DELIVERABLE D.T2.3.3

Training sessions summary and recommendation

Joint English Version

Version n°1 11/2019

D.T2.3.3: Training sessions summary and recommendation

A.T2.3 Capacity building

Issued by:	**Energie Agentur Steiermark n°6 - EASt**
Reviewed by:	**AEE Institut für Nachhaltigen Technologien n° 3 - AEE INTEC**
Version date:	**31.03.2022**
Version. Revision	**1.0**
Circulation	**PU - Public**

Document History

Date	Version	Description of Changes
31.03.2022	v 1.0	Document issued by PP6°

Partners involved

PPn°6 - PP Energie Agentur Steiermark - EASt

PPn°3 - PP Institut für nachhaltige Technologien – AEE INTEC

Interreg CENTRAL EUROPE

Priority:	2. Cooperating on low-carbon strategies in CENTRAL EUROPE
Specific objective:	2.2 To improve territorial based low-carbon energy planning strategies and policies supporting climate change mitigation
Acronym:	**ENTRAIN**
Title:	**Enhancing renewable heaT planning for improving the aiR quality of commuNities**
Index number:	CE1526
Lead Partner:	Ambiente Italia Ltd
Duration:	01.04.2019 31.03.2022

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1. EXECUTIVE SUMMARY

The ENTRAIN project aimed at improving the capacities of public authorities to develop and implement local strategies and action plans for enhancing the use of locally available renewable energy sources (RES) in small district heating (DH) networks. DH is seen as the main option to decarbonise the heating sector in both urban and rural areas thus enabling higher penetration of RES. A further expansion of DH networks is part of the recent national and regional Climate and Energy Strategies, which are setting a focus on the extended use of biomass and enhanced integration of solar thermal and waste heat to improve air quality and foster more efficient use of biomass.

One of the core concepts of the ENTRAIN methodological approach to support these strategies is the knowledge transfer from forerunner regions in RES DH in Central Europe, namely Styria in Austria and Baden-Württemberg in Germany to the target regions (Poland, Croatia, Germany, Italy and Slovenia). This knowledge transfer and exchange of experience was performed within the activity Capacity building (A.T2.3) within the Thematic Work Package T2 (Knowledge transfer) of the project. The present deliverable D.T2.3.3: Training sessions summary and recommendation has been elaborated as a part of this activity.

The main objectives of the capacity building activity were to design and organise tailor made trainings for defined target groups (see below) in a two-step procedure. First dedicated trainers in the target regions have been trained in so-called “train the trainer” (TT) sessions. These trainings addressed relevant topics and contents e.g. based on the Austrian QM Heizwerke system. Subsequently local trainers performed courses in national languages for stakeholders in the different target regions. All training materials are freely available to interested parties at the project website (www.interreg-central.eu/Content.Node/ENTRAIN.html - see section “Training Toolbox”).

The following train the trainer sessions were held within the ENTRAIN project:

TT1, Nov 2019: How to develop a project from the scratch?

TT2, June 2020: Fundings, Economics and Financing of RE-DH

Add on: Web-meeting, Sept 2020: How to convince investors?

TT3, 2nd Dec 2020: Emissions, Air Quality, Fuel and Ash Logistic

Add on: Web-meeting, April 2021: Study tour to the solar and biomass DHS of MZZ

TT4, 23rd June 2021: Operation and optimisation of DHSs

TT5, extra training, Today, 23rd November 2021: QM system Basics and extension

The contents of the train the trainer sessions were used as inputs for the local trainings in the 5 target regions and addressed the following target groups:

PUBLIC AUTHORITIES & AGENCIES, TECHNICAL ACTORS (UTILITIES, PLANNERS, Q-MANAGERS, RESEARCH, ETC.), INTEREST GROUPS (ASSOCIATIONS, TRADE UNIONS, NGOs, ETC.), ECONOMIC ACTORS (FUNDING BODIES, BANKS).

2. TRAIN THE TRAINER SESSIONS

2.1. First Train the trainer session

Summary

The first train the trainer session (TT1) was organised to coincide with the second project meeting in Rottenburg am Neckar in Germany. The training was held on 29th November 2019 and it gathered 21 participants including project partners responsible for the organisation and lecturing as well as an external speaker. The attendance sheet with a list of participants can be seen in Annex 1.

The topic of the first training session was "How to develop a project from the scratch: Getting started and key factors for success" and was dealing with the initiation and first steps in the development of a renewable energy source district heating (RES DH) project. The training aimed to equip project participants with knowledge and skill to train their local stakeholders in the target regions.

During the training, participants were first introduced to the basic goals of the project, capacity building activities and first training.

A short introduction given by Viktorija Dobravec from Energie Agentur Steiermark (EASt) was followed by a presentation of Harald Schrammel from AEE INTEC. He talked about approaches and timing for the project initiation based on the success experiences from Austria. It has been emphasized that often is a good idea to start with a smaller project focusing on a few big consumers and later stepwise enlarge district heating network. The first and the most important criterion of a RES DH project is sufficient heat density in the area calculated via pre-feasibility study. The next point is to find possible drivers and operators and after that a detailed feasibility study should be conducted by experts.

In the second presentation Patrick Geiger from Solites focused on different approaches to reach stakeholders. He pointed out that besides technical details of the project it is of great importance to explain to the key stakeholders the core reason for RES DH such as need for CO_2 emission reduction, climate change, limited fossil fuel resources. In addition, various advices on successful ways of reaching the stakeholders form the German experience were explained, e.g. benefits for the local economy improving life quality and other. Opposed to the approach of the first presentation he suggested reaching as much as possible customers gives bigger chances for a success because you want to have the public on your side. He also mentioned that it is very important to adopt your way of communication according to know who you are addressing (supporters, thwarters or people who are neutral concerning the topic). Several solar DH projects were presented as successful stories.

Jörg Dürr-Pucher from Solarcomplex gave an overview of the situation of RES DH in Germany and explained the history of the Solarcomplex company. Technical benefits of RES DH in comparison to the other individual heating options were highlighted. These refers to sector coupling, grid supplied from different types of DH plants (biomass, solar, waste heat, etc.), system flexibility due to large storage systems. Biodiversity is highlighted as an important aspect that should be considered while building RES DH plants and especially solar thermal plants. RES DH always have to lead to win-win situations (good for economy and environment) and in rural regions a soft start can make sense with the municipalities as role models. Role models have to be geographically

close and also concerning the time frame – after the model planning soon a first step to put the project into action should take place.

Figure 1 Presentation about best practice examples from Germany, Jörg Dürr-Pucher, Solarcomplex

After a short break Harald Schrammel explained key steps to conduct a prefeasibility study. The aim of the pre-feasibility study is to give an idea and get a feeling about the project and it does not need to be done by a professional planner As a first step it is important to take a look at the area and identify the heat demand, number of objects and the current heating systems and think about possible heat sources. Again, he mentioned that it is important to focus on the biggest or key customers. The next step includes definition of the scenarios while in the third intermediate evaluation is performed which includes calculation of linear heat density and first economic check. If the pre-feasibility study is positive as a next step, a professional planner should be assigned.

Figure 2 Presentation about pre-feasibility study, Harald Schrammel, AEE INTEC

In the last presentation Sabrina Metz from AEE INTEC presented key facts and benefits of RES DH.

Training was closed by EASt (Viktorija Dobravec). Partners were reminded on the next step of the capacity building activity, i.e. local training.

At the end of the training the evaluation questionnaire was conducted.

Training evaluation

A total of 17 participants that will act as local trainers provided their inputs to the evaluation questionnaire for TT1. The overall satisfaction with the training session is very high. On a scale 1 to 5, participants have rated training with an average grade of 4.6, where 65% rated training as very satisfactory (5). The training fulfilled the expectations of the participants to a high extent with the average satisfactory rate of 4.6 of maximum 5. Training was also successful in bringing new knowledge to the participants where knowledge update was rated as very satisfactory (5) and satisfactory (4) for 59% and 18% of the participants respectively. The satisfaction level of each presentation is shown in Table 1.

Presentation	Average satisfactory level	%				
		1	2	3	4	5
Best practice examples from Austria	4,7	0	0	0	29	71
Best Practice Solarcomplex	4,7	0	0	12	6	82
Possible drivers and how to reach them	4,5	0	0	0	47	53
Pre-feasibility study including exercise	4,7	0	0	0	31	69
Facts and benefits of renewable DH for consumers and municipalities	4,8	0	0	0	25	75

Table 1 Satisfactory level of the training content

The participants evaluated examples, solutions and advices provided at the training as very useful and applicable to their target regions. An average rating of the transferability of the solutions was 4.6 out of 5. Evaluation of applicability of examples, solutions or advices presented per specific presentation are given in Table 2.

Presentation	Average satisfactory level	%				
		1	2	3	4	5
Overall training session	4,6	0	0	0	38	63
Best practice examples from Austria	4,6	0	0	6	29	65
Best Practice Solarcomplex	4,4	0	0	18	29	53
Possible drivers and how to reach them	4,5	0	0	12	24	65
Pre-feasibility study including exercise	4,7	0	0	0	29	71
Facts and benefits of renewable DH for consumers and municipalities	4,4	0	0	12	35	53

Table 2 Applicability level of the examples, solutions and advices

More than half of the participants have listed pre-feasibility study as the most interesting element of the training to be use in a future work within the region. Second most interesting element were presentation of best practice examples from both Austria and Germany where. Facts and benefits of RES DH and advices how to reach potential stakeholders were listed three times each. Other

interesting elements included aspects such as technical details and creation of ideas, discussions and question and answer sessions. Some participants listed more than one element as the most interesting.

Two most common topics about which partners would like to have more details are economic aspects and calculation of the economic feasibility but also more time for the prefeasibility study. In addition, several other topics were mentioned which range from more specific topics such as contractual issues, decision process, technical aspects and feasibility, targeting and creating interest of key stakeholders to broader such as detailed steps of the initiation process, RES DH, qm system.

Participants have also given some useful and interesting advices for the improvement of future trainings. It has been emphasized that longer trainings would enable better knowledge transfer and better prepare participants, i.e. project partners of target regions to perform local trainings. This would also enable to present specific topics of interest in more details (e.g. best practice examples, pre-feasibility study) and have more time for the discussions. Having training materials beforehand could help participants to easier follow the training. In addition to the knowledge of the topic, the knowledge and skills on the training methods were requested

2.2. Second train the trainer session

Summary

The 2nd train the trainer session was planned in Poland. In consequence of Covid-19 and the first lockdown all project partners decided to organise the 2nd train the trainer session as an online training.

It was held on the 18th of June 2020 and organised by EASt, AEE INTEC and Ambiente Italia, who hosted the participants at the online platform gotomeeting.

The TT2 was organised together with the 3rd project meeting, which was held the day before at the 17th of June 2020.

The topic of the 2nd training session was fundings, economics and financing.

For potential operators and investors of district heating systems it is very important to know, if they are profitable or not. The 2nd train the trainer session was about economic profitability calculations, about how to compare heating costs of district heating systems and individual heating systems, about some examples of economic feasibility of solar thermal projects and Bioenergiedörfern, about the funding models in ENTRAIN regions and also about contracting as a possible financing and operation model.

After a short introduction of Sabrina Metz from the AEE INTEC, Harald Schrammel (AEE INTEC) talked about “Proftability calculation of district heating plants”. He introduced the tool profitability calculation and showed its application with the aid of an example.

This tool helps to calculate the necessary fuel consumption and the associated annual costs, based on the actual annual heat demand, the annual efficiency rates of the network and the boiler.

By varying the input parameters and storing the individual results of the profitability assessment, it is possible to evaluate the influence of individual parameters on the positive economic development of the heating plant.

After that the “Heat cost comparison tool” was introduced by Heidrun Kögler from the EASt and Carlos Ribas-Tugores from the AEE INTEC. This excel tool was developed by AEE INTEC and helps to compare the costs of different individual heating systems with the costs of district heating systems. The tool allows the input of several assumptions and prices for different fuels, as well as the net heating value and the heat demand of the customers. With these inputs the heating costs of different heating systems and district heating systems can be calculated and compared to each other with the help of the tool.

After a ten-minute coffee break Patrick Geiger from Solites and Joachim Zacher (RVNA) talked about the economic feasibility of solar thermal plants connected to district heating systems and of the “Bioenergiedörfer”, which are villages that try to convert the majority of the heat and power supply to the renewable energy source biomass.

This was followed by a presentation of Heidrun Kögler (EASt) about fundings for district heating systems in Austria. This includes investment fundings on the operator side, the support of consultation of older biomass district heating systems and the subsidies for customers, who wants to connect to a district heating system. But the first question, that had to be answered, was “Why does it make sense to support renewable district heating systems?”

Then, Patrick Geiger (Solites), Iva Tutanovstki (Regea), Matteo Mazzolini (APE FVG), Anna Lachowicz (PNEC) and Nejc Jurko (KSSENA) also gave and a short overview about the fundings for district heating systems in all 5 target regions.

After another short coffee break, one external speaker, Siegfried Aigner (Aigner Energie Contracting GmbH), gave an overview about different financing schemes with a focus on the financing and contracting model, as one possible financing and operation model.

In conclusion Sabrina Metz (AEE) reminded the partners on next steps of the work packages 2, in particular the capacity building activity and gave a short outlook for the following training sessions.

At the end of the training the evaluation questionnaire was conducted. This was organised as an online questionnaire. T*he evaluation questionnaire was send out with surveymonkey*. The results are summarised in the following part.

This training was supplemented by one presentation at the last online webmeeting in September, where Christoph Walla from Engie held a presentation about “How to convince investors of district heating systems”.

Figure 3: screenshot of the participants of the 2nd training session

Training evaluation

A total of 9 participants that will act as local trainers provided their inputs to the online evaluation questionnaire for TT2. The overall satisfaction with the training session is very high. On a scale of 1 to 5, participants have rated training with an average grade of 1,3, where 70% rated training as very satisfactory (1).

The satisfaction level of the training is summarised in the following graphic:

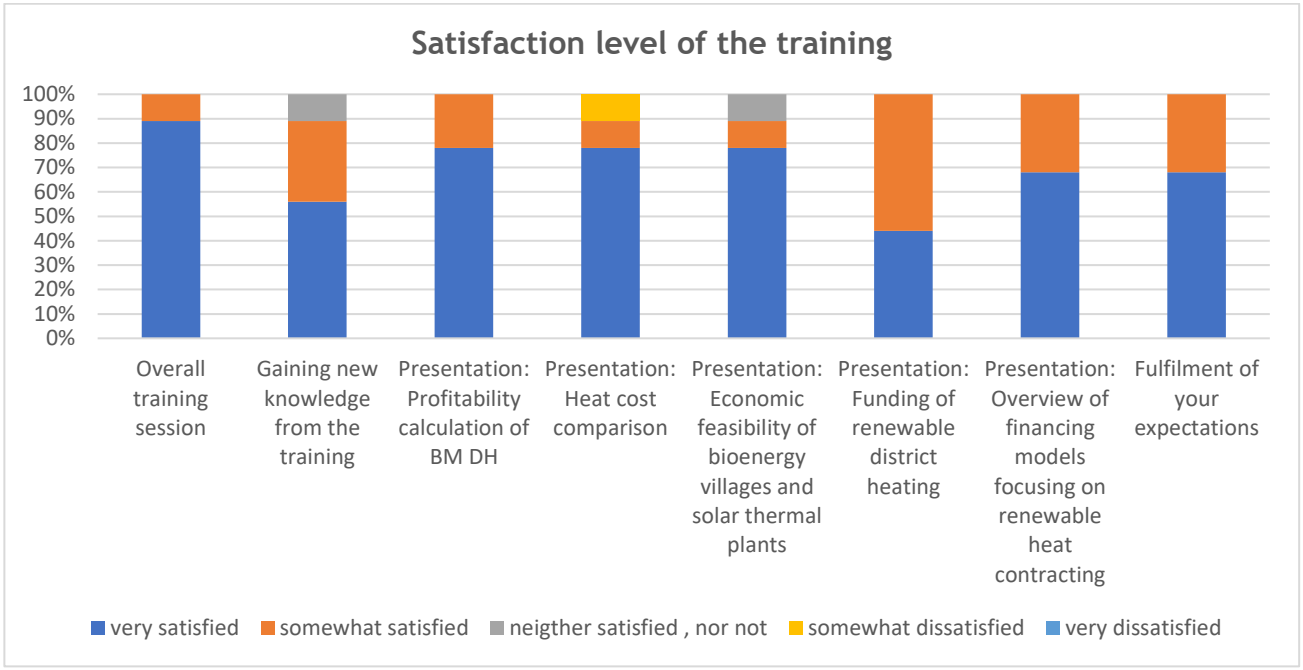


Figure 4: Satisfactory level of the training content

On a scale of 1 to 5, the participants have rated the training with an average grade of 1,9, where an average of 30% rated the training as extremely useful (1), an average of 48% rated the training as very useful (2), an average of 18 % rated the training as somewhat useful and an average of 4% rated the training as not so useful.

The applicability level is summarised in the following graphic:

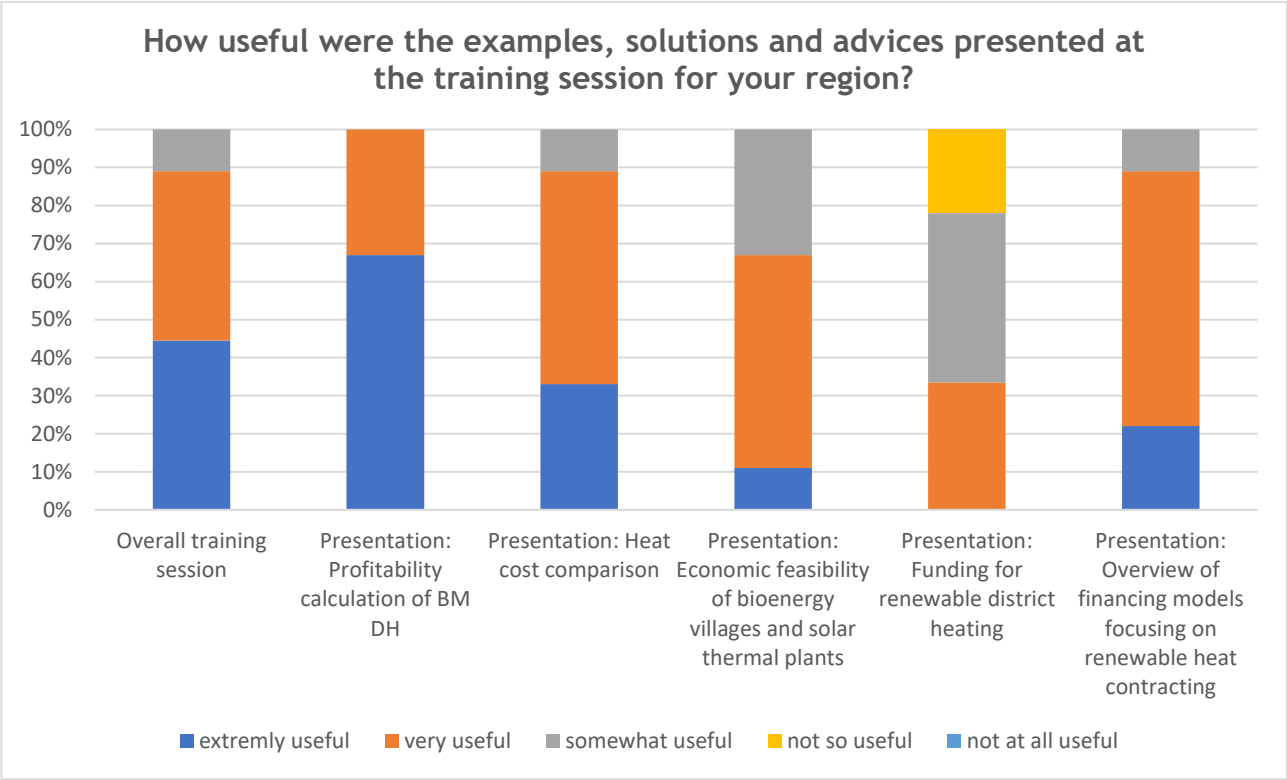


Figure 5: Applicability level of the examples, solutions and advices

Furthermore the participants, who filled out the questionnaire, answered to the questions below with the following listed comments:

Which elements of the training were most interesting for your future work within the region?

