunh./UniStutt | 1 | 30 |
| Greece | ANEPKO | SPES (SEVT) | 1 | 30 |
| Spain | ESCAN | SPES (FIAB) | 1 | 30 |
| France | ATEE | SPES (ANIA) | 1 | 30 |
| Romania | Romalimenta | UNIBS | 1 | 30 |
| Latvia | RTU | | 1 | 30 |
| EU | Escan | | 1 | 30 |
| Overall | | | 9 | > 200 |

Table 4 E-learning target number of users

The ICCEE e-learning training course has been developed to be accessible by anyone interested in food and beverage cold supply chains, using similar materials than ICCEE face to face trainings and including additional contents. The platform selected for the e-learning has been Moodle as it provides several advantages versus other platforms, as the possibility to use mobile devices. At present this is a critical issue as many people use their smartphones or tables instead of computers to attend trainings).

5.2. Results and conclusions

The ICCEE e-learning includes the following contents and tools:

1. A set of materials with key information of sustainable food and beverage cold supply chains constitute the “Main Course” and should be read and understood by the user. These materials include the following topics:
 - ICCEE project description
 - Energy outlook
 - Energy performance indicators (EnPIs)
 - Energy Management System based on ISO50001 and Measurement and Verification (IPMVP)
 - Energy saving opportunities in the complete cold chain
 - Financial analysis and funding opportunities
 - LCA and LCC
 - Non-Energy Benefits (NEBs) and behavioural aspects
 - ICCEE tool introduction
2. A set of secondary materials which provide additional information to the user and recommended to be used, but not mandatory
3. A Forum where users can include their questions, doubts, or comments
4. A “Final Test” to be completed by the user when finalizing the use of the previous contents, to check the knowledge acquired and revise the materials to improve it.
5. A “Quality Test” to be completed by the user to provide feedback on the e-learning and which allow us to improve the training (We appreciate your feedback)

The E-learning training programme requires between 8 to 20 hours overall in order to be completed and comprehensively worked through. Participants of the training can administer and organize their own training hours according to their preference since no tutors are required and the platform can be accessed at all times. The course is available in 8 different languages, including English.

To ease the registration process and facilitate the use of the platform for participants of all ages, a user manual was elaborated. In this document, a step-by-step guide can be found for the registration process and the enrolment in any of the specific training courses.

ICCEE English

Participants

Badges

Competencies

Grades

General

Main Course

Help Materials

Tests

Forum

Dashboard

Site home

Calendar

Private files

My courses

Curso Energético Europeo

Site administration

ICCEE Training Course in English

Dashboard / Courses / ICCEE English

Main Course

ICCEE project description

01-ICCEE-Project-Description.pdf

01-ICCEE-Project-Description-Prep-Material.pdf

Energy Outlook

02-Outlook.pdf

02-Outlook-Prep-Material.pdf

Energy performance indicators (EnPIs)

03-EnPIs.pdf

03-EnPIs-Prep-Material.pdf

EMS ISO50001 and Measurement and Verification (IPMVP)

04a-EnMS.pdf

04a-EnMS-Prep-Material.pdf

04b-MV.pdf

04b-MV-Prep-Material.pdf

04b-ICCEE-MV.xlsx

04b-ICCEE-MV-Avoided-Energy-Consumption.xlsx

Energy saving opportunities in the complete cold chain

Illustration 5 E-learning structure and contents (part 1)

ICCEE English

Participants

Badges

Competencies

Grades

General

Main Course

Help Materials

Tests

Forum

Dashboard

Site home

Calendar

Private files

My courses

Curso Energético Europeo

Site administration

Energy saving opportunities in the complete cold chain

05-EEMs-Best-Practices.pdf

05-EEMs-Best-Practices-Prep-Material.pdf

Financial analysis and funding opportunities

06-Financial-Analysis.pdf

06-Financial-Analysis-Prep-Material.pdf

06-Financial-Analysis-Example-Template.xlsx

06-Financial-Analysis-Example-Solved.xlsx

LCA and LCC

07-LCA-LCC.pdf

07-MOODLE-ICCEE-LCA-LCC-Prep-Material.pdf

07-LCA-LCC.xlsx

NBEs and behavioural aspects

08-NEBs.pdf

08-NEBs-Prep-Material.pdf

08-NEBs-Tool.xlsx

08-NEBs-Tool-ISI-Graph.xlsx

08-NEBs-Tool-Example.xlsx

ICCEE tool introduction

Hidden from students

Help Materials

ICCEE

Energy Outlook

Hidden from students

Tests

Final Test

Quality Control Test

Forum

Forum

Illustration 6 E-learning structure and contents (part 2)

The overall training course in the 9 languages offered, shows that the majority of the participants come from organizations under the “Industry and processes” type, adding 46% of the total. The second largest group, with 19% of the participants, come from the university and research sector, while the third largest portion come from the logistic and storage sector with the 11% of the total. The remaining participants that have participated in the course, adding 24%, are from the groups of the public sector, investors, retail and wholesale, the media sector or various of the different groups.

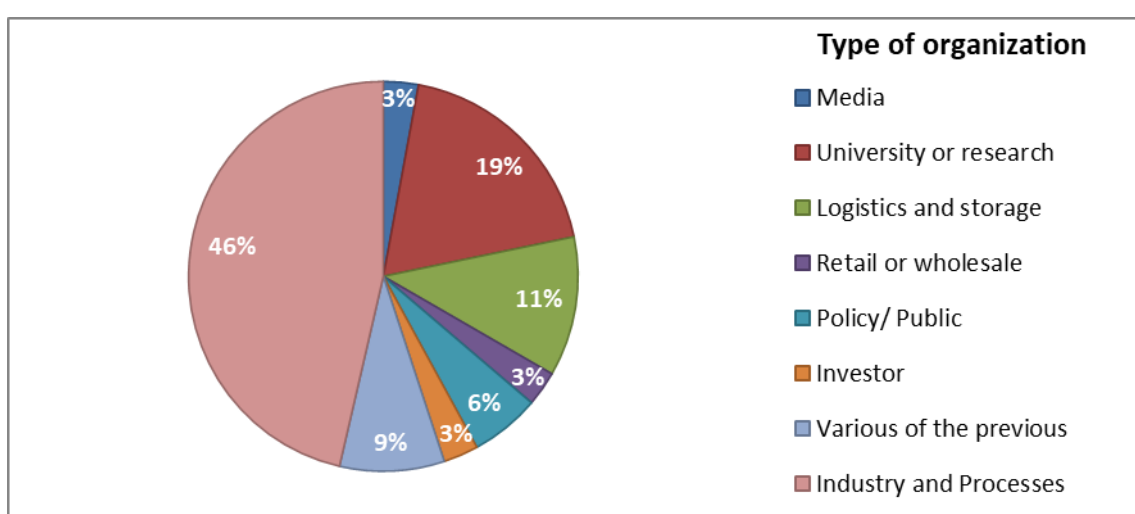


Illustration 7 Type of organizations participating in the E-learning

Related to the food and beverage subsectors, the largest group of participants come from the meat subsector (16%), beverage (13%), Fruits and vegetables (7%), HORECA (4%), dairy (3%), fish (2%). It should be mentioned that 29% of users do not work in any of the previous food and beverage subsectors or in sectors not even related to the food industry at all. Also, 26% of the users work in several of the subsectors listed. The complete distribution is presented in the following chart diagram.