- Presentation of profitability calculation and heat cost comparison excel tools.
- RES heat contracting presentation by Mr. Aigner
- Examples
- Tools (2 times named)
- Toolkit

Which topics would you prefer to be presented more detailed?

- How to present my project to an investor
- Calculation of a total D-System, the boundary conditions and useful values for the calculation
- creating business models around RES DH systems
- Toolkit

Please indicate what you liked the least at this training and what you think can be improved:

- The web meeting worked properly, but still, it is something else to meet in person.
- For a TT-Session, a physical meeting is much better.
- Due to the virtual venue, there was little room for reflection, exchange, and discussion (compared to personal meetings). Overall, very good time management and moderation of the online session, thank you!
- Funding part: too much related to local contexts

2.3. Third train the trainer session: Emissions, Air Quality, Fuel and Ash Logistic

Summary

Again, the 3rd train the trainer session, that was supposed to take place in Poland again, was finally held as online training in consequence of increasing Covid-19-numbers.

It was held one day after the 4th project meeting on the 2nd of December 2020 and was again organised by EASt, AEE INTEC and Ambiente Italia, who hosted the participants at the online platform gotomeeting.

The topic of the 3rd training session was “Emissions, Air Quality, Fuel and Ash Logistic”.

These issues are very important for each operator of a combustion plant – also if it is the combustion plant of a renewable district heating net.

Burning fuels, and especially if it is biomass, produces many different emissions, as for example fine dust, carbon monoxide, nitrogen oxides and ashes as waste products.

These emissions must be reduced as good as possible. How it is possible to do that and which legal framework in the different countries regulates that, was the content of the 3rd train the trainer meeting.

At first Heidrun Kögler from the Energy Agency of Styria gave a short introduction by summarising the topics of the previous trainings and giving an outlook for the presentations of this training and its contents.

The first presentation was held by DI Joachim Kelz, who works at the AEE INTEC and gave a very detailed introduction about the main impacts on emissions and air quality, the main emissions of district heating systems (DHS) and we can reduce them.

After that Harald Messner from the energy Agency of Styria, Andreas Schopper and Bernd Hafner, who both are working at the federal state of Styria in the Department 15 – which concerns Energy, Housing and Technology -, were speaking about Austrian and Styrian regulations, initiatives, and projects to control air pollution and emissions of combustion plants.

These presentations addressed the following questions: What are the legal framework conditions of the EU? Which are the main initiatives of the federal state of Styria to reduce emissions and to improve the air quality?

After a 10 minute coffee break the second part of the training was started with Harald Thorwarth from the Holzenergiefachverband Baden-Württemberg e.V. and Christian Ramerstorfer from the AEE INTEC. They were talking about the main influence factors for ash formation in combustion plants, about how to handle ash and how to dispose it.

The following contributions came from the ENTRAIN-partners. One short presentation from each target region gave an overview about the situation of legal framework conditions concerning emission limits in their countries and regions. The presentations were held by Anna Lachowicz (PNEC), Johanna Eichermüller (HEF), Martina Krizmanic Pecnik (REGEA), Franci Voglar (Javne sluzbe Ptuj) and Francesco Locatelli (APE FVG).

Another ten-minute coffee break followed and after that DI Christian Ramerstorfer talked about how to reduce particles and nitrogen oxide emissions in combustion plants. He gave a very good overview about different technologies for reducing emission from the flue gas with different filters, cyclones, catalytic and non-catalytic reduction and flue gas condensation. Also with the very nice aspect of recovering heat and so improving the efficiency of plants.

The last expert presentation came from DI Martin Schober from the Maschinenring in lower Austria. He spoke about fuel quality and logistics. Thereby he addressed the different properties of various biomass fuels, their prices as well as the logistic of biomass fuel and its challenges - and of course about what this means for operators of heating plants.

The 3rd train the trainer session was closed after a conclusion that was given by Heidrun Kögler (EASt). She reminded about the next trainings and announced the following train the trainer session, TT4, that will address the topics operation and optimisation of district heating systems and take place in June 2021.

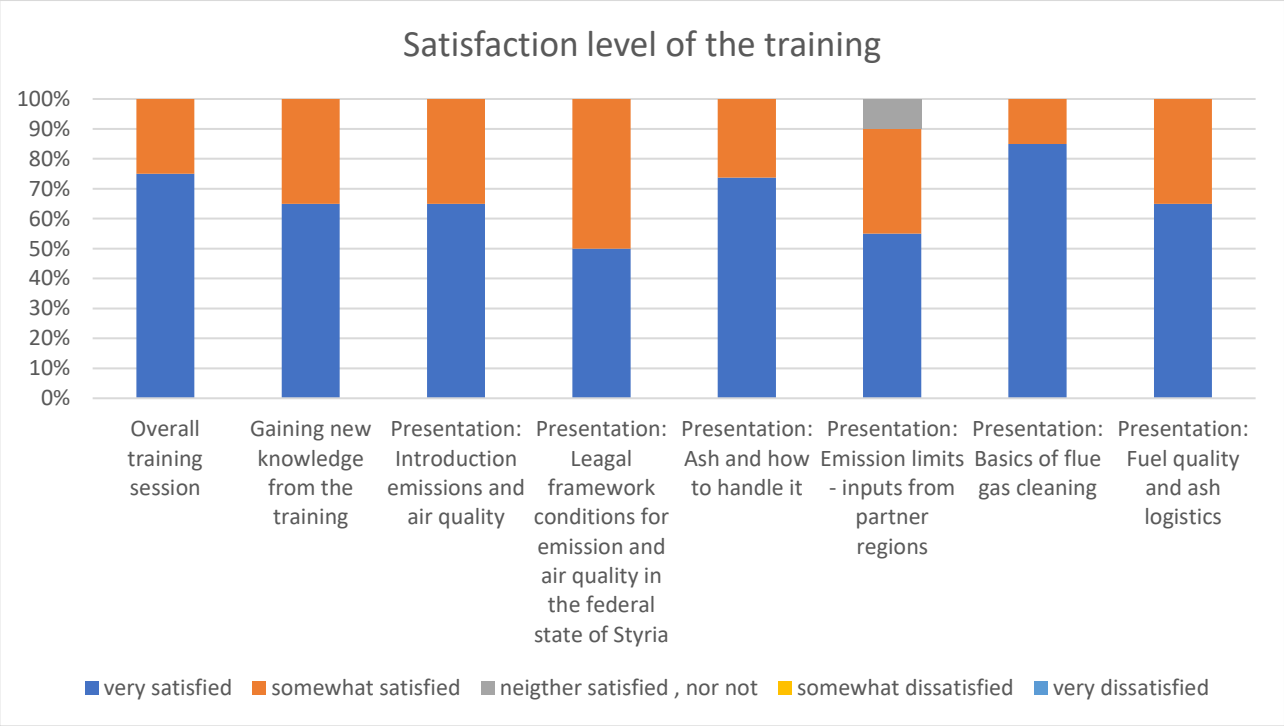
As feedback for this training an online evaluation questionnaire was organised with surveymonkey. All partners gave their feedbacks and the results are summarised in the following part.

After taking an online “group picture” as screenshot, the traing was closed.

- Training evaluation

A total of 20 participants that will act as local trainers provided their inputs to the online evaluation questionnaire for TT3. The overall satisfaction with the training session is very high. On a scale of 1 to 5, participants have rated training with an average grade of 1,2, where 67 % of the participants rated training as very satisfactory (1), 32 % as somewhat satisfactory, and 1 % as neither satisfactory nor not.

The satisfaction level of the training is summarised in the following graphic:



<u>Furthermore the participants, who filled out the questionnaire, answered to the questions below with the following listed comments</u>:

Which elements of the training were most interesting for your future work within the region?

- Fuel quality and logistics, emission and air quality
- all
- Practical examples
- Fuel quality and fuel logistics and for sure legal framework
- Ash and how to handle it
- Fuel quality and fuel logistics
- All of them are interesting when you take them in detail

Which topics would you prefer to be presented more detailed? What did you like best/worst?

- It has been very well balanced
- Emission limits
- Emission and air quality
- Basics of flue gas cleaning – best presentation
- Inputs from each partner region: maybe presentations could not be shown region after region, but directly comparing the situation in each target region
- Technology and cost for limit emissions of plants

2.4. Fourth train the trainer session: Operation and Optimisation of renewable DHSs

- Summary

Within the 4th train the trainer session the topic "Operation and Optimization of renewable District Heating Systems" was addressed. This training session once more had to be held online because of the still insecure Covid-19-situation.

The training session was held on the 23th of June 2021, one day after the 5th ENTRAIN project meeting, which was also organised as an online meeting. It was organised by EASt, AEE INTEC and Ambiente Italia, who hosted the participants at the online platform gotomeeting. About 30 project partners and also external stakeholders from Cosovo participated.

Operation and optimization of renewable district heating systems is a very important part for each operator of a district heating plant.

At first Heidrun Kögler from the Energy Agency of Styria gave a short introduction by summarising the topics of the previous trainings and giving an outlook for the presentations of this training and its contents.

The first speaker of this training session was Mr. Klaus Gall from Gall and Gärtner, who was co-founder of the wood heat cooperative WeilerWärme eG. As an architect he already planned 9 heating stations/plants most of them for heat cooperatives.

In his presentation he gave a short overview of what are the key issues and Challenges in the daily operation of a DHs, which safety related issues are important and what has to be considered concerning the qualification of operating staff.

The next speaker was Josef Bärnthaler, who is CEO of the energy agency of Upper Styria and also teaches at the advanced college "Fachhochschule Joanneum". Also he is Q-Manager according to QM Heizwerke in Austria.

In hie presentation he gave an overview about the theoretical part of technical aspects of optimization and modernisation of DH-networks. He will talk about the basics of energy optimization, the improvement of the energy performance, as well as the importance of load and heat storage management and network densification.

After the theoretical part of the technical aspects for optimisation of DHSs and a short coffee break, Mr. Klaus Paar from Güssing Energy Technologies company (GET GmbH) continued with some practical examples for the optimization and modernisation of DH-networks.

Güssing Energy Technologies company (GmbH), which is a privately-funded, non-profit research institute with focus on renewable energy and energy efficiency.

Klaus Paar works there since 2007 and is specialised on energy efficiency analyses and energy optimisation of district heating systems and also industrial clients.

In his presentation he focused on optimisation from the heating central to the customer, optimisation on customer side and the reduction of electricity demand in general.

After that Christoph Aste continued with kind of a virtual study tour to two flagship projects, DHS Krumpendorf 2.0 and the Energy Island Landskron Villach, where the integration of alternative

renewable energy sources (alternativ renewable means others than biomass) were increasing the energy efficiency of DHSs.

Christoph Aste is CEO of the engineering office asteenergy and institute director of the Institute of Energy and environment Carinthia.

Through his work in several projects he gained a lot of experience in planning and quality management of biomass district heating systems and is project leader in the huge solarthermal project Krumpendorf, Ebenthal and Landskron/Villach.

And finally, Christian Ramerstorfer from the AEE INTEC talked about ("Plant monitoring according to QM-system", which was a first early on the adapted QM-Heizwerke, which will be the topic of the last and "additional" training session 5.

The 4th train the trainer session was closed after a conclusion that was given by Heidrun Kögler (EASt). She reminded about the next trainings and announced the following train the trainer session, TT5, that will address the adapted QM: Heizwerke and will take place in Autumn 2021.

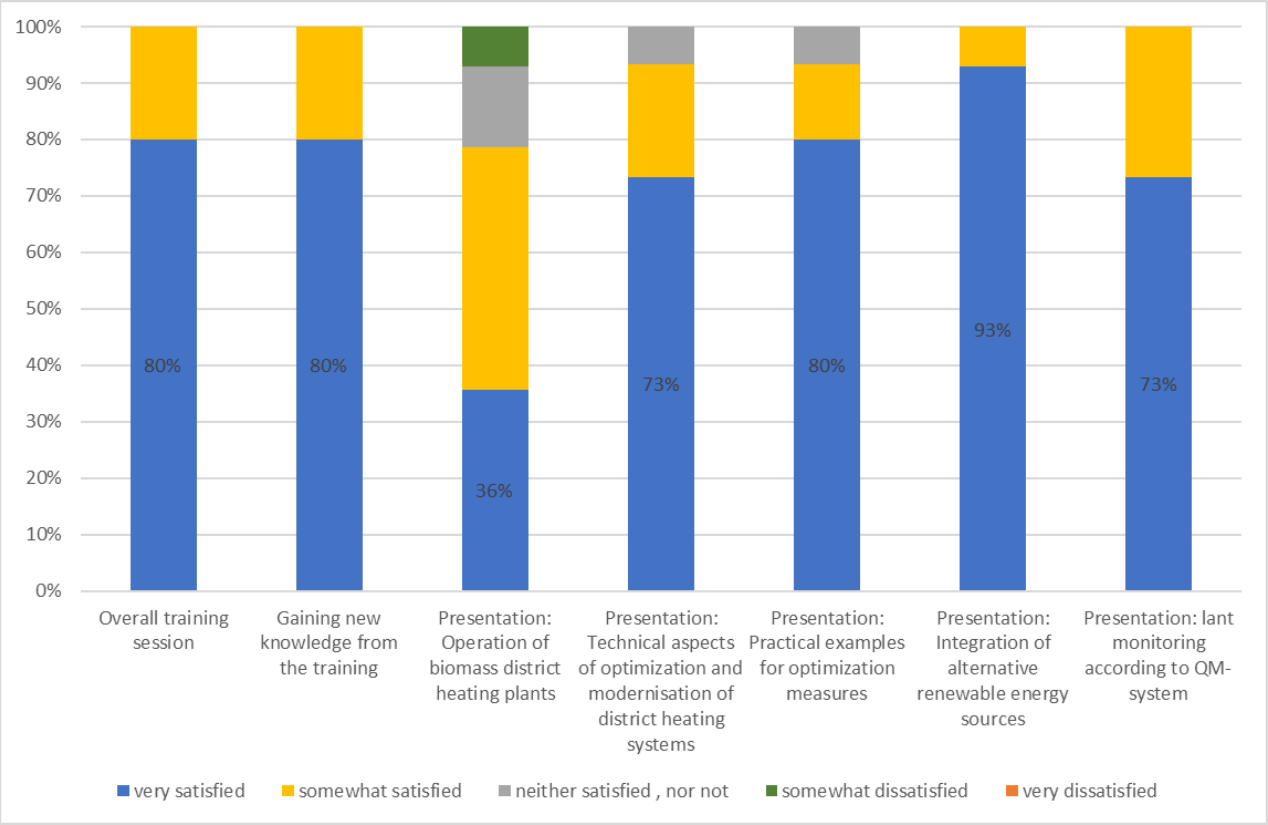
As feedback for this training an online evaluation questionnaire was organised with surveymonkey. The participants gave their feedbacks and the results are summarised in the following part.

After taking an online "group picture" as screenshot, the training was closed.

- Training evaluation

A total of 15 participants provided their inputs to the online evaluation questionnaire for TT4. The overall satisfaction with the training session is very high. On a scale of 1 to 5, participants have rated training with an average grade of 1,2, where 80 % of the participants rated training as very satisfactory and 20 % as somewhat satisfactory.

The satisfaction level of the training is summarised in the following graphic:



<u>Furthermore the participants, who filled out the questionnaire, answered to the questions below with the following listed comments</u>:

Which elements of the training were most interesting for your future work within the region?

- Innovative Technologies
- Alternative energy sources
- How to practically act on inefficient DH networks
- Practical examples for optimization measures
- Numbers, figures, KPIs, benchmarks, best practices
- KPIs and Banchmarks
- All
- Practical examples

Which topics would you prefer to be presented more detailed?

- Commercial issues
- Optimization of the process control
- Some more financial data about the presented projects/interventions would be interesting
- Everything was quite detailed.

- Critical aspects of DHN management
- KPIs and Banchmarks
- RES integration in DH networks

Which topics did you like best/least?

- Only the focus of optimazition in combination with biomass plants.
- great balance of practical examples and theoretical background!
- Alternative renewable energy sources
- Technical details
- KPIs and Banchmarks
- I liked all the presentations

2.5. Fifth train the trainer session

Summary

In the fifth and last training session, which was an add-on to the 4 previous training sessions, the "QM System Basics and Extension" were presented.

The training was held on the 23rd of November 2021 as an online training.

It was organised by EASt, AEE INTEC and Ambiente Italia, who hosted the participants at the online platform gotomeeting. 29 project partners and some German students, who joined as external stakeholders, participated the training session.

Heidrun Kögler from the Energy Agency of Styria moderated the training. After a short introduction, the first and the second presentation about the basics and the details of the QM system were held by Christian Ramerstorfer and Harald Schrammel from the AEE INTEC. First, they gave an overview about the basic idea of the QM-system, the basics of the QM guidelines and the QM planning handbook. After that, they went into more detail and explain the documents and checklists of the QM system and also talk about important milestones and design guidelines within the program.

After a 15-minute coffee break, the third presentation was again held by Harald Schrammel and Christian Ramerstorfer about "Integration of alternative renewable heat sources and the extension of the QM system". They talked about the application of the QM system for alternative renewable heat sources and about relevant contents of the new QM Planning Handbook and annexes to the planning guidelines.

The inputs for this presentation were developed as one part of the ENTRAIN project within the last months.

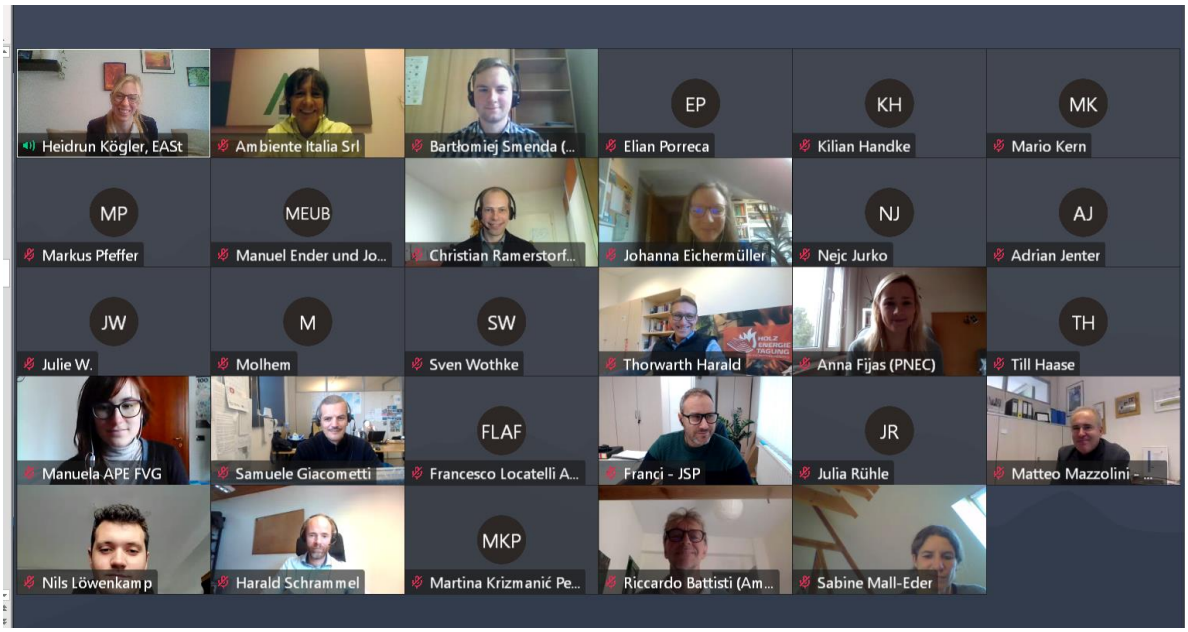
After that at 11:20 Harald Blazek was introduced as the last speaker of the training. He is a pioneer for absorption heat pumps and works in the company StepsAhead Energysytems and was also one of the founders of the company.

He talked about the basics of absorption heat pumps, applications and potentials and showed some best practice examples.

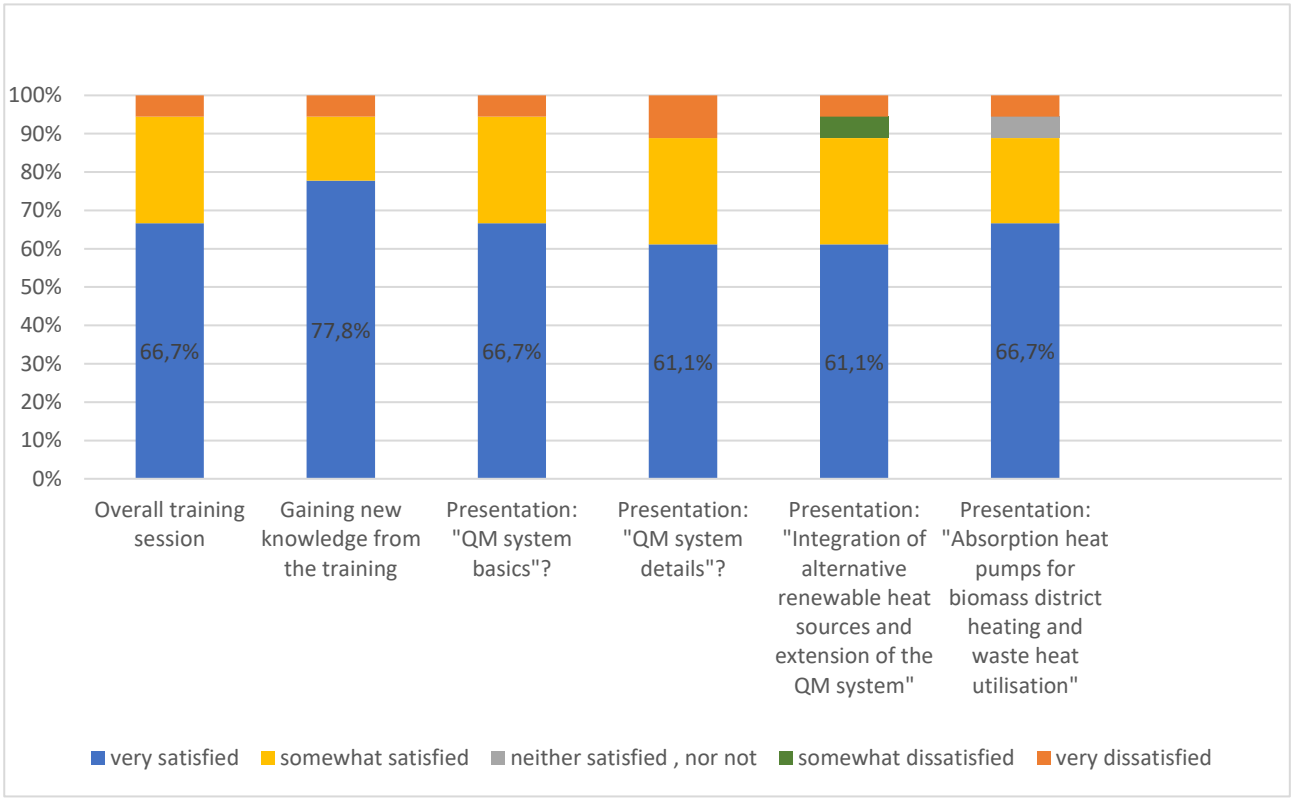
The 5th train the trainer session was closed after a final discussion round.

As feedback for this training an online evaluation questionnaire was organised with surveymonkey. The participants gave their feedbacks and the results are summarised in the following part.

After taking an online “group picture” as screenshot, the training was closed.



The satisfaction level of the training is summarised in the following graphic:



Furthermore the participants, who filled out the questionnaire, answered to the questions below with the following listed comments:

Which elements of the training were most interesting for your future work within the region?

- Practical benefits of the QM system
- Integration of alternative renewable heat sources and extension of the QM system
- QM
- Last presentation "Absorption heat pumps..."
- QM -extension
- Absorption pumps
- Absorption heat pumps

Which topics would you prefer to be presented more detailed?

- How other RES could be integrated in details in the QM

- Examples of small scale CHP, because all the examples presented were way above the feasible scale on our territory
- QM
- Absorption pumps
- Absorption heat pumps

Which topics did you like best/least?

- QM
- BEST: Very practical approach to the quality concept. LEAST: Not enough information about the synergy among RES
- Very interesting input on absorption heat pumps
- All presentations were very useful
- Everything

3. LOCAL TRAININGS IN CROATIA

3.1. First local training

Summary

Approx. 1 page including photos, tables or similar – short summary in English including key information about the training (longer description about the content (presentations) should be described ONLY in the version on national language)

The description should give an answer to the following questions

- *When was the meeting held?*
- *Where was the meeting held?*
- *Who were trainers and who were participants?*
- *What was the topic of the meeting?*
- *Any highlights, conclusions, achievements*

Due to the Covid-19 crisis and restrictions put in place around the world and to limit the spread of the virus, the training was organized online. REGEA organized first training event on 30th September 2020, as a virtual live event using the platform MS Teams. The event was supposed to be prepared in collaboration with the Wood Key project (Interreg IPA CBC), however, due to some delays in WoodKey project it was decided to go as a stand-alone event. 29 participants registered for the training, of which 16 participated. The trainings addressed the following target groups: Energy agencies, Municipalities, Faculty of Mechanical Engineering and Naval Architecture, Partners of WoodKey project, Development agencies, LEADER Network Croatia, Cities (national umbrella association of LAGs in Republic of Croatia), Hrvatske šume.

With a few welcoming words, the event was opened by Velimir Šegon, Deputy Managing Director at REGEA. He introduced the aims and objectives of ENTRAIN project. After the opening remarks Mr. Šegon held presentation *How to plan a small district heating system*. The following training agenda was implemented: project identification, project sustainability examples of good practice, involvement of stakeholders, situation in Croatia. Good examples of district heating systems in Germany and Austria are presented. One such example already exists in Croatia - the biomass district heating plant in the municipality of Pokupsko opened in November 2015. As a result of the presentation on the project to implement the biomass district heating plant in Pokupsko, the training participants became aware that such projects are truly possible in Croatia. Other district heating systems in Croatia mainly belong to so called 2nd generation of district heating, using hot water with supply temperatures well above 100°C.In addition, they received further information about the process of developing and implementing such a DH plant.

Another speaker was Mr. Mario Klobučar from Hrvatske šume, state owned company managing state owned forest and its business approach is based largely on a very traditional model of woody biomass sale to customers. Mr. Klobučar spoke about biomass logistic centers as the key to successful integration of the biomass supply chain for bioenergy production in Croatia. He announced the launch of a national strategic project for the construction of collection and logistics centers for biomass, collection stations for the purchase of biomass from citizens and legal entities

and the construction of biomass boilers and accordingly, the development of a national program for forest biomass energy use in the public sector. Hrvatske šume and REGEA are members of the Working Group established in January 2020 by the Croatian Ministry of Agriculture which has the main aim to develop the strategic vision and recommendations for the programming period 2021-2027 regarding forestry and woody biomass topics. The Working Group has in July 2020 produced the Sectorial analysis and status report on forestry in Croatia as an input to define the Strategic plan for Common Agriculture Policy of the Republic of Croatia.

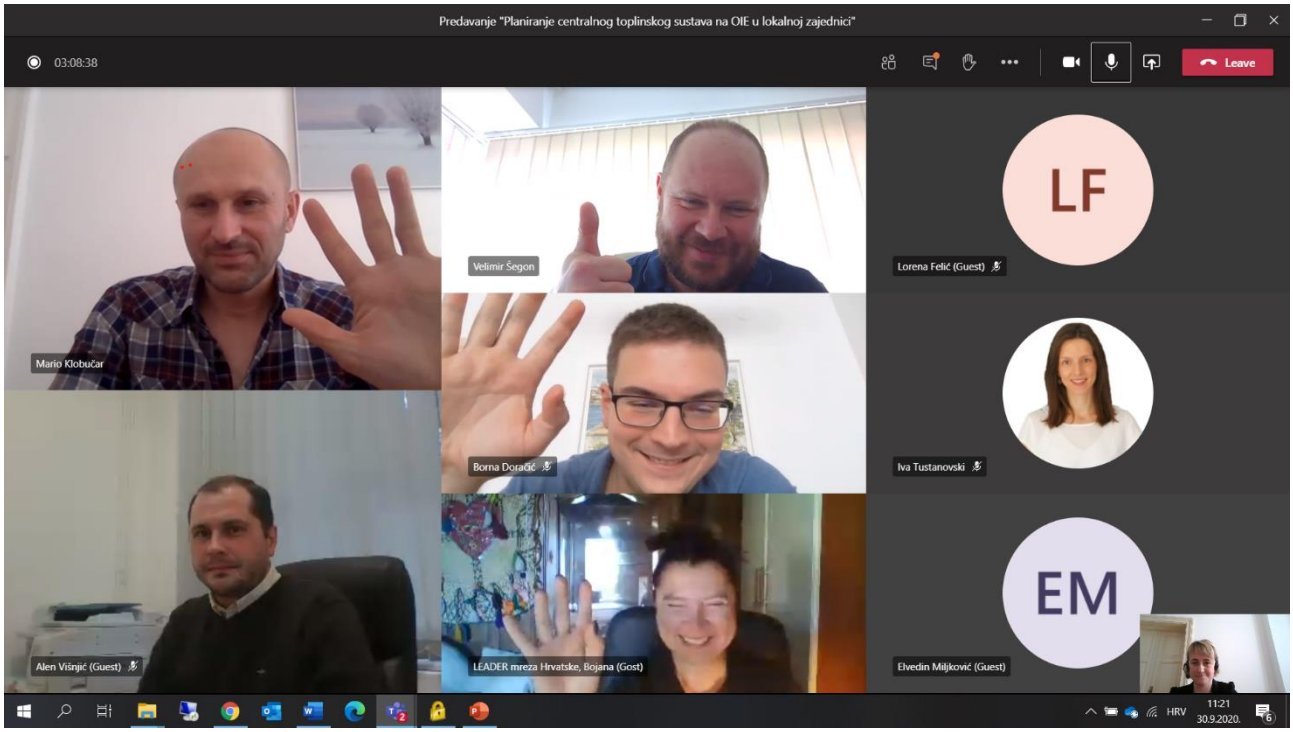


Photo from the online training via the Microsoft Teams platform

From the discussions among participants and speakers it can be concluded that a continuous communication is necessary between the national ENTRAIN partner and the stakeholders in the target region, involving as many stakeholders (for example: LAGs) as possible for the successful implementation of the planned projects. In addition to that, it was suggested to organize more public events, inviting technical experts and local administrators of the regions, in order to give evidence of best practices at local and national level and paying particular attention to the economic revenues provided by a biomass district heating plant. Another lesson learnt was, that education and awareness raising for citizens and key stakeholders, e.g., municipal employees, play a key role in fostering energy transition. Municipalities should take over a leading role. However, when developing their communication strategies on energy transition and energy efficiency measures it has to be considered that it takes a lot of time and efforts to change consumption patterns of citizens and to overcome the old habits and traditions.

Feedback of the participants was generally very positive. Participants together with speakers proved that local biomass-based value chains and small district heating network can bring economic benefits to the society, whilst granting nature protecting, if the different actors/stakeholders are willing to cooperate and work together.

The event was also used for getting feedback about their general interest to support and participate in the project activities, but also to raise awareness of the benefits of using renewables in district heating systems. Training participants were encouraged to attend all foreseen events and activities within the ENTRAIN project and also to become an active member of the local ENTRAIN working group.

Training evaluation

Approx. 1 page including photos, tables or similar

Aggregated analysis of the evaluation questionnaire results. - short summary of the participants feedback (more detailed analysis should be provided ONLY in the version on national language)

The evaluation of the training course was conducted based on the questionnaire prepared by AEE. REGEA translated it to the national language and adapted it to local conditions in Croatia, distributed it online to the participants. All 16 participants responded to the questionnaire. and REGEA compiled all results. The response rate on questionnaire was 100% of total number of participants. The evaluation questionnaire consisted of 7 assessment questions (on a scale of 1 to 5; where 1- I am not at all satisfied and 5- I am completely satisfied) and 3 open-ended questions. There were 10 questions in total. The evaluations were anonymous. The first group of questions was related to satisfaction with the content of the training. The average satisfaction ratings for each area are presented below in the table.

Evaluation on the training	Average satisfactory level	%				
		1	2	3	4	5
Presentation content	5	0	0	0	0	100
The usefulness of information	4,9	0	0	0	6,67	93,33
Quality of exposure	4,8	0	0	0	13,33	86,67
Meeting expectations	4,8	0	0	0	13,33	86,67
Update of your knowledge in this area	4,7	0	0	6,67	13,33	80
General impression	4,8	0	0	0	13,33	86,67
Evaluation of presented examples, solutions and applicability of advice	4,9	0	0	0	6,67	93,33

Satisfactory level of the training content

According to the responses given by the participants, they were completely satisfied with the organization and the training in general. The atmosphere among the participants was excellent and the moderation of the training course, the presentations and the information provided in the training course also received the maximum rating.

The participants assessed the presentation and explanation of the best practice examples as the most important part of the training course. Participants also emphasized, that public institutions should develop support initiatives for the development of local small-scale heating systems based on renewable resources, as can be seen in other countries with similar natural resources.At the end, most of them also expressed their willingness to act as multipliers and to talk about the

project to more people in the municipalities/cities and to other relevant stakeholders in order to spread the knowledge and ideas. As recommendations for future training events respondents stated that there is a need to learn more about financing risks and potential de-risking instruments, and information are needed also regarding detailed calculations of district heating systems.

The training event was very well received among the participants who have provided positive feedback collected in questionnaires, as well as provided during the discussions and to the speakers after the training course. The participant's feedback can be summarized as follows:

- Increasing the participation of representatives from the business sector, institutions and local self-governments as well as NGOs dealing with ecology and environment;
- Encouraging the development of renewable energy sources through the implementation of decentralized local development led by the local community (LEADER / CLLD);
- There is a huge need for dissemination activities among the local inhabitants;
- Sharing more practical examples and involving their financing and realization as well as their benefits and the period when they are expected to be realized;
- Include more information about cost-effectiveness of the project, with an emphasis on contracting with ESCOs.

Overall, the training can be defined as very successful taking in consideration the evaluation forms provided by the participants but also the good working atmosphere and the active involvement of all participants during the presentations and question and answer sessions.

3.2. Second local training

Summary

The 2nd training was organized online in partnership with Med Renewable Energy project, on February 4, 2021 year. The Interreg Med Renewable Energy Community promotes the integration of renewable energies in rural and island areas and has similar approach like Entrain project. North-West Croatia Regional Energy Agency (REGEA) is part of a project consortium of MED Renewable Energy. Mihaela Babić, representing the REGEA, made a welcome speech to the participants to the training, as host of the training. REGEA experts cover three fallowing topics on this training: Economics, Financing and Funding of Renewable District Heating, Sustainable Energy Action Plans (SEAPs) and Sustainable Urban Mobility Plans (SUMPs) are strategic plans that, although from different perspectives, share the same goal: reducing the emissions of pollutants and promoting sustainable urban development. The training agenda is displayed below.

Presentation	Presenters	Time and durations
Online registrations		9:50-10:00

1. Introduction the Sustainable Energy and Climate Action plan (SECAPs)	▪ Mihaela Babić, REGEA ▪ Tomislav Novosel, REGEA	▪ 10:00-10.30
2. Sustainable Urban Mobility Plans (SUMPs)	▪ Marko Čavar; REGEA ▪ Marko Zlonoga, REGEA	▪ 10:30 -11:00
3. Introduction to the Entrain Project - Economics, Financing and Funding of Renewable District Heating	▪ Martina Krizmanić Pećnik, REGEA	▪ 11:00 -11:45
▪ Questions	▪	▪ 11:45-12:15
▪ Conclusion	▪	▪ 12:15-12:30

Table 1: Agenda of the 2nd training

The objective of this training was to gather the relevant participants from local/regional governments (decision makers) and energy/development agencies and experts from the field of renewable energy sources together. The objectives of this training were as follows:

- To promote the Renewable Energy Project and Entrain project;
- To promote Sustainable Energy and Climate Action Plans;
- To promote Sustainable Urban Mobility Plans;
- To explain the participants the methodology how to develop the Sustainable Energy and Climate Action Plans;
- To explain the participants the methodology how to develop Sustainable Urban Mobility Plans;
- To raise awareness about global environmental challenges
- To build the capacities of the participants towards education for sustainable development
- To promote the integration of renewable energies in rural and island areas

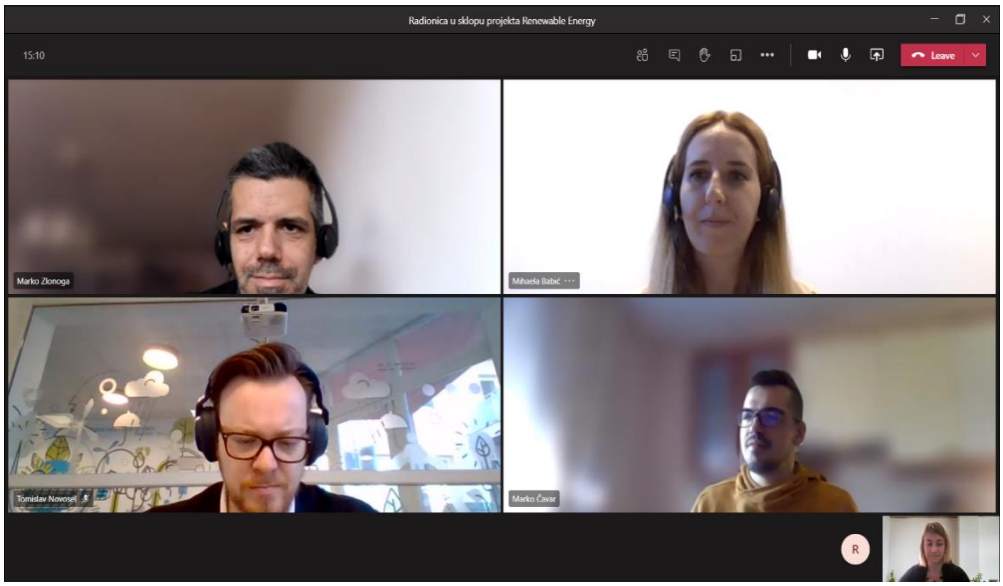
▪ Expected results of this training were as follows:

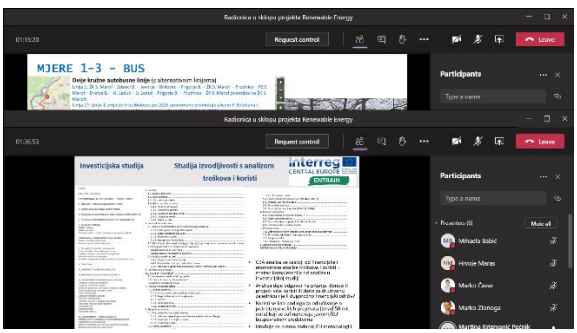
- Involve municipalities/cities in Republic of Croatia into the Entrain and Renewable Energy projects.