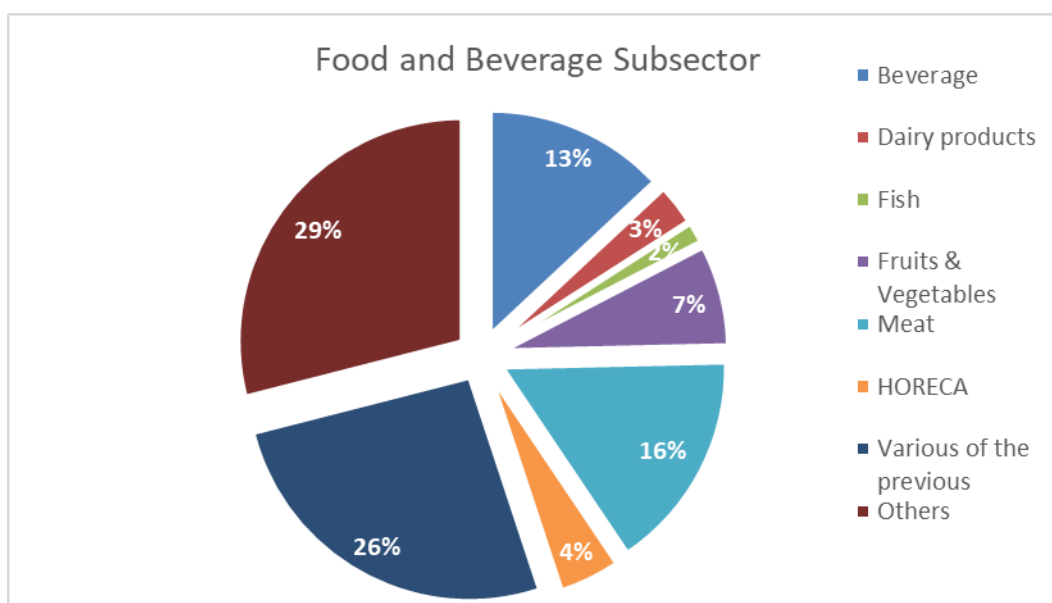


Illustration 8 Food and beverage subsectors participating in the E-learning

Overall, the target for the project is to engage 200 participants in the E-learning. Thus, it is envisaged that each one of the project partners has a minimum target audience of 30 participants. To reach this target the course has been communicated and disseminated among the partner's channels, such as mailing lists, social networks, and articles. Each of the partners is responsible for achieving the target of the course for their respective country and language. Exceptionally, the course in English has been promoted by all partners with the leadership of Escan, since English is not the native language for any of the participant regions and the aim is to reach a wider European audience.

The overall results achieved in terms of professionals completing the training are described in the table below. Overall, 279 professionals completed the ICCEE e-learning training successfully, which is a larger impact than the target foreseen.

| | Partner | Country | Target audience | Achieved (29/04/2022) |
|---|---------|-----------------|-----------------|-----------------------|
| 1 | FIRE | Italy | 30 | 37 |
| 2 | IECCP | The Netherlands | 30 | 9 |
| 3 | ADELPHI | Germany | 30 | 21 |

| | | | | |
|----|-------------|---------|-----|-----|
| 4 | ANEPKO | Greece | 30 | 53 |
| 5 | ESCAN | Spain | 30 | 43 |
| 6 | ATEE | France | 30 | 18 |
| 7 | Romalimenta | Romania | 30 | 43 |
| 8 | RTU | Latvia | 30 | 13 |
| 9 | ESCAN | EU | 30 | 42 |
| 10 | Overall | | 200 | 279 |

Table 5 E-Learning result in number of users

For the E-learning the number of target audience reached in each of the regions have been compiled by Escan, the organisation in charge of the online platform.