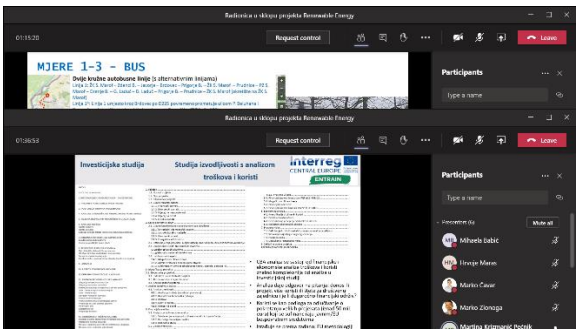
Martina Krizmanić Pećnik gave a presentation on the topic Economics, Financing and Funding of Renewable District Heating to present the local authorities with the main concept of the project and their potential contribution.

The main idea of this presentation was to give the participants an overview of the funding's of renewable district heating from Entrain countries, examples of Economic feasibility of solar thermal plants and bioenergy villages, model of renewable heat contracting from Austria and Germany being one of the most developed countries in the field of small modular renewable district heating projects. Furthermore, all of these systems use some kind of combination of biomass and solar thermal as a heat source, which is rather interesting for Croatia, due to high potentials for these sources in this target country. An interesting discussion followed about the potentials of small renewable district heating implementation in Croatia. There were identified several barriers that could hamper the implementation of pilot projects of small/big integrated renewable district heating networks in Croatia.

The questions raised at the training mainly included technical aspects, such as how to ensure the automatic feeding of biomass, costs of the installation and service and whether such a project can be realized in Croatia without governmental support or not. Other points of discussion were the perspectives for biomass fuel production and the details of the local framework analysis regarding the availability of biomass potential in the target regions. This was discussed with the background that the price of the woodchips increased in last few years, therefore the cost of heating with biomass is now even more expensive in Croatia than with natural gas.







Photos from the 2nd online training via the Microsoft Teams platform

At the end of the event Mihaela Babić, REGEA concluded the training session and thanked participants for their involvement in training.

Training evaluation

The evaluation of the training course was conducted based on the questionnaire prepared by AEE. REGEA translated it to the national language and adapted it to local conditions in Croatia. Questionnaires are sent to targeted respondents via email, beacuse of the tehnical issues with online system. The meeting was attended by 29 participants. The attendance consisted of a mix of local and regional authorities, energy institutes faculties researchers, energy agencies -

Municipality of Brdovec, City of Sveta Nedelja, City of Dugo Selo, City of Zabok; Zagreb County, North-West Croatia Regional Energy Agency (REGEA),Regional Energy Agency North, Međimurje Energy Agency Ltd (MENEA), Local Development Agency of the Town of Belišće and Dubrovnik-Neretva County Development Agency DUNEA, Energy Institute Hrvoje Požar; Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Society For Sustainable Development Design (DOOR). Twenty-seven evaluation forms were collected, however, not all participants filled answers for all questions. The evaluation comprised 6 items which took the form of open-ended questions and rating scale items using a 5-point rating scale, with scores from 1 to 5. Responses were gathered from 27 of the 29 participants which represented a response rate of 93.10%. The ensuing summary reflects the views of those 27 respondents on the training which is captured as 100% in this report. The average satisfaction ratings for each area are presented below in the table.

Evaluation on the training	Average satisfactory level	%				
		1	2	3	4	5
Presentation content	4,9	0	0	0	7,41	92,59
The usefulness of information	4,6	0	0	0	33,33	66,67
Quality of exposure	4,8	0	0	0	11,11	88,89
Meeting expectations	4,7	0	0	0	22,22	77,78
Update of your knowledge in this area	4,6	0	0	3,70	25,93	70,37
General impression	4,8	0	0	0	14,81	85,19
Evaluation of presented examples, solutions and applicability of advice	4,9	0	0	0	3,70	96,30

Satisfactory level of the training content

The aim of the evaluation was to assess the effectiveness of the training in deepening participants' knowledge of the economics, financing, and funding of renewable district heating, how to calculate economic feasibility study, how does funding work in ENTRAIN-countries and what are the benefits, what are possibilities for investment. In addition, it sought participants' views on the logistical arrangements and support provided for the training and identified weaknesses in the organization and conduct of the sessions. The latter was expected to provide feedback which would guide the organization of future trainings. The results of the evaluation were very good. The majority of participants declared that they were very satisfied with the training programme, presentations and information that they received. In general, the training was evaluated with 4,9 points. The main messages from the training were:

- The participants expressed that they have received new information and they will communicate the topic on DH on RES with other stakeholders in their communities.
- Without increasing consumption, any investment in a biomass-based system is absolutely unsustainable.
- The price of biomass should be defined in the long-term supply contract between the district heating owners and biomass suppliers.

- For the acceptability of the DH project on RES, it would be useful for a district heating operator to be obliged to purchase a part of the biomass from local forest owners or at least from the district heating user.
- Even a small percentage of investment subsidies should significantly reduce the return period and significantly improve the overall profitability of the project
- The lack of government subsidies for investing in a biomass production project (and other renewable energy sources) for the production of heat represents a significant obstacle to this type of project.

The participants were interested and very active in the discussions while a number of questions raised among the attendees. At the event, participants familiarized with the most important steps of initialization of pilot projects of renewable district heating networks, including potential institutional and business models that ensure the realization of the pilot project under the Croatian local conditions.

Asked about concrete ideas of how to apply what they have learnt, all the respondents answered affirmatively, which means, they have concrete ideas for the future on the implementation of DH-system in their municipalities. Thus, it can be assumed that the objectives of the training were achieved, and the training might have a substantial impact on the further promotion of renewable district heating networks in the target regions and beyond.

According to the feedback given by participants, the training was efficient and successful, and the participants were satisfied with the content and the expertise they received. However, next time such training has to be organized in a more workshop style in order to be more interactive and less lecture likely. For many participants, the bioenergy concept was new, thus, know how transfer was realized by the training especially for the stakeholders from local authorities. REGEA with the Entrain target regions will continue the dissemination and information sharing of the RES utilization in rural areas.

3.3. Third local training

Summary

The 3rd online training took part within the event of the Med Renewable Energy project, on February 24, 2021 year. The Interreg Med Renewable Energy Community promotes the integration of renewable energies in rural and island areas and has similar approach like Entrain project. North-West Croatia Regional Energy Agency (REGEA) is part of a project consortium of MED Renewable Energy. Mihaela Babić, representing the REGEA, made a welcome speech to the participants to the training, as host of the training. The event gathered 30 participants, representatives of local and regional authorities, sectoral agencies, universities, and interest groups. The programme and speakers of the training are given below.

Presentation	Presenters	Time and durations
Welcome speach	Mihaela Babić, REGEA	10:00-10.05
Project Entrain – Emmissions, Air Quality, Fuel and Ash Logistic	Martina Krizmanić Pećnik, REGEA	10:05-10:35

How to plan the energy transition, the PRISMI toolkit	Antun Pfeifer and Goran Krajačić, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb	10:35-11:50
Conclusion		11:50-12:00

Table 2: Agenda of the 3rd training

The presentation of REGEA expert Martina Krizmanić Pećnik provides information about properties of biomass ash, air quality, emissions and on fuel quality. She explained that biomass ash is produced by combustion of biomass for heat and power production. It is produced in boilers of different size and combustion technology. Whenever the production in small units and for district heating with mostly grate firing technology is practised since decades, the production in bigger units with fluidised bed combustion technology or converted coal boilers with dry bottom technology is increasing. Due to this, the total amount of biomass ash produced has increased. The utilisation of biomass ash is depending on their physical, chemical, and mineralogical properties. The properties are depending on biomass fuel and combustion technology. For coarse biomass ash the physical properties have predominantly to be considered for utilisation whereas for fine biomass ash the chemical composition is decisive. The range of biomass fuel is wide and covers e.g., fresh wood as also waste wood, agricultural residues like straw or manure. With the combustion technologies different feeding systems and operation conditions must be considered. This results in different shares of fine and coarse ash amount to be considered for logistics reasons.

During the presentation she pointed out the quality of forest wood is dependent upon the source of the biomass and the techniques employed for comminution, handling and storage. Consistent particle size as well as low contents of moisture, foliage as ah each improves the efficiency and economy of combustion. However, different boilers demand different fuel properties. The larger the plant, the more tolerant it usually is of random variations in fuel properties, mainly because large boilers employ the fluidized bed technology. Even so, knowledge of fuel properties and careful control of quality are essential to the operational reliability and efficient combustion of all boiler systems. The most important single quality factor is the moisture content of wood chips, as it affects the net calorific heating value, storage properties and transport costs of the fuel. Moisture content is thus a direct cost factor, and it is considered in the pricing of fuel. Excessive moisture content results in a price reduction, while a low one may bring a bonus.

The moisture content of fresh biomass must be reduced to obtain the fuel energy potential. Moisture is a critical fuel property, especially in wintertime, as the moisture during the autumn rains requires careful planning and timing of operations. During recent years, the procurement organisations have managed a better control of the moisture content, and truck loads of fuel with excessive 55-60% moisture content are no longer common. Nevertheless, energy is still lost because biomass arrives at the plant with an excess of moisture.

Oher presentation was made the representative of Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb presented the PRISMI toolkit, explaining how to gather the information needed for developing useful energy scenarios to plan the energy transition of an island or a rural municipality. Training session was covered following three tools:

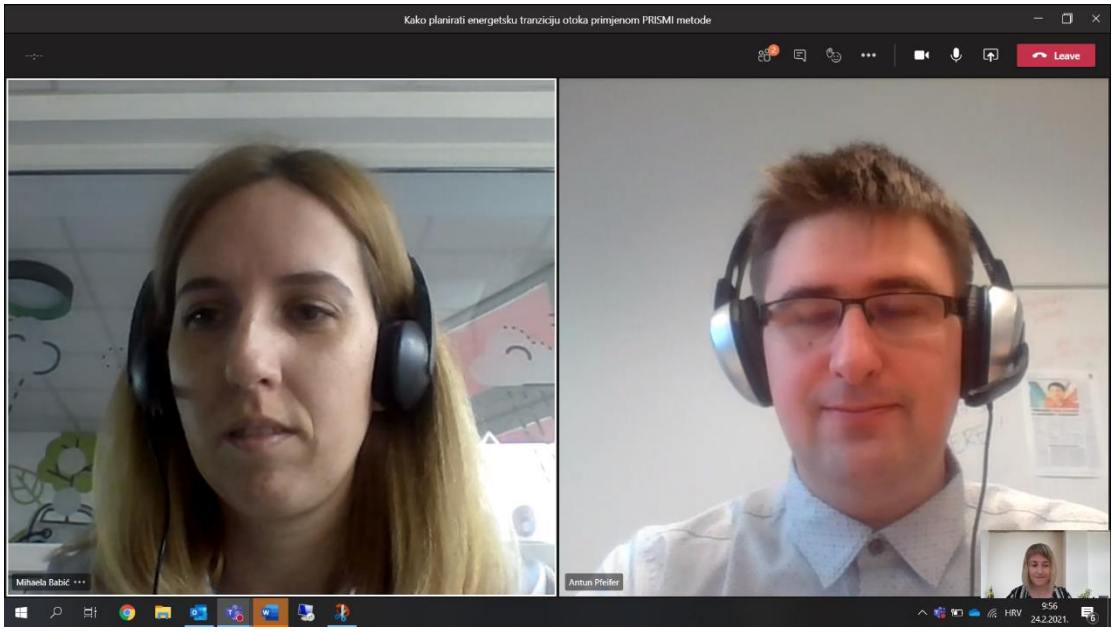
- Online free sources for RES potential assessment and power profiles;
- Wind Power Calculator;
- EnergyPLAN and

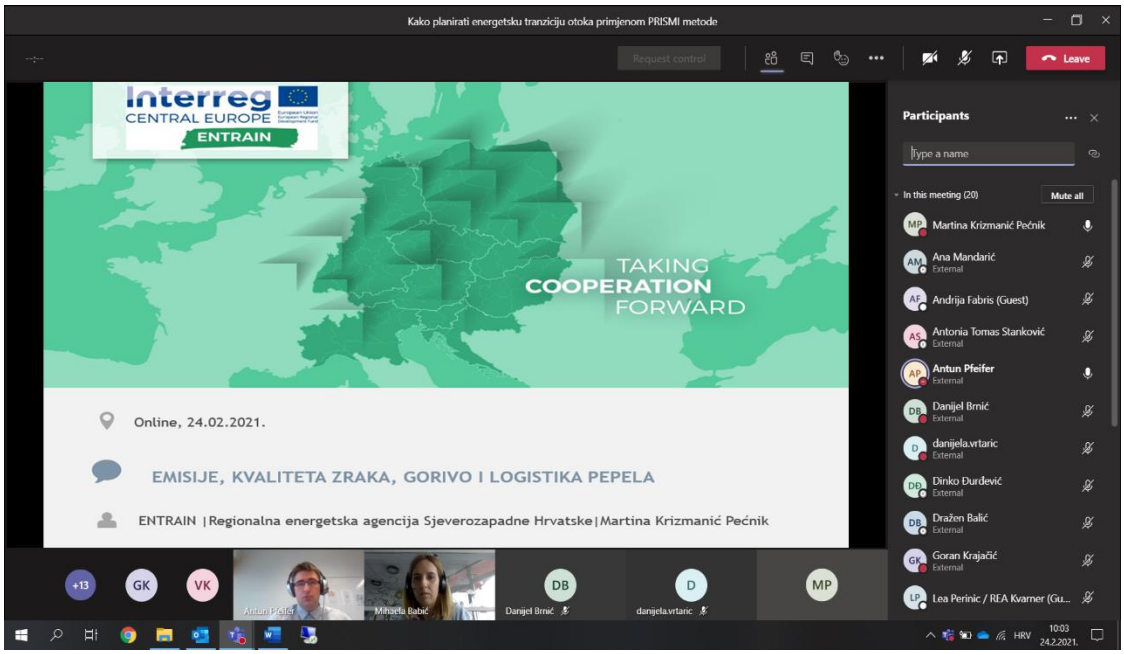
- Post-processing PRISMI tool.

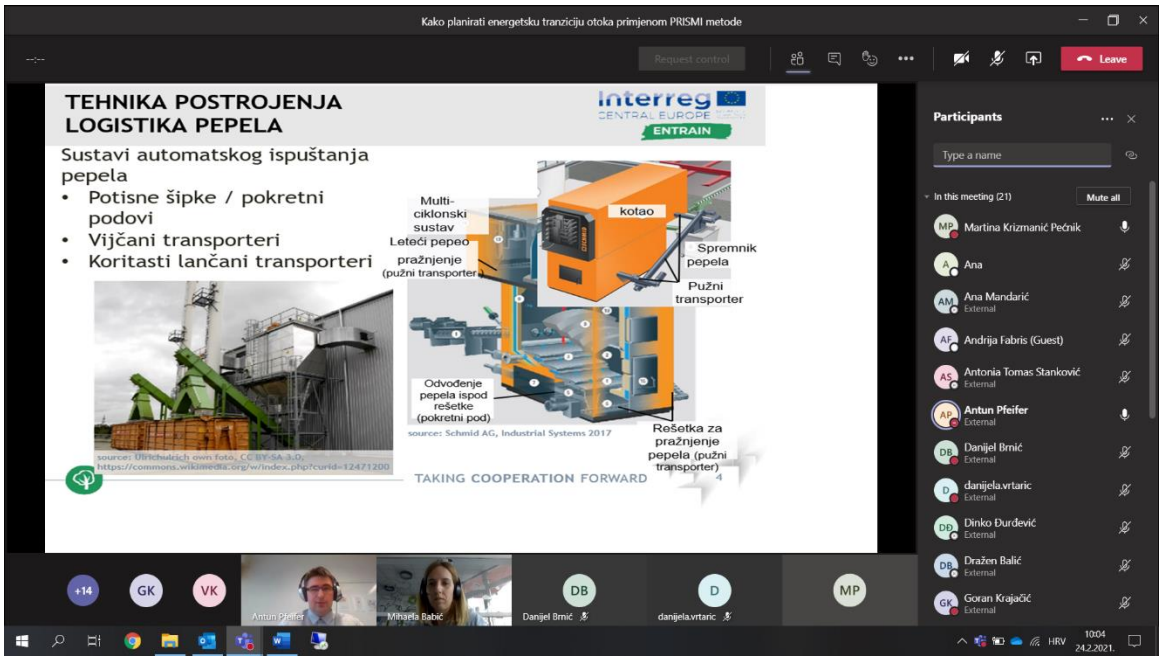
The objectives of this training were as follows:

- To promote the Renewable Energy Project and Entrain project;
- To emphasize quality criteria and quality assurance measures for wood energy sources;
- Understand which factors have the greatest impact on ash from wood combustion (- type of wood biomass, combustion technology, method of biomass collection - pollution etc., and wood biomass growth conditions;
- Promotion of the PRISMI toolkit (Online free sources for RES potential assessment and power profiles, Wind Power Calculator, EnergyPLAN and Post-processing PRISMI tool);
- To build the capacities of the participants towards education for sustainable development;
- To promote the integration of renewable energies in rural and island areas.

The very intensive discussions and the reflection at the end showed that the participants were satisfied with the training and the provided information. They especially liked what they learned about the quality criteria and quality assurance measures for wood energy sources and about the benefits that it brings to the local communities.







Photos from the 3rd online training via the Microsoft Teams platform

- Training evaluation

The evaluation of the training course was conducted based on the questionnaire prepared by AEE. REGEA translated it to the national language and adapted it to local conditions in Croatia, distributed it online to the participants. All 30 participants responded to the questionnaire. and REGEA compiled all results. The response rate on questionnaire was 100% of total number of participants. The evaluation questionnaire consisted of 7 assessment questions and 3 open-ended questions. There were 10 questions in total. The evaluations were anonymous. The evaluation criteria are built on a 1 to 5 scale, 1 standing for the minimum satisfaction and 5 for the maximum. The complete and detailed results are presented in a table below.

Evaluation on the training	Average satisfactory level	%				
		1	2	3	4	5
Presentation content	4,8	0	0	0	20	80
The usefulness of information	4,6	0	0	3,33	30	66,677
Quality of exposure	4,8	0	0	0	16,67	83,33
Meeting expectations	4,5	0	0	10	26,67	63,33
Update of your knowledge in this area	4,4	0	0	20	16,67	83,33
General impression	4,8	0	0	0	16,67	83,33
Evaluation of presented examples, solutions and applicability of advice	4,7	0	0	0	23,33	76,67

Satisfactory level of the training content

In general, the training got a very positive response. The respondents assessed all organizational issues and the presentations as very good. The weighted average varies between very satisfied and satisfied (4.8 to 4.4). None of the evaluated aspects of the training has been rated below 4.

Overall, the training course can be assessed as very successful, considering the evaluation results but also the working atmosphere and active involvement of all the participants during the presentations and question and answer sessions.

In addition, the participants of the Croatian training also assessed the lessons learnt and the further use of the received information and gained knowledge.

During the moderated discussion, the participants discussed possible what can be done with ash from plants on biomass, concluded that the current practice of disposing of wood biomass ash in Europe causes financial and material losses as well as additional environmental burden. Participants raised several questions such as: How do wood biomass ash can be used / transformed for other purposes; what the advantages for the producer / consumer in are ensuring the quality of fuel, how is ash disposed in Croatia, what role do biomass trade centers play in improving quality.

On the training course participants also discussed about characteristics of wood biomass ash may differ to some extent, which primarily depends on tree species, combustion technology, and location where the ash is collected. Wood biomass composition varies significantly depending on the type of biomass used, whereas its quality depends on the geographical location, variety in composition (tree species), climatic conditions in which the tree grows, and the harvesting technology used. Key quality criteria in describing wood chips are moisture/water content, homogeneity and size of wood chips, content of small particles, form of wood chips, their origin, ash content, impurities, and chemical composition. The quality of raw material entering as input into energy supply affects the output, i.e., the quality of wood is a very important factor that influences the wood biomass ash properties.

Participants highlighted the importance of utilising wood biomass ash which involves logistical challenges for owners and managers of wood biomass plants, as well as for companies that collect wood biomass ash from biomass plants. Proper storage undoubtedly implies preventing environmental pollution at storage sites, as well as storage that will not significantly change wood biomass ash properties before it is used as a secondary raw material. Methods of wood biomass ash storage, disposal and/or utilisation primarily depend on its chemical and physical properties, and so identification, quantification and subsequent characterisation of wood biomass ash can be regarded as the first and foremost step in identifying proper wood biomass ash management and utilisation.

A last comment affirmed that the training course was carried out on a very high level.

3.4. Fourth local training

- Summary

On Friday, July 16, 2021 in the municipality of Krapinske Toplice (Community Center), a representative of REGEA held the fourth training - Operation and optimization of district heating systems on renewable energy sources for local authorities, technicians and other market participants to whom knowledge was transferred and examples of good practice from other developed regions (Germany and Austria) regarding renewable energy district heating systems. The presentations included guidelines on district heating planning procedures, reference standards and quality criteria (Austrian Quality Management System QM Holzheizwerke).

The meeting presented and explained centralized thermal systems (CTS) technologies by which thermal energy is produced at one location and then distributed to consumers by hot water or hot water systems. By using such systems as opposed to local ones, lower production and operating system costs can be achieved. Newer generation CTSs are also easy to implement with RES systems such as wind or solar, and low-temperature heat sources can be used with heat pumps. As part of this paper, it is analyzed how CTSs with different technologies of production and storage of fast response thermal energy can be optimized so that in each hour thermal energy is obtained from exactly the source that is most profitable at that time.

The representative of REGEA explained several scenarios of cogeneration technologies on biomass and tanks, and the impact of reducing the network temperature was observed through the ratio of electrical and thermal power of the cogeneration plant. In the second scenario, an air-to-water heat pump was added, the COP of which also depends on the network temperature, so the influence of two factors was observed. Finally, in the third scenario, solar panels for heat

production were added to the configuration. In them, depending on the temperature of the network, the specific heat produced is the third factor whose influence was observed. In each of the scenarios, the decrease in network temperature led to a decrease in LCOH and RC, ie lower costs of heat production. It has also been shown that the introduction of heat pumps and solar panels further reduces LCOH, a fact that favors the incorporation of newer and cleaner heat generation technologies.

A heat storage tank has also shown its benefits when using newer technologies by taking over the heat they produced at a low price, which would be useless without the presence of the tank and would probably have to produce heat at a higher price later. In addition to all of the above, the Quality Management System (QM) for district heating systems on biomass is a project-oriented quality management system. This quality system ensures the implementation of the project with the involvement of various stakeholders according to high quality standards within the set deadlines. The quality management system for district heating systems on biomass is the result of international cooperation. It was developed by a quality management working group for district heating systems, consisting of experts from Switzerland, Austria, Germany and, more recently, Italy, who are constantly developing and improving this system. Advanced planning capacities and many years of experience will contribute to the implementation of new projects, said the REGEA representative.

Photos from the fourth training held live in the Community Center of the Municipality of Krapinske Toplice

The goal of planning and investing in a biomass heating plant is to enable a technically and economically feasible and environmentally friendly heat supply for end consumers. In recent years, a large number of district biomass district heating projects have been successfully implemented in Germany, Austria and Switzerland. However, in addition to a number of positive examples, there are always examples where design and construction were not successful and may notice some of these shortcomings: oversizing of the plant or distribution network, oversizing and incorrect design of wood fuel storage, faulty hydraulic and control solutions and inaccurate and unstable controls systems. Subsequent analysis of various projects showed that most mistakes could have been avoided by careful planning and application of knowledge and experience gained in the construction of similar plants. Quality and detailed planning together with the application of knowledge and experience from previous projects encourage technically and economically optimized solutions that lead to low emissions and efficient use of fuels from biomass.
All training participants had the opportunity to actively participate and contribute their opinions and ideas to future cooperation on the project.

The training concluded that by properly optimizing the period of use of various technologies and the introduction of cheaper and cleaner technologies, significant savings can be achieved in the production of thermal energy from CTS. It is necessary to use all technologies in the time period when it is most profitable for them. Also, if newer technologies are used, it is cost-effective to install a heat storage tank so that cheaply produced heat can be stored and used later. It is desirable to have the lowest possible network temperature, because in this situation the efficiency of almost all technologies increases, and costs are reduced.

- Training evaluation

In order to determine the satisfaction of users with the training, we applied a questionnaire. The questionnaire examines the satisfaction of the program in general, an assessment of which training activities they liked the most and the least, an assessment of how understandable the trainings were and how much such a program can help them in their current work. Users also assessed whether they would participate in similar trainings in the future, and gave their comments and suggestions.

The evaluation questionnaire consisted of 7 assessment questions (on a scale of 1 to 5; where 1- I am not at all satisfied and 5- I am completely satisfied) and 3 open-ended questions. A total of 30 evaluation questionnaires were collected from all participants who participated in the training. The evaluations were anonymous. The response rate to the questionnaire was 100% of the total number of participants. Detailed results are presented in the table below.

Evaluation on the training	Average satisfactory level	%				
		1	2	3	4	5
Presentation content	4,8	0	0	0	13,33	86,67
The usefulness of information	4,8	0	0	0	13,33	86,67
Quality of exposure	4,8	0	0	0	13,33	86,67
Meeting expectations	4,8	0	0	0	13,33	86,67
Update of your knowledge in this area	4,8	0	0	0	13,33	86,67
General impression	4,8	0	0	0	13,33	86,67
Evaluation of presented examples, solutions and applicability of advice	4,8	0	0	0	13,33	86,67

Quantitative data obtained from the survey questionnaire indicate a strong satisfaction of participants with all components of the workshops: general satisfaction, preparedness and expertise of the lecturers and the importance and usefulness of the topics. Respondents rated all organizational issues and presentations with a very high score of 4.8. None of the evaluated aspects of training was rated below 4.

During the moderated discussion, participants discussed how the transition to obtaining energy from renewable sources will play a major role in meeting EU targets. This process will also reduce the price of energy, because despite the fact that the initial investments are higher, exploitation is cheaper, which will lead to a fall in prices in a liberalized market. Centralized heating systems will also play an important role, especially since it is very easy to implement RES in CTSs of newer generations, which provide low-temperature heat. CTSs combined with heat pumps will play a major role in future energy systems. In times when there is a large production of electricity from renewable sources, the price will be very low, which will potentially make heat pumps very profitable. These technologies as well as the storage technologies of the thermal energy are in increasing development.

Participants stressed the importance of the process of modernization of district heating systems, which is sophisticated and time-consuming, time-consuming and requires large investments. Special attention should be paid to modernization measures in buildings connected to the system,

for example in the introduction of low-temperature operation. Such processes require direct cooperation with housing owners and consumers themselves.

Overall, the participants are extremely satisfied with the training, especially the way of conducting training and lecturers, and their ways of communicating and establishing relationships with participants. From all the above, it can be concluded that there is a need to continue training of this type.

4. LOCAL TRAININGS IN GERMANY

4.1. First local training

Summary

The first local training for the target region Neckar-Alb was held on Friday, 21. Feb 2020 (10 - 12 am) in Mössingen, hosted by PPn°8 RVNA.

Participants:

Representatives of the climate and energy agencies from the three 3 districts within the Neckar-Alb region:

- Agentur für Klimaschutz Kreis Tübingen (Daniel Bearzatto, Diana Taubert)
- Klimaschutzagentur Landkreis Reutlingen (Abrahim Dold)
- Energieagentur Zollernalb (Matthias Schlagenhauf)

ENTRAIN-team Neckar-Alb region:

- RVNA (Dirk Seidemann, Joachim Zacher, Sabine Mall-Eder, Dieter Neth)
- Steinbeis Forschungsinstitut Solites (Patrick Geiger)
- Holzenergie-Fachverband BW (Johanna Eichermüller)

Highlights:

- ENTRAIN Neckar-Alb exchanges ideas and knowledge with key players in the regional climate and energy development
- Needs, contents and target groups for at least 2 of the following trainings have been identified
- Covered topics:
    - Methodology to collect data on heat supply
    - Information materials and public relations
    - Market climate for (renewable) district heating

Aiming to create common ground for an exchange of experiences between participants, the first training was kind of special: To ensure a sustainable cooperation between equal partners, no classical roles of “trainer” and “trainee” had been defined. In the atmosphere of an expert workshop, information could be exchanged mutually between all participants. Each institution brings specific knowledge and know-how in different fields (spatial planning, plant/systems engineering with a focus in solar and wood energy, public relations, financing, etc.), joining forces to increase renewable heat supply in the region. The first point on the agenda was a presentation of the main competencies within ENTRAIN Neckar-Alb:

- Identify and address communities with high potential for RES district heating solutions
- Offering initial advice to DH projects
- Ensure quality of DH systems with a focus on biogenic heat generation
- Support the introduction of the obligatory heat planning (expected for 2021 in BW)
- Networking between stakeholders and experts
- Provision of high-quality information, public outreach

The analysis of heat demand and potential for renewable heat (grids) has already progressed in the region. The meeting enabled good professional exchange in terms of methodological competence for data collection and dealing with data protection issues. The existing database can be expanded usefully (GIS-based analysis).

The climate agencies can check existing data and expand them if necessary. The goal is an overview of existing supply networks (natural gas and heat) as well as “nuclei” for DH projects. It is important to define a cut-off criterion for the analysis of DH grids. Participants agreed on a limit of > 10 house connections as this can also be found within the funding conditions of the federal state of BW. Depending on the network operator, information about the gas network is more or less accessible to the agencies. There is a good level of knowledge with regard to places with an existing local heating supply or a lack of wired supply ("oil villages"). To ensure data protection, the representation level in the form of streets / quarters, not at the level of individual connections, should be selected as the resolution level.

On the topic of knowledge transfer from / to the region, the development of information and training documents as well as the identification of two municipalities per district were discussed, which offer themselves as a "pilot area" for project support. Information materials and training documents are already available, however they need to be consolidated, adapted and updated. For example, Mr. Bearzatto reported on the creation of a “Guide for municipal heat planning” by KEA BW. According to the current state of knowledge, the information is aimed at both the large municipalities and smaller municipalities. In this context, Mr. Schlagenhauf reported from the municipality of Bitz in the Zollernalb district, which could be a "pilot municipality".

Two very concrete points were identified as recommendations for future trainings:

1) Capacity building at climate agencies for planning and projecting local heating networks
2) Showing development opportunities for municipalities and possible business models for municipal utilities

All participants rated the training positively. Among other things, the informal but concentrated atmosphere as well as the good organization and preparation by the RVNA contributed to the success and enabled a productive exchange of experiences. The ENTRAIN team in the region regards networking and cooperation with existing institutions as particularly valuable.

The needs of specific target groups as well as capacities and strengths of possible trainers could be identified as a base for further trainings. They will be planned, organized and carried out in the form of tailor-made workshops and excursions.

4.2. Second, third and fourth local training

The employees of the energy agencies of the three districts in the target region are the most important target group for the local trainings as multipliers. During the first LT1, they expressed the wish to conduct the subsequent trainings in a more compact form than previously planned. In order to achieve the best results for the region and to increase the motivation of the participants, Local Trainings 2, 3 and 4 were combined into a compact training unit and planned as one connected unit. The topics of trainings 2-4 were to be integrated in the best possible way. Since the detailed planning for trainings 3 and 4 was still pending at the time, the overarching topics were taken up. By integrating regional experts as additional speakers, all desired and required topics could be covered and the quality of the training and its content could be increased. The changes in the procedure with the local trainings were coordinated in advance with the work package managers, the lead partner Ambiente Italia and the project managers of Interreg.

Highlights:

- Knowledge transfer on a very high and appealing level
- Exchange between ENTRAIN target region Neckar-Alb and other regions from Baden-Wuerttemberg
- Incentives and impulses for the expansion of renewable heating networks in rural areas

- Summary

In the first approach, LT 2-4 were planned as a three-day face-to-face event in November 2020 in Rottenburg. Since the risk situation in the context of the Corona pandemic and the associated security precautions had again become significantly more stringent immediately before the planned event, it was not possible to hold it as an in-person event. As a result, the program planning was adjusted and a five-day web training (half a day each) was offered in February 2021 for the interested participants from the Neckar-Alb region.

Program

The Goal of the training program was to convey as many relevant topics as possible regarding the planning and project development of renewable and energy-efficient heating networks in the rural area. To this end, the program is divided into several key topics:

- Basics
- Project initiation
- Technical aspects
- Regulatory requirements.

Within the **basics,** the necessity of renewable and energy-efficient district heating in rural areas was emphasized and placed in the context of the overarching EU climate protection goals. In addition, it was shown how the Neckar-Alb region supports the expansion of district heating and promotes them with planning law means. With the presentation of the quality management system for biomass heating plants “QM Holzheizwerke”, another important element for the high-quality implementation and successful operation of district heating was introduced.

The next important step towards a renewable district heating is project initiation. The focus in this context was on local activities, how inhabitants can be motivated and convinced, and how the processes from the first idea to the groundbreaking ceremony look like. This lesson was rounded off with an experience report from the German model region “Rhein-Hunsrück-Kreis” in Rhineland-Palatinate.

In the t**echnical part,** the main technical engineering boundary conditions for the actual district heating and for heat generation were dealt with. The focus in district heating was not only on the design of the pipelines but also on the connections in the building and on economic efficiency. In the case of the heat generation units, wood chips, large-scale heat pumps and solar thermal energy and their planning-relevant aspects were dealt with in detail.

In the field of wood chips, the focus was on the one hand on the actual technology of the heating plant (design of wood chip boiler, flue gas cleaning), and on the other hand on the design of the entire heating plant (design of the wood chip storage, transport, ash utilization).

For large-scale heat pumps and solar thermal energy, possible areas of application, but also supply limits have been shown as well as the integration into existing and new infrastructure.

For both, heat generation and district heating, different operating procedures and optimization potential during operation were highlighted in addition to the technical focus. This is an essential element to ensure an energy efficient, low-emission and economical operation.

In the concluding block of topics on the **regulatory requirements**, different legal forms for operators of the grid and/or heat generation as well as ways and means of suitable financing for district heating projects were presented. The web training ended with an insight into the procedure for the development of land potentials for solar thermal plants and a complete overview of the diverse funding structure in Germany and especially in Baden-Wuerttemberg.

In the selection of external speakers, care was taken to ensure that the wide range of topics could be covered and that there was a high level of practical relevance.

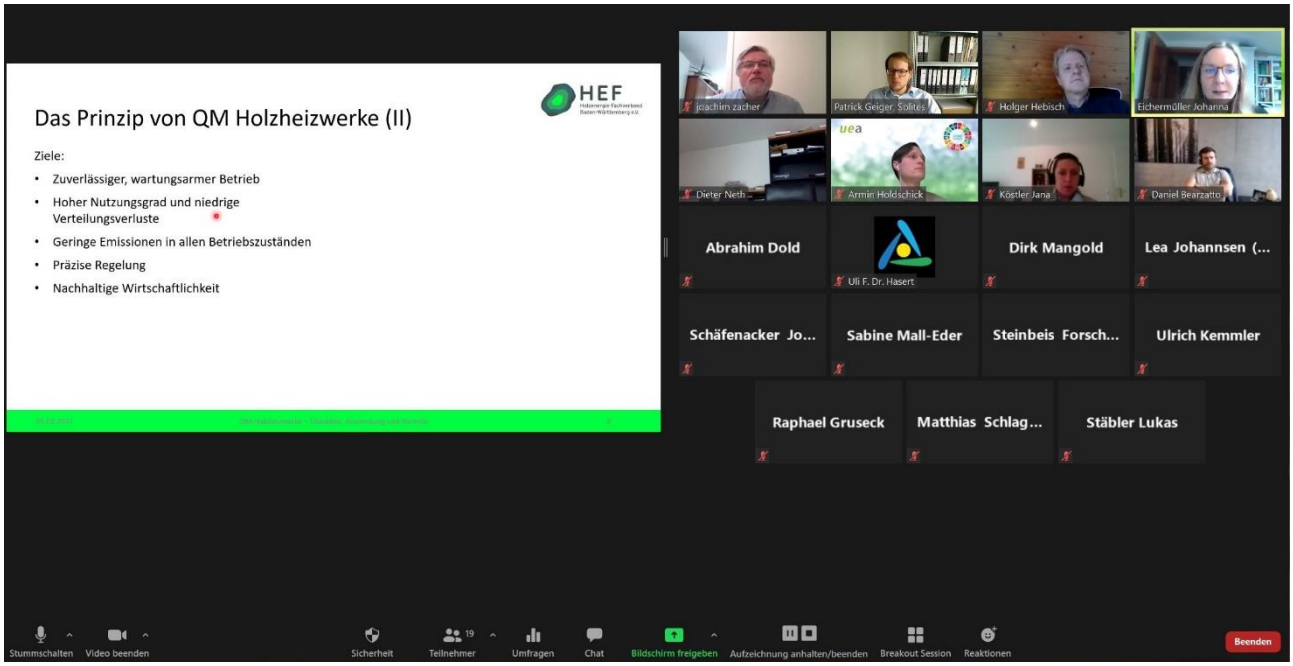
Figure 1: program of the five half day local trainings