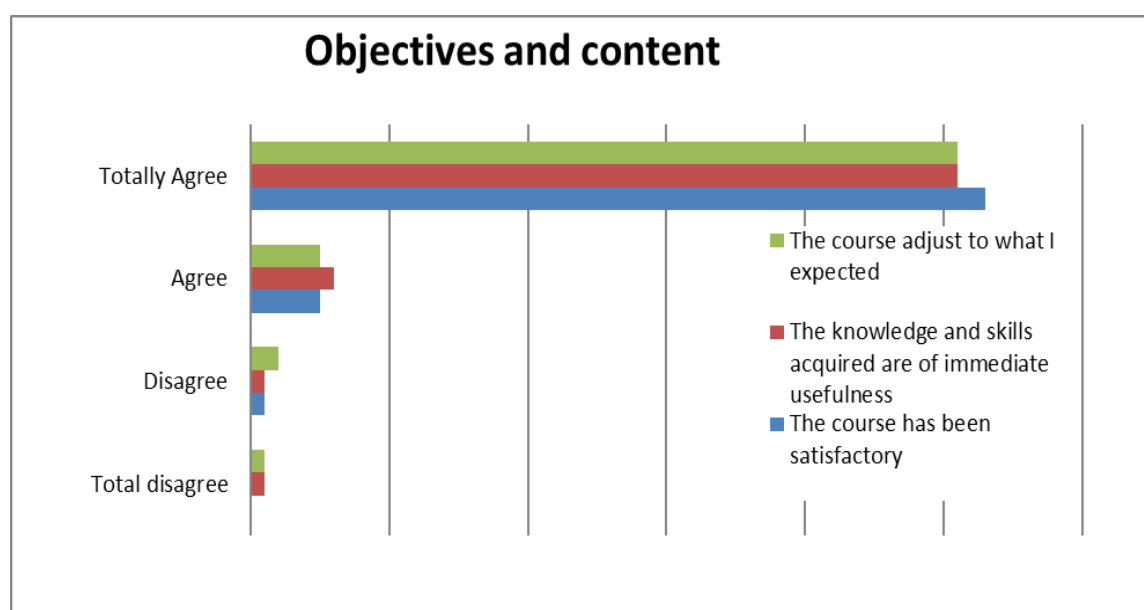


Illustration 9 Results of the E-learning satisfaction as feedback by the users

The overall satisfaction assessment related to the course has been massively positive, as 97% of the users totally agree or agree on that the course was satisfactory, provided the capacity expected and the knowledge and skills gained were of immediate usefulness. There have been very few cases where the users were not satisfied or thought that the skills provided were not suitable for them, which are usually linked to users that were not related to the food and beverage industry while the contents are specific for this sector.

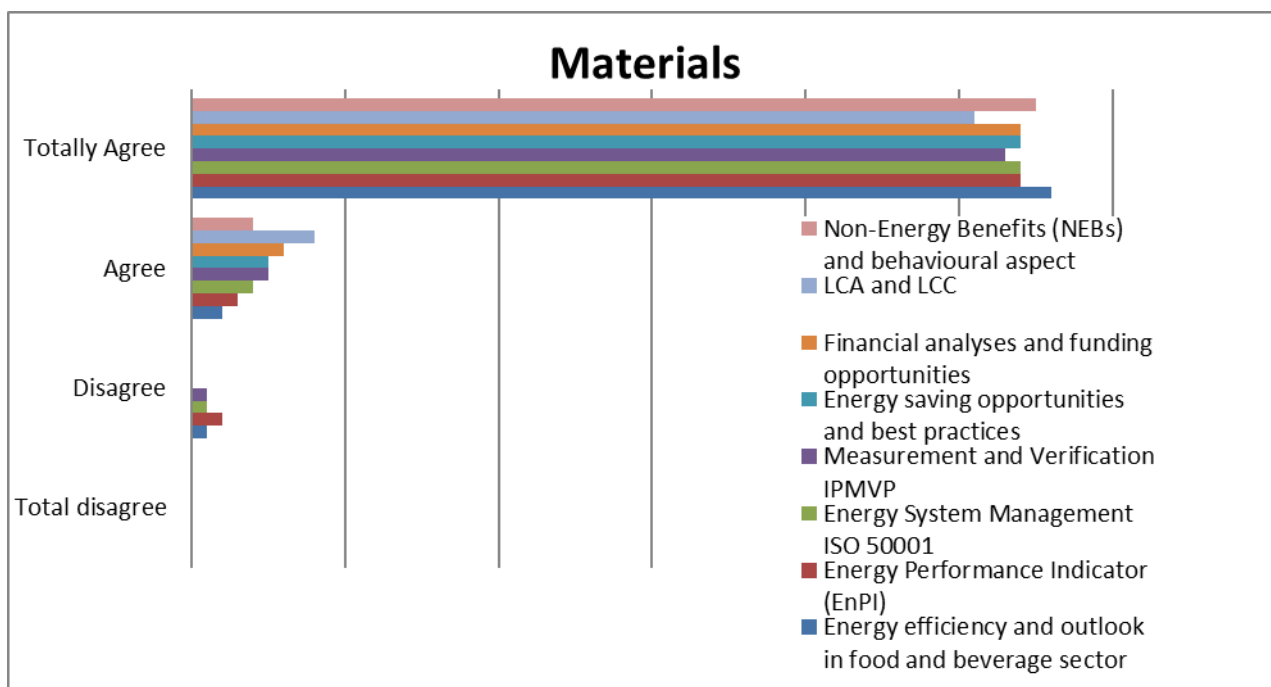


Illustration 10 Results of the E-learning materials assessment as feedback by the users

When assessing satisfaction rating from the users with the materials prepared for the 8 topics included in the e-learning training course, the result indicates that they have also a high level of satisfaction coherent with the result of the previous section for the full e-learning training course.

All materials have in general a very good score (>95% totally agree or agree the quality was high). Nonetheless, some materials would have slight room for improvement such as the “Energy Performance Indicator (EnPI)”. Some of the materials as the “Energy efficiency and outlook in the food and beverage sector” or “Non-energy benefits and behavioral aspects” obtained the top points by the users.