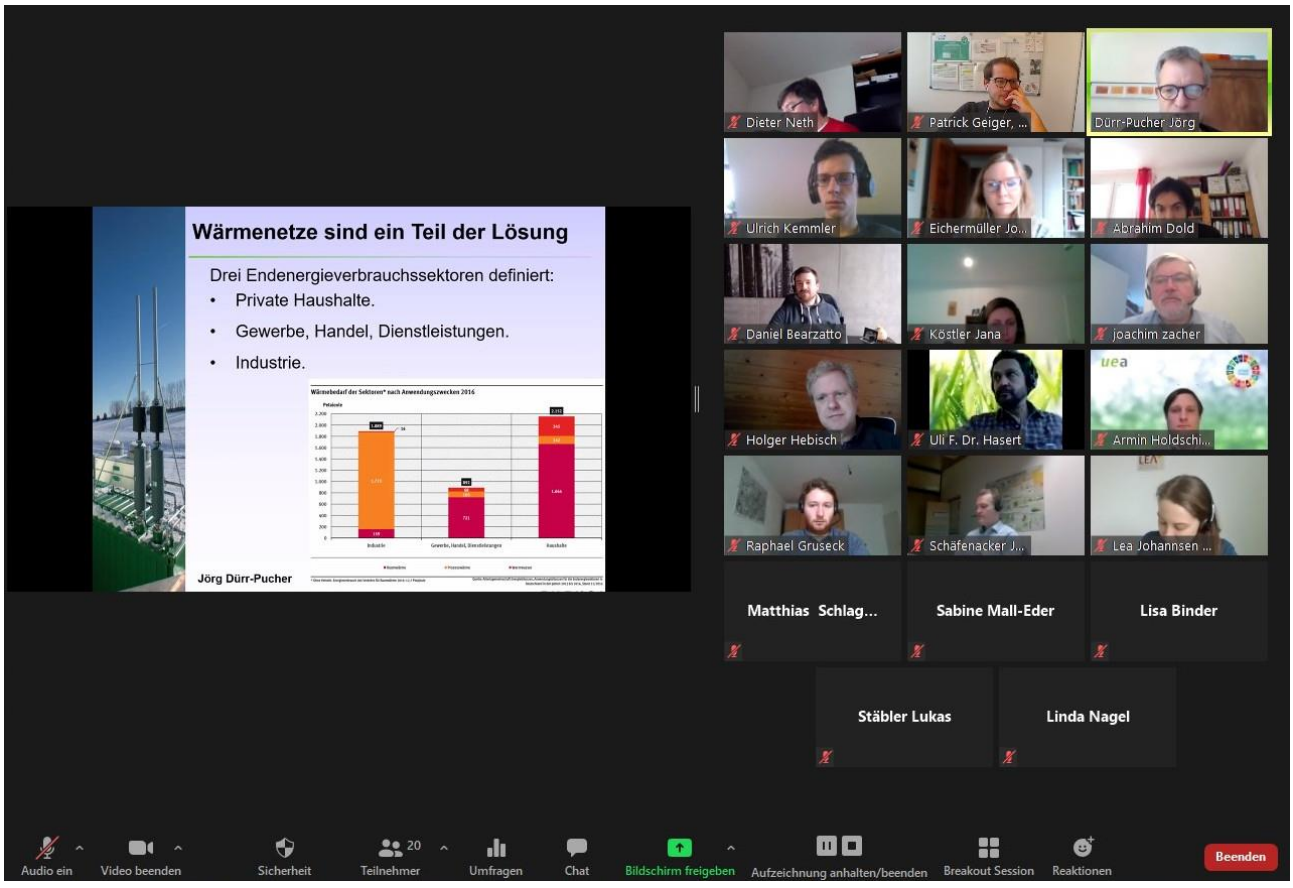
- Participants

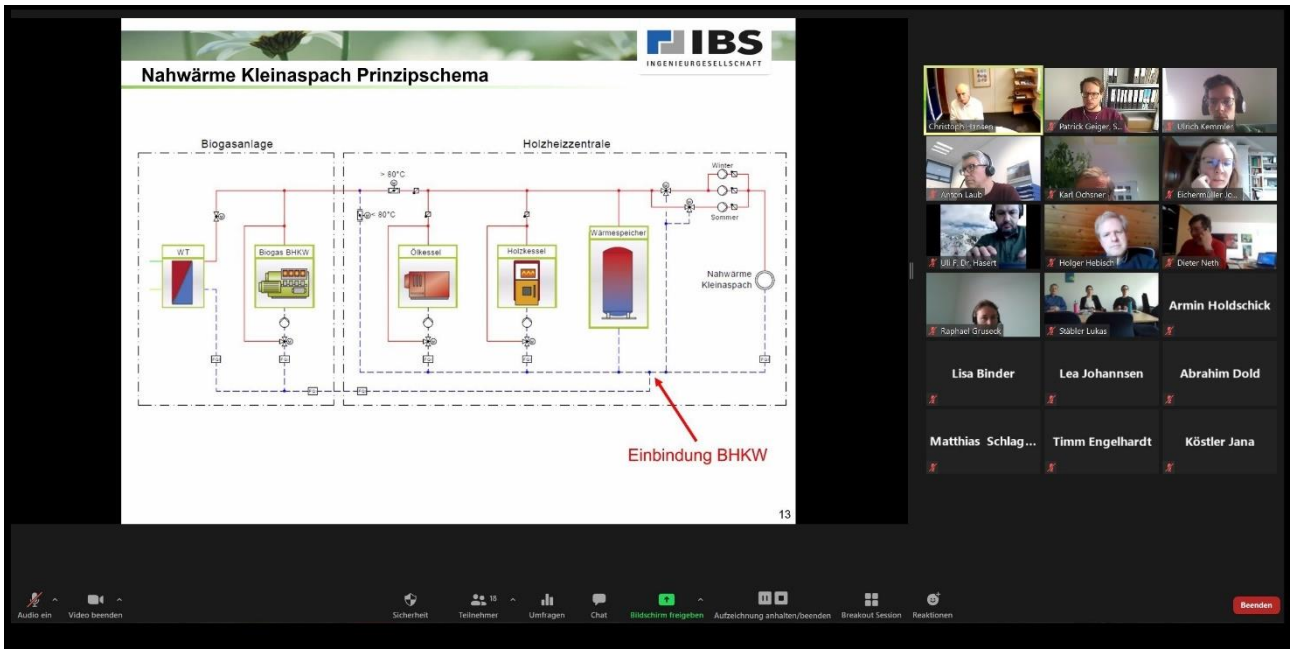
The circle of participants focused on actors from the target region Neckar-Alb, but was also extended to interested persons from all over Baden-Wuerttemberg. One advantage of this is a wider exchange between the actors and a further spreading and publicizing of the activities of the ENTRAIN project. A total of 18 people from different regions took part in the training.

Nr.	Name	Vorname	Firma
1	Schlagenhauf	Matthias	Energieagentur Zollernalb gGmbH
2	Schäfenacker	Jochen	Energieagentur Zollernalb gGmbH
3	Stäbler	Lukas	Energieagentur Zollernalb gGmbH
4	Bearzatto	Daniel	Agentur für Klimaschutz Kreis Tübingen gGmbH
5	Köstler	Jana	Agentur für Klimaschutz Kreis Tübingen gGmbH
6	Kemmler	Ulrich	Agentur für Klimaschutz Kreis Tübingen gGmbH
7	Hebisch	Holder	KEA Klimaschutz- und Energieagentur Baden-Württemberg GmbH
8	Dold	Abrahim	KlimaschutzAgentur Landkreis Reutlingen gGmbH
9	Zacher	Joachim	Regionalverband Neckar-Alb
10	Neth	Dieter	Regionalverband Neckar-Alb
11	Hasert	Uli	KlimaschutzAgentur Landkreis Reutlingen gGmbH
12	Holdschick	Armin	Umwelt- und EnergieAgentur Kreis Karlsruhe GmbH
13	Johannsen	Lea	Energieagentur Kreis Ludwigsburg LEA e. V.
14	Gruseck	Raphael	Energieagentur Kreis Ludwigsburg LEA e. V.
15	Nagel	Linda	Energieagentur Zollernalb gGmbH
16	Laub	Anton	B.E.N BiomasseEnergieNetzwerk eG
17	Binder	Lisa	Energieagentur Landkreis Göppingen gGmbH
18	Engelhardt	Timm	Energieagentur Landkreis Göppingen gGmbH

Impressions of the webinar







- Training evaluation

The feedback from the participants was very positive throughout the five-day webinar. The overall assessment, the evaluation of the quality as well as the selection of topics were rate as „Excellent“ or „Very good” by most participants. In addition, the discussion atmosphere and the need for joint work in the network as well as the very high practical relevance were positively emphasized. This is underlined by a very high average rating of all speakers and shows the high quality, variety and selection as well as practical relevance of the presentations. In most cases the set expectations of the speakers could be fulfilled to a large extent. There is potential for improvement in the organization of break times and the important networking between the participants during the break, although this can still be classified as rather difficult in an online event.

Overall, it´s shown that the workshop fulfilled the expectations of the participants with a very high practical relevance, a positive discussion atmosphere and high-quality, in-depth content.

4.3. Third local training

See local training #2

4.4. Fourth local training

See local training #2

4.5. Conclusions local trainings Germany

Adapting the training to the individual needs of the target region and the corresponding target groups, in deviation from the originally planned procedure, had a positive effect on motivation and participation. In addition, a pleasant and constructive training and discussion atmosphere evolved from the cross-regional field of participants, which promoted not only joint learning but also an overarching exchange. With the selection of individual topics and corresponding, practice-oriented speakers, knowledge transfer of very high quality could be provided within the ENTRAIN project, also beyond the target region.

Overall, all five topics envisaged in the work plan (project development, financing and profitability, operation and optimization, fuel/ash logistics and emissions, and quality management for wood-fired heating plants) could be covered and disseminated to an appropriate extent within the framework of the local trainings conducted in the Neckar-Alb target region.

5. LOCAL TRAININGS IN ITALY

5.1. First local training

Summary

The first local training in Friuli Venezia Giulia took place on May 26th and 27th from 3 to 5 pm 2020 and was provided online through Google Meet due to the health emergency.

It was split into two different sessions according to different types of stakeholders involved: the first for the RSAG members and the second for political decision makers and municipalities of the Autonomous Region Friuli Venezia Giulia.

Trainers:

Chiara Lazzari (Ambiente Italia)
Samuele Giacometti (APE FVG)
Riccardo Battisti (Ambiente Italia)

Partecipants (Day 1):

ENTITY	REFERENCE PERSON	CATEGORY
Direzione Foreste Regione Autonoma Friuli Venezia Giulia	Rinaldo Comino	ADMINISTRATION
QUADRA FVG-FROLING	Fabrizio Passone	TECHNOLOGY SELLER
Comune di Arta Terme	Vanessa Gressani	TECHNICIAN
Direzione Energia Regione Friuli Venezia Giulia	Sebastiano Cacciaguerra	ADMINISTRATION
AIEL - Associazione Italiana Energie Agroforestali	Andrea Argnani	ASSOCIATION
ESCOMONTAGNA	Sergio Buzzi	ESCO
LA FORESTA Soc. Coop.	Giorgio Talachini	FORESTRY ENTERPRISE
CIGLIANI PRIMO S.n.c.	Cigliani Mirco	FORESTRY ENTERPRISE
ARPA FVG	Francesca Bonemazzi	AIR QUALITY DEP.
ARPA FVG	Stefania Del Frate	AIR QUALITY DEP.
VERIO SOLARI	Verio Solari	EXPERT
RELEN	Franco Petrigh	Plant + Wood chip logistic platform
AMBIENTE ITALIA	Riccardo Battisti	LP
AMBIENTE ITALIA	Chiara Lazzari	LP
E-LASER S.r.l.	Andrea Barilotti	TERRITORIAL INFORMATION SYSTEMS
APE FVG	Manuela Ortis	PP
APE FVG	Matteo Mazzolini	PP
APE FVG	Samuele Giacometti	PP
SCMITH	Matteo Pippa	TECHNOLOGY SELLER
SECAB	Alberto Orsaria	ENERGY PRODUCER
UNIVERSITA' DI UDINE	Patrizia Simeoni	UNIVERSITY

Participants (Day 2)

MUNICIPALITY	REFERENCE PERSON	ROLE
TOLMEZZO	Valentino Pillinini	TECHNICIAN
AMPEZZO	Michele Benedetti	MAYOR
BRUGNERA	Daniele Zanette	CITY COUNCILLOR (ENERGY)
GRADO	Cristiano Gillardi	TECHNICIAN
MARTIGNACCO	Giancarlo Saro	CITY COUNCILLOR
MARTIGNACCO	Merluzzi Giulio	CITY COUNCILLOR (ENVIRONMENT)
PORDENONE	Cristina Amirante	CITY COUNCILLOR
RAGOGNA	Marco Yuri	CITY COUNCILLOR
SAN GIORGIO DI NOGARO	Enzo Bertoldi	VICE MAYOR
TERZO D'AQUILEIA	Filippo Ceccotto	TECHNICIAN
VARMO	Andrea Gobbato	TECHNICIAN
VIVARO	Fernando Petruccelli	CITY COUNCILLOR
GAL TORRE NATISONE	Stefano Carta	TECHNICIAN

The aim of this training session was to continue with the involvement and training of the regional RSAG group and to introduce the ENTRAIN project to political decision makers and municipalities of the Autonomous Region Friuli Venezia Giulia.

One week before the appointment the participants received by email the training materials (slides and documents) that were to be presented at the online meeting. This gave them the opportunity to consult the materials and topics of discussion before the training and take note of interesting points and topics worth deepening into.

List of presentations shown during the web meeting:

- Interreg Central Europe ENTRAIN project's presentation *(Chiara Lazzari, Ambiente Italia)*
- APE FVG role in the project *(Samuele Giacometti, APE FVG)* &

  How to conduct an effective pre-feasibility study of a small RES DH network *(Samuele Giacometti, APE FVG)*

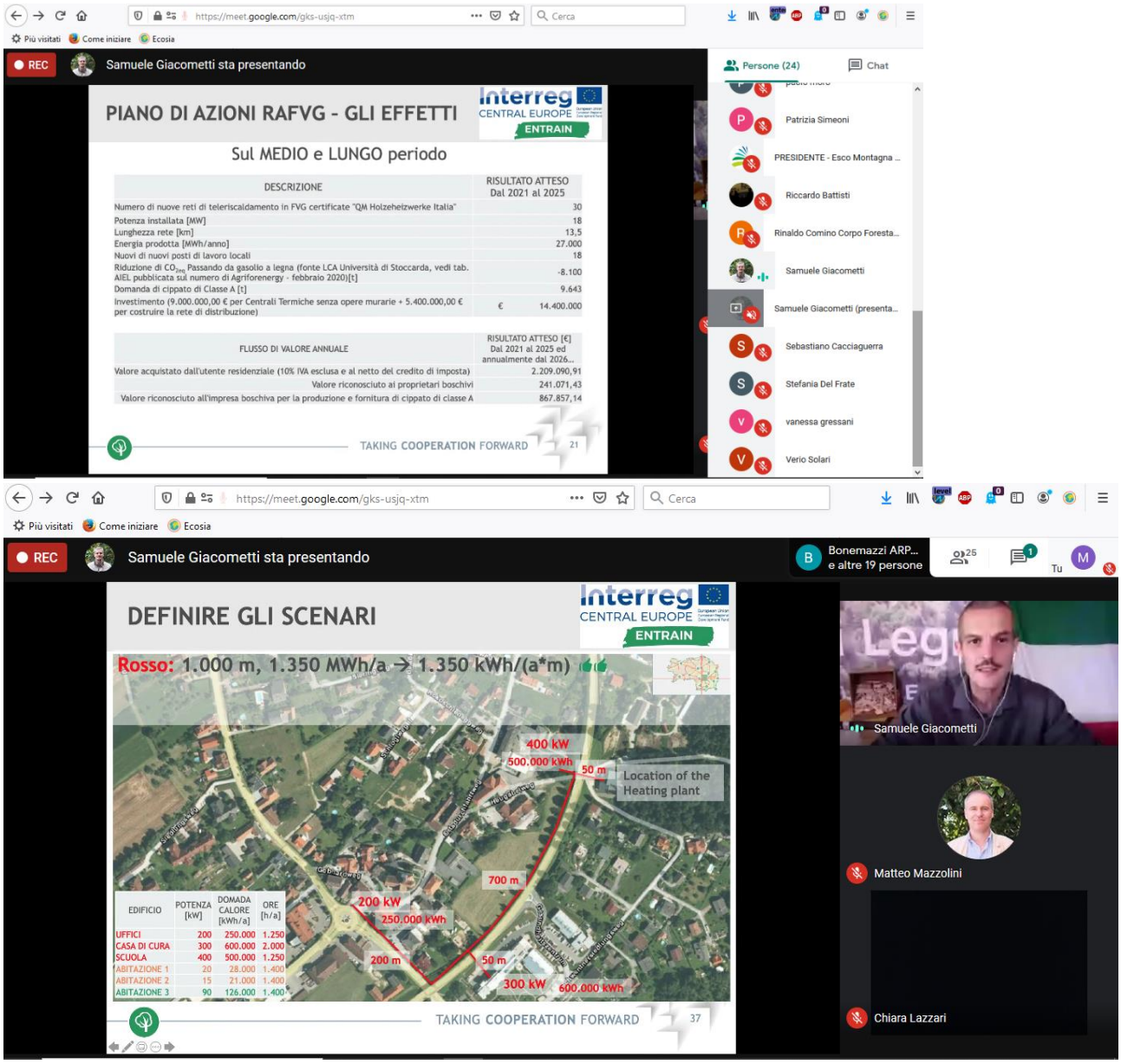
  ➔ *VIDEO https://youtu.be/crsvMxRmc6s*
- Evaluation on matching solar-thermal and wood biomass *(Riccardo Battisti, Ambiente Italia)*

  ➔ *VIDEO https://youtu.be/BduwSXcBwas*

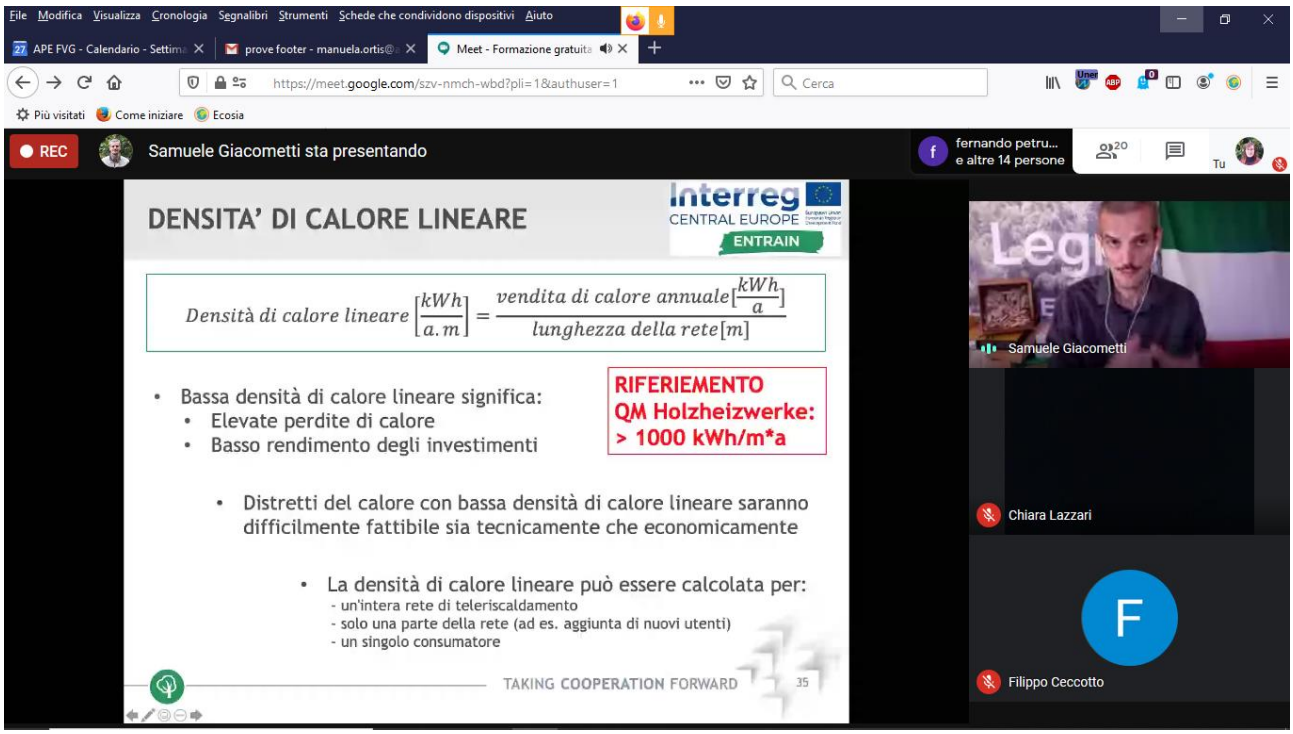
Conclusions, results and feedback

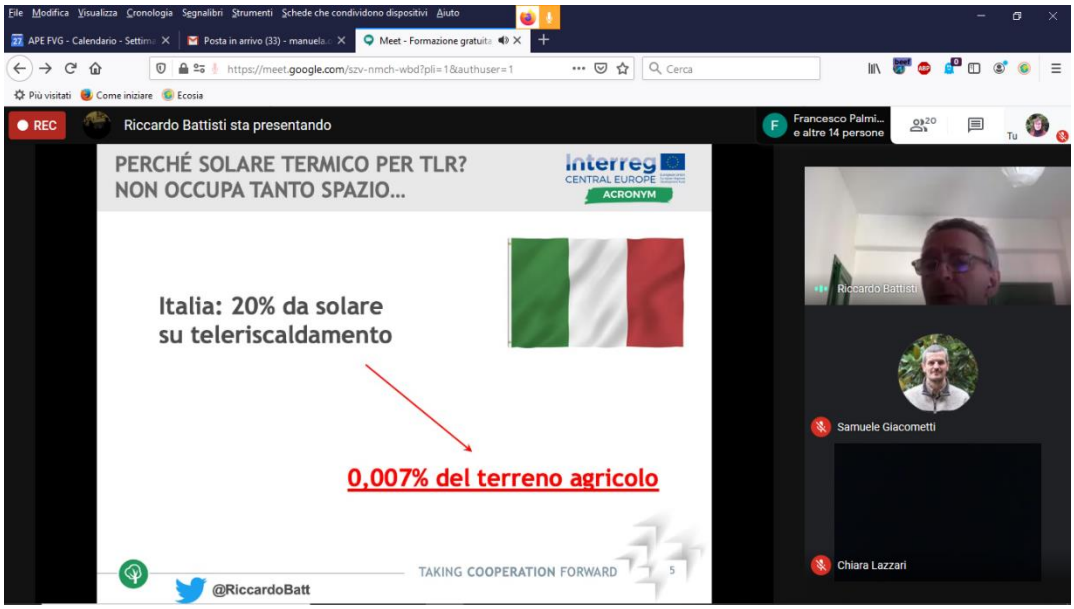
Day 1. The debate, that involved most of the members of the group both through the chat and through direct speech, underlined once again the importance of a Quality System that is able to accompany the whole process of creating a district heating network powered by RES from the pre-feasibility study to operation. Particular attention was also paid to the objectives described in the action plan that envisage an annual requirement of Class A wood chips of approximately 13,000 tons once the 30 plants are fully operational, for a total of 18 MW of installed power, to be built on the territory of the Autonomous Region of Friuli Venezia Giulia by 2025.

The number of possible new employees, equal to 18 units, also aroused interest because they would affect the entire supply chain, from forest management to heat supply.



Day 2. Pordenone and San Giorgio di Nogaro's Municipalities have shown great interest in the topics dealt with and have given their full availability to deepen their knowledge and implementation of the ENTRAIN project in their areas.





Training evaluation

- **Analisi risultati questionario di gradimento Giorno 1**

	Valutazione del contenuto	1	2	3	4	5	Punteggio rilevato	Punteggio massimo rilevabile	%	Classifica
1	Sessione formativa nel suo complesso	4	3	5	4	5	21	25	84%	2°
	"Studio del Potenziale", Samuele Giacometti (APE FVG)	4	3	5	4	5	21	25	84%	2°
	"Piano di Azioni", Samuele Giacometti (APE FVG)	4	3	5	4	5	21	25	84%	2°
	Valutazione di fattibilità, Samuele Giacometti (APE FVG)	4	3	5	4	5	21	25	84%	2°
	Presentazione dell'integrazione reti TLR con il solare termico, Riccardo Battisti (Ambiente Italia)	4	4	5	4	5	22	25	88%	1°
	Raggiungimento delle tue aspettative	4	3	4	4	5	20	25	80%	3°
	Aggiornamento delle tue conoscenze	4	3	4	3	5	19	25	76%	4°
	molto soddisfacente	5								
	soddisfacente	4-3-2								
	Insoddisfacente	1								

	Valutazione degli esempi, soluzioni e consigli di applicabilità presentati	1	2	3	4	5	Punteggio rilevato	Punteggio massimo rilevabile	%	Classifica
2	Sessione formativa nel suo complesso	4	3	5	5	5	22	25	88%	2°
	"Studio del Potenziale", Samuele Giacometti (APE FVG)	4	3	5	5	5	22	25	88%	2°
	"Piano di Azioni", Samuele Giacometti (APE FVG)	4	3	5	4	5	21	25	84%	3°
	Presentazione dell'integrazione reti TLR con il solare termico, Riccardo Battisti (Ambiente Italia)	4	3	5	4	5	21	25	84%	3°
	Valutazione di fattibilità, Samuele Giacometti (APE FVG)	4	4	5	5	5	23	25	92%	1°

Day 1. Five evaluation questionnaires were compiled by email. The results show great interest in the topic with a high satisfaction score. Content-wise the more successful presentation was Riccardo Battisti's *Evaluation on matching solar-thermal and wood biomass*.

Samuele Giacometti's *How to conduct an effective pre-feasibility study of a small RES DH network* scores first in the evaluation of examples, solutions and applicability advice presented.

- **Analisi risultati questionario di gradimento Giorno 2**

	Valutazione del contenuto	1	2	3	4	5	Punteggio rilevato	Punteggio massimo rilevabile	%	Classifica
1	Sessione formativa nel suo complesso	5	4	4	5	4	22	25	88%	3°
	Central Europe ENTRAIN "Studio del Potenziale Chiara Lazzari di (Abiente Italia)	5	4	4	5	4	22	25	88%	3°
	"Studio del Potenziale" "Piano di Azioni", Samuele Giacometti (APE FVG)	5	4	5	5	4	23	25	92%	2°
	Valutazione di fattibilità, Samuele Giacometti (APE FVG)	5	5	5	5	4	24	25	96%	1°
	Presentazione dell'integrazione reti TLR con il solare termico, Riccardo Battisti (Ambiente Italia)	5	5	4	5	4	23	25	92%	2°
	Raggiungimento delle tue aspettative	5	5	4	5	4	23	25	92%	2°
	Aggiornamento delle tue conoscenze	5	5	5	5	4	24	25	96%	1°
	molto soddisfacente	5								
	soddisfacente	4-3-2								
	Insoddisfacente	1								

	Valutazione degli esempi, soluzioni e consigli di applicabilità presentati	1	2	3	4	5	Punteggio rilevato	Punteggio massimo rilevabile	%	Classifica
2	Sessione formativa nel suo complesso	4	5	4	5	5	23	25	92%	1°
	Central Europe ENTRAIN "Studio del Potenziale Chiara Lazzari di (Abiente Italia)	4	4	4	5	4	21	25	84%	2°
	"Studio del Potenziale" "Piano di Azioni", Samuele Giacometti (APE FVG)	4	5	5	5	4	23	25	92%	1°
	Valutazione di fattibilità, Samuele Giacometti (APE FVG)	4	5	4	5	3	21	25	84%	2°
	dell'integrazione reti TLR con il solare termico, Riccardo Battisti (Ambiente Italia)	4	5	5	5	4	23	25	92%	1°

	Quale argomento ti ha interessato di più
3	n.d.
	La valutazione di fattibilità
	n.d.
	La spiegazione del funzionamento della centrale di teleriscaldamento e gli esempi pratici, le informazioni dettagliate del progetto
	All'interno delle aree piu' vocate per la produzione legnosa un impulso positivo può essere realizzato.

	Quale argomento vorresti approfondire
4	n.d.
	Studio del potenziale "Piano di Azioni" La valutazione di fattibilità
	n.d.
	Il piano di azioni regionale nel suo complesxso e, in particolare, di quali tematiche ed elaborati si compone, quali riflessi ha sugli enti locali. Gli aspetti della produzione del cippato
	Aree a bassa vocazione di produzione legnosa, quale prospettive

	Cosa ti è piaciuto di meno o cosa pensi potrebbe essere migliorato
5	n.d.
	n.d.
	n.d.
	La sessione di lavoro è stata completa
	A livello personale mi è piaciuta la presentazione, a volte troppo riferita a delle realtà distanti, chiaramente per il mio contesto.

Day 2. Five evaluation questionnaires were compiled by email also on the second day of training. The results again show great interest in the topic with a high satisfaction score. The training session as a whole scores even better than day 1, with 88% against 84% of the previous day.

Participants gave also interesting hints and suggestions when asked which topics they would like to elaborate on:

- RES heat potential assessment, action plan and feasibility study;
- The action plan as a whole and what themes and papers it consists of and what influence it has on local authorities. Aspects of wood chip production;
- What prospects for areas with a low vocation for wood production.

5.2. Second local training

Summary

The second local training in Friuli Venezia Giulia took place on December 23rd from 2:30 to 5 pm 2020 and was provided online through Cisco Webex - webmeeting platform.

The session was combined with the third meeting of the RSAG members.

Trainers:

Samuele Giacometti (APE FVG)
Stefano Pagani (APE FVG)

Participants:

SOGGETTO	REFERENTE	CATEGORIA
Direzione Foreste Regione Autonoma Friuli Venezia Giulia	Rinaldo Comino	ADMINISTRATION
Direzione Energia Regione Friuli Venezia Giulia	Sebastiano Cacciaguerra	ADMINISTRATION
AIEL - Associazione Italiana Energie Agroforestali	Andrea Argnani	ASSOCIATION
LA FORESTA Soc. Coop.	Giorgio Talachini	FORESTRY ENTERPRISE
ARPA FVG	Stefania Del Frate	AIR QUALITY DEP.
Verio Solari	Verio Solari	EXPERT
RELEN	Franco Petrigh	Plant + Wood chip logistic platform
AMBIENTE ITALIA	Riccardo Battisti	LP
AMBIENTE ITALIA	Chiara Lazzari	LP
APE FVG	Samuele Giacometti	PP / Relatore
APE FVG	Stefano Pagani	PP / Relatore
APE FVG	Manuela Ortis	PP
APE FVG	Martina Arteni	PP
APE FVG	Francesco Locatelli	PP
APE FVG	Vito Tisci	PP
Alessandro bortali	Alessandro Bortali	EXPERT
AGRISYSTEM	Claudio Nadalin	Wood chipping

Sindaco Comune di Stregna	Luca Postregna	ADMINISTRATION
Assessore Comune di Prata	Yuri Marchelo	ADMINISTRATION
Direttore ATER Pordenone	Mario Liut	ADMINISTRATION
Vicesindaco Lusevera	Mauro Pinosa	ADMINISTRATION
GAL Torre Natisone	Stefano Carta	ADMINISTRATION
Sindaco Comune di Dogna	Simone Peruzzi	ADMINISTRATION
Progettista	Luca Tommasoni	EXPERT
Tecnico Comune Pordenone	Maurizio Gobbato	ADMINISTRATION

The training session focused on two presentations: the first one by Samuele Giacometti (APE FVG) who began the presentation with an update on the activities carried out after the second RSAG meeting in May 2020 and then continued with the presentation of the QM Hozheizwerke Italia Guidelines. Stefano Pagani (APE FVG) followed with a Financial-Economic Analysis of a QM certified biomass district heating network. Both presentations had as undisputed protagonist the quality management system of wood heating systems QM Holzheizwerke translated into Italian within the framework of the ENTRAIN project. In particular, the peculiarities of this quality standard were highlighted, focusing on the economic aspects considered as key elements for the construction of new wood heating systems with distribution network.

The primary purpose of the meeting was to raise the need to follow a quality standard to ensure the right profitability of the investment made, especially when it comes to contributions from public funds. Finally, the slogan that APE FVG intends to promote and share both at regional and national level was presented: “Do you manage quality with QM? Yes! Then I'll finance you! ".

List of presentations shown during the web meeting:

- Guidelines of QM Holzheizwerke Italy *(Samuele Giacometti, APE FVG)*

  ➔ *VIDEO* https://youtu.be/PSXWb31wDeg
- Financial Economic Analysis of a QM certified biomass district heating network *(Stefano Pagani, APE FVG)*

  ➔ *VIDEO* https://youtu.be/phTAGbx8TsU

Conclusions, results and feedback

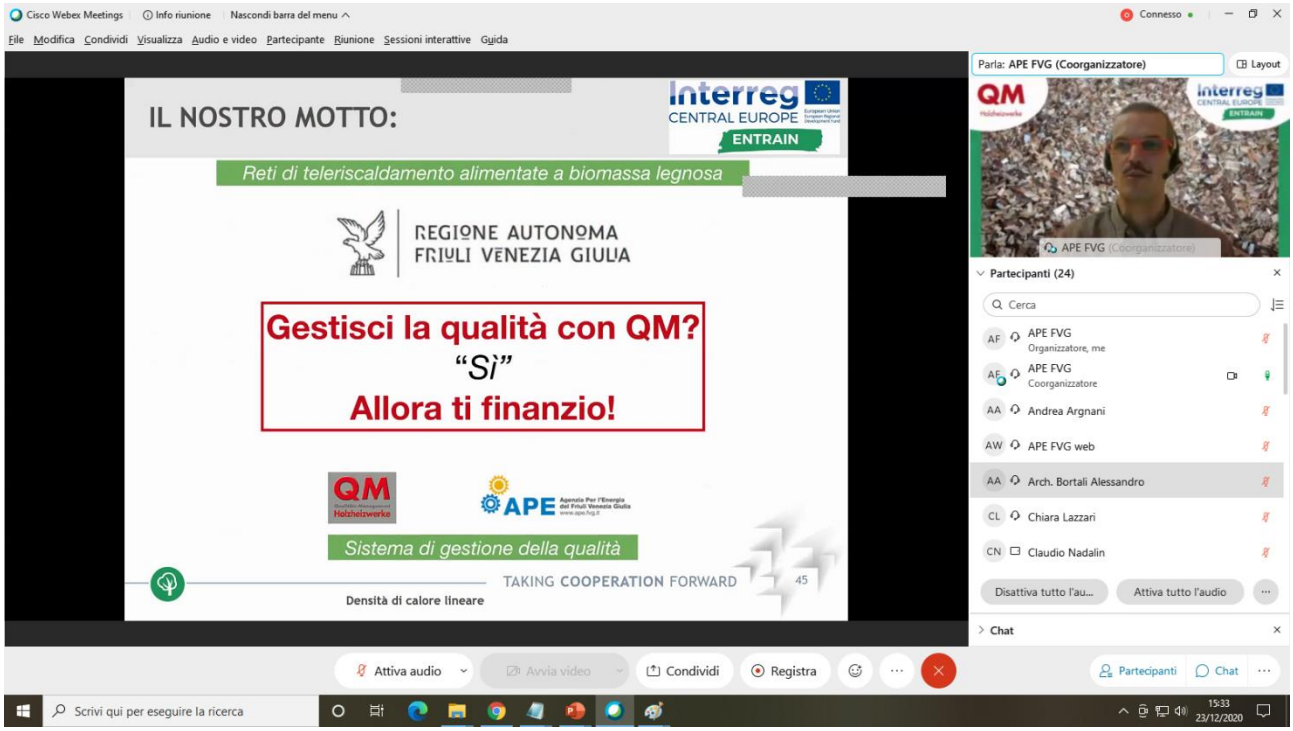
The meeting was attended by seventeen stakeholders representing fourteen different entities; in addition to local stakeholders operating in Friuli Venezia Giulia, Giorgio Talachini of La Foresta Soc. Coop. headquartered in Piedmont, Chiara Lazzari and Riccardo Battisti of Ambiente Italia, lead partner of ENTRAIN also took part in the videoconference.

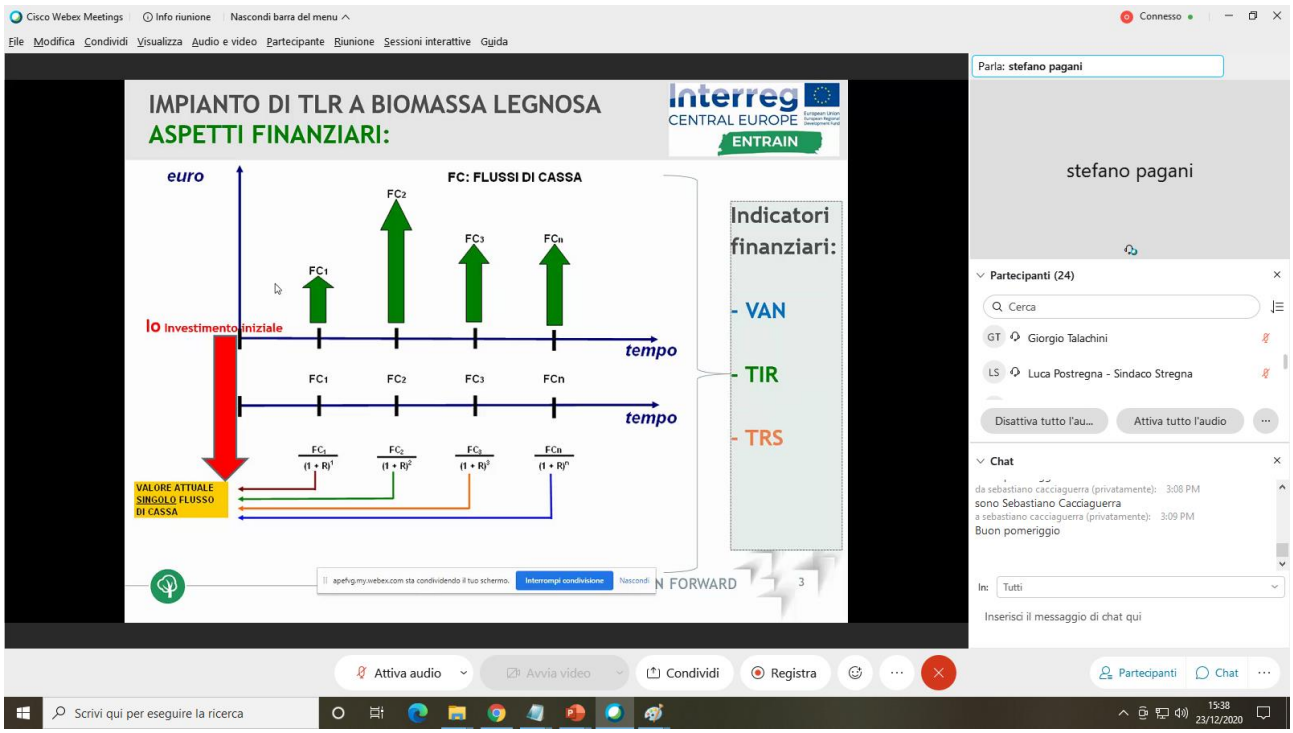
The audience addressed to the following comments with particular attention and interest. The first by Sebastiano Cacciaguerra (Energy Service, Autonomous Region of Friuli Venezia Giulia), who

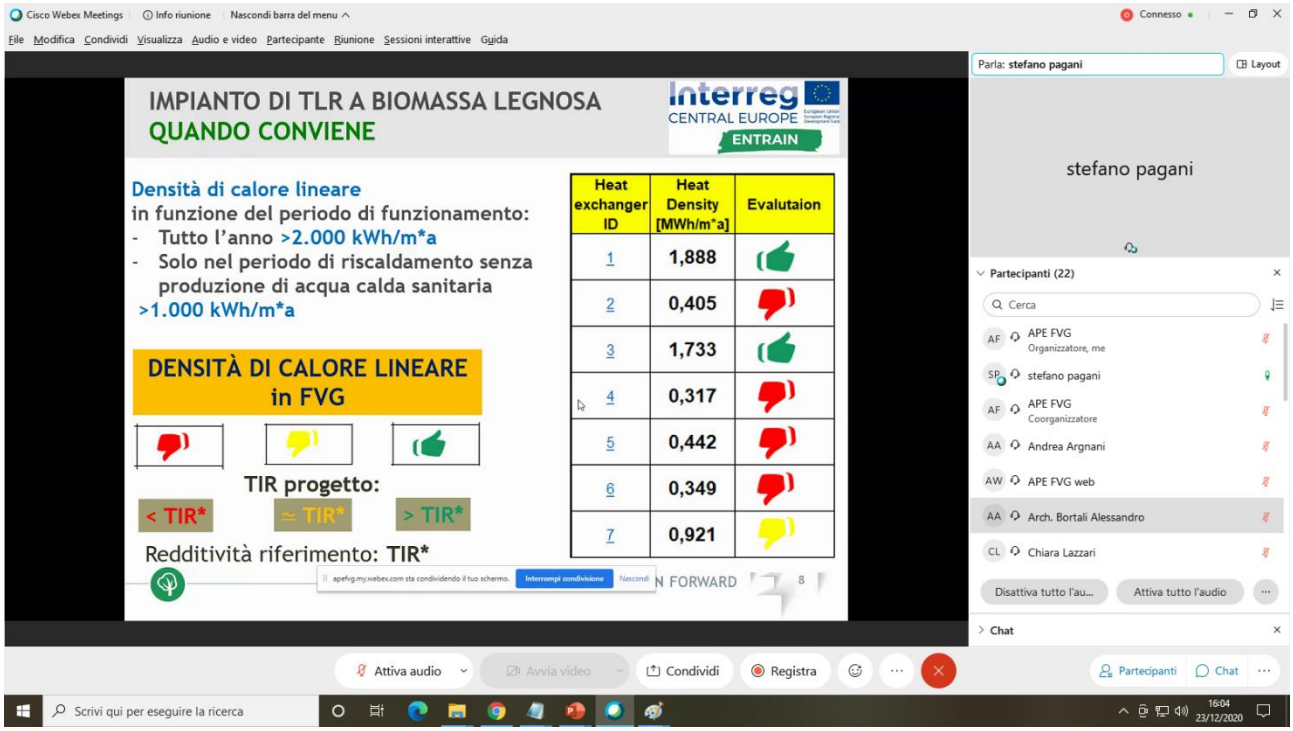
brought to the table the issue of state aid when the DH systems are used to heat private buildings and not only public buildings, alongside the matter of quality and availability of local wood chips. The Director also mentioned the use of thermal waste and the use of additional RES energy sources integrating biomass. A good thing would be a "study of the territory to identify the areas in which to build plants where we have thermal waste from the industries". The Director highlighted how the sale of heat is essential for the repayment of the loan, and therefore heating only public properties will not allow the return on investment.

Giorgio Talachini (*Cooperative LA FORESTA - LENO*), confirms the need for an economically sustainable plant to live off the market and not on subsidies, and above all underlines how a plant built according to the QM protocol is a healthy plant that will stand up economically and will not need extensive incentive formulas.

During the session, participants were also asked for their availability to participate in an interview in which the importance of QM certification for the allocation of public funding for the construction of a district heating plant in FVG should be highlighted. Six people confirmed their availability.


IL NOSTRO MOTTO:
Reti di teleriscaldamento alimentate a biomassa legnosa
REGIONE AUTONOMA FRIULI VENEZIA GIULIA
Gestisci la qualità con QM?
"Sì"
Allora ti finanzio!
Sistema di gestione della qualità
TAKING COOPERATION FORWARD
Densità di calore lineare
Parla: APE FVG (Coorganizzatore)
Partecipanti (24)
APE FVG Organizzatore, me
APE FVG Coorganizzatore
Andrea Argnani
APE FVG web
Arch. Bortali Alessandro
Chiara Lazzari
Claudio Nadalin
Chat

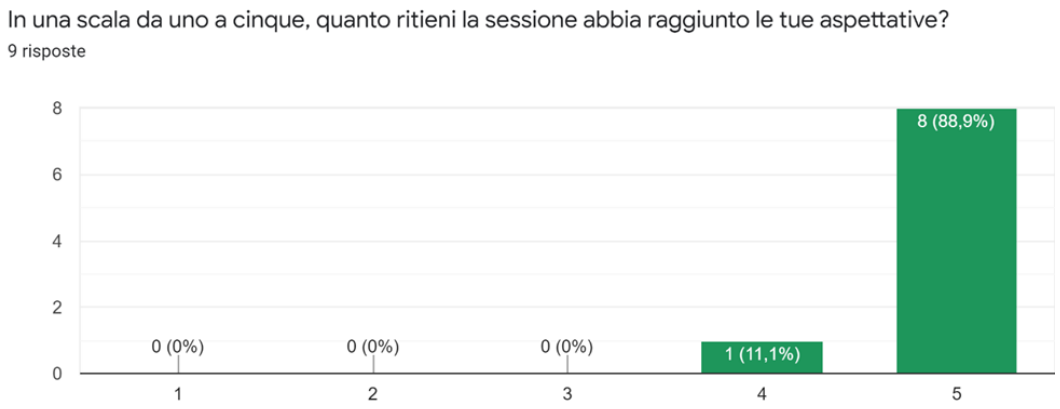

IMPIANTO DI TLR A BIOMASSA LEGNOSA
ASPETTI FINANZIARI:
euro
FC: FLUSSI DI CASSA
Io Investimento iniziale
tempo
VALORE ATTUALE SINGOLO FLUSSO DI CASSA
Indicatori finanziari:
- VAN
- TIR
- TRS
Parla: stefano pagani
stefano pagani
Partecipanti (24)
Giorgio Talachini
Luca Postregna - Sindaco Stregna
Chat
sono Sebastiano Cacciaguerra
Buon pomeriggio



Training evaluation

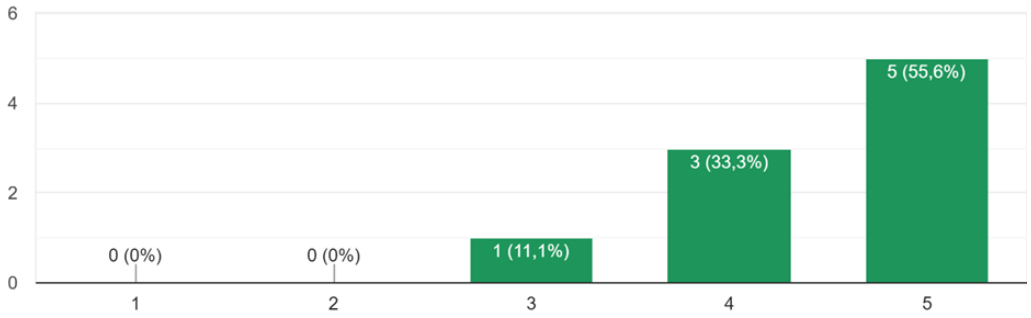
9 evaluation questionnaires were filled in by means of Google Form, linked on the webmeeting platform chat.

The results show high satisfaction score on both presentations and for the session as a whole



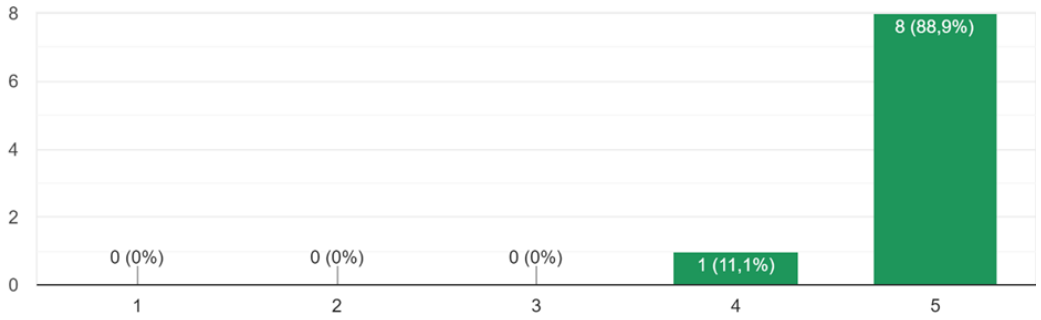
In una scala da uno a cinque, quanto ritieni la sessione abbia contribuito ad aggiornare le tue conoscenze?

9 risposte



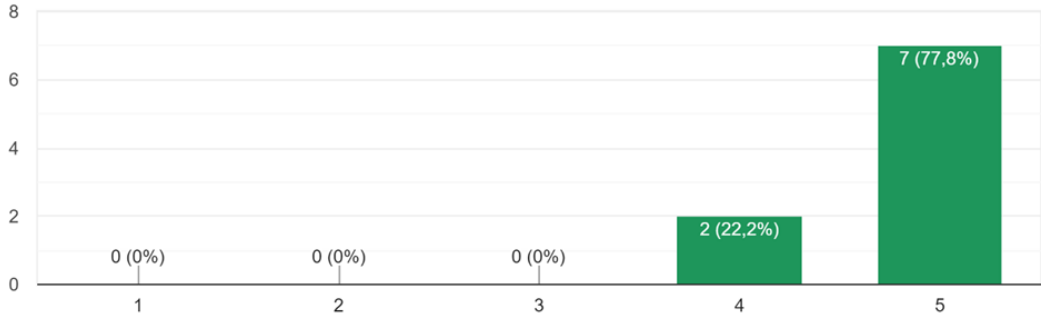
Quanto sei soddisfatto/a della sessione formativa nel suo complesso?

9 risposte



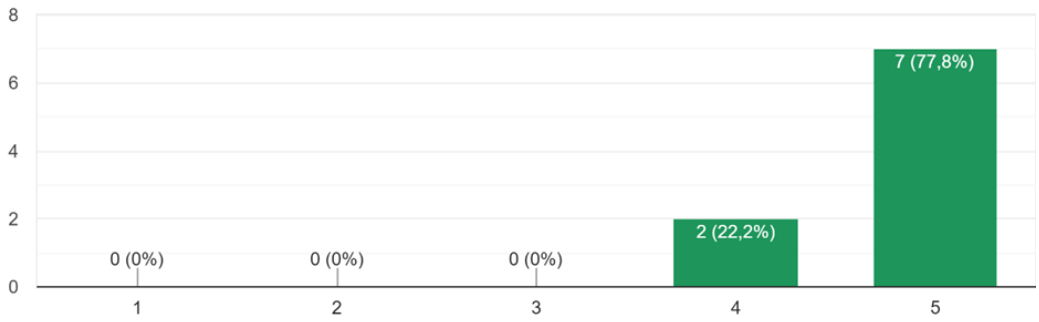
Quanto sei soddisfatto/a dell'intervento su "Linee Guida QM Holzheizwerke Italia" di Samuele Giacometti?

9 risposte



Quanto sei soddisfatto/a dell'intervento sulla "Analisi economico-finanziario di una rete di teleriscaldamento a biomassa certificata QM" di Stefano Pagani?

9 risposte



There were also some optional open questions that are reported here below:

What elements of the training were most interesting for future work within the regional territory?

5 answers

- planning of new interventions
- QM as a regional quality standard
- density criterion of energy withdrawal
- the economic part of the system
- the 3 QM levels

Which elements would you like to further elaborate on?

4 answers

- the protocol as a whole
- How to certify with QM?
- the previous one
- These 3 levels starting with the smallest

Please indicate what you liked least about the training session and what you think could be improved:

4 answers

- nothing
- nothing
- everything OK
- the fact that not all participants presented themselves on video

5.3. Third local training

- Summary

1 *When was the training held?*

On July 9th 2021, from 9:45 to 12:30, at the Hotel Savoia located in via Roma 4, Arta Terme 33032 (UD)

2 *Chi erano i formatori e chi erano i partecipanti?*

a. Speakers:

Matteo Mazzolini (APE FVG)
Francesco Locatelli (APE FVG)

b. Participants:

SOGGETTO	REFERENTE	CATEGORIA
Presidente CM Carnia	Ermes Antonio de Crignis	Amministrazione
Direzione Energia Regione Friuli Venezia Giulia	Sebastiano Cacciaguerra	Amministrazione
Sindaco Comune Arta Terme	Luigi Gonano	Amministrazione
Sindaco Comune Dogna	Simone Peruzzi	Amministrazione
Sindaco Comune Socchieve	Coriglio Zanier	Amministrazione
Sindaco Comune Lusevera	Fabrizio Nigris	Amministrazione
Vicesindaco Comune Amaro	Edi Mainardis	Amministrazione
Funzionario CM Carnia	Patrizia Gridel	Amministrazione
Funzionario Comune Arta Terme	Vanessa Gressani	Amministrazione
Chiurlo	Marco Mosco	ESCO
Direttore ESCOMontagna	Michele Pertoldi	ESCO
Presidente ESCOMontagna	Sergio Buzzi	ESCO
Presidente AIBO	Agostino Michelin	Impresa Boschiva/ Fornitore cippato
Drywood biomassa di qualità	Carlo Bevilacqua	Impresa Boschiva/ Fornitore cippato
Agri. Val. Impresa Boschiva	Walter Bevilacqua	Impresa Boschiva/ Fornitore cippato
CIGLIANI PRIMO S.n.c.	Mirco Cigliani	Impresa Boschiva/ Fornitore cippato
E-LASER S.r.l.	Andrea Barilotti	Pianificazione Foresta
Verio Solari	Verio Solari	Pianificazione Foresta
Herz Energie	Davide Capraro	Produttore Tecnologia
Quadra FVG	Fabrizio Passone	Produttore Tecnologia
Herz Energie	Mary Helem Balbinot	Produttore Tecnologia
Pinosa	Mauro Pinosa	Produttore Tecnologia
Pinosa	Stefania Traunero	Produttore Tecnologia

Enrico Gatti	Enrico Gatti	Progettista
Fabrizio Corte	Fabrizio Corte	Progettista
Marchiori Energie	Fabiano di Lazzaro	Progettista
Presidente Ordine Periti Industriali di Trieste	Luca Tommasoni	Progettista
De Blasio Associati	Silvio De Blasio	Progettista
De Blasio Associati	Vanni Bortoluzzi	Progettista
La Vita Cattolica	Veronica Rossi	Comunicazione
APE FVG	Matteo Mazzolini	PP/Relatore
APE FVG	Samuele Giacometti	PP
APE FVG	Francesco Locatelli	PP/Relatore
APE FVG	Manuela Ortis	PP
APE FVG	Martina Arteni	PP
Fratelli Leita	Alessandro Leita	Strumentista
Gianmaria Paschini	Gianmaria Paschini	Musicista

3 What was the content of the training

The training session consisted of 3 presentations, managed by APE FVG employees. Director Matteo Mazzolini opened the training with an introduction on the role of biomass and bioenergies in the energy system currently and in future development scenarios, on how the technology is fully market competitive with respect to conventional generation and on the evaluations to be made for a proper economical and technical sustainability.

After that Francesco Locatelli, with two presentations, introduced QM and tackled different aspects of it. In the first presentation, after a brief recap of roles, steps and key concepts of QM, the work APE performed in the last months was listed: recognition of the international QM working group, translation of Q-guidelines and annexes, regional biomass potential analysis, existing plants analysis (and definition of their problems), support to municipalities for interventions of repowering or new plants with prefeasibility analysis. Future steps are monitoring and optimization of pilots and existing plants, integration of other heat sources, creation of a regional working group and training courses. The second and more technical presentation dealt specifically with monitoring and optimization of plants, which are fundamental steps in the QM process. A detailed monitoring is key to see if the objectives set during the planning phase are achieved, and then to decide interventions for optimization. Each optimization aspect was supported by a practical example from an Austrian plant.

Main goal of the training was to highlight the importance of a careful initial planning, of the monitoring and of the optimization phases. The QM process gives all of this a proper structure.

4 Conclusions, results and feedback

More than 30 regional stakeholders, ranging from forestry companies to technology suppliers, from administrators to plant designers. At the round table, the mayor of Socchieve shared his experience: thanks to the pre-feasibility analysis performed by APE FVG following the QM principles, he rejected 440 thousand euros of regional funds that were set to build a very inefficient and unsustainable DH network. Within few years this plant would have become a critical and expensive asset for the future administrations.

A goal was definitely to start building a regional working group connecting professionals and administrations. The regional director Cacciaguerra expressed appreciation towards the new approach and techniques, and admitted that in the past many inefficient and badly planned projects were funded.

Last, the technical presentation of the event showed how it is possible to act effectively to improve the economical and operational aspects of the plant.

- Training evaluation

	Quesito	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Punteggio rilevato	Punteggio massimo	%	Classifica
1	QM Impianti termici a legna: quanto ritieni importante l'applicazione di un sistema di gestione della qualità durante la pianificazione, progettazione, realizzazione e ottimizzazione di un impianto di teleriscaldamento alimentato a fonti rinnovabili?	5	5	4	3	4	5	5	5	5	4	4	4	4	5	4	5	5	5	5	5	5	5	5	5	5	5	5	126	135	93%	n.a.
	molto soddisfacente	5																														
	soddisfacente	4-3-2																														
	Insoddisfacente	1																														

	Quesito	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Punteggio rilevato	Punteggio massimo	%	Classifica
2	Finanziamenti: quanto ritieni importante rendere il QM materia cogente per la cessione di finanziamenti per la realizzazione di un impianto di teleriscaldamento alimentato a fonti rinnovabili? di un sistema di gestione della qualità durante la pianificazione, progettazione, realizzazione e ottimizzazione di un impianto di teleriscaldamento alimentato a fonti rinnovabili?	5	4	4	3	4	5	5	4	5	3	3	5	4	4	4	4	4	5	5	5	5	4	5	4	4	4	4	115	135	85%	n.a.
	molto soddisfacente	5																														
	soddisfacente	4-3-2																														
	Insoddisfacente	1																														

	Soddisfazione complessiva	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Punteggio rilevato	Punteggio massimo	%	Classifica
3	Comunicazione prima dell'evento	5	5	5	5	4	5	5	4	4	5	4	2	5	2	4	5	3	5	5	3	4	4	5	3	4	4	4	113	135	84%	7°
	Accoglienza	5	5	5	5	5	5	5	5	4	5	5	4	5	4	5	5	4	5	5	4	5	5	5	3	5	4	4	126	135	93%	2°
	Qualità dei relatori	5	5	5	4	5	5	5	5	5	5	4	4	5	3	4	5	4	5	5	5	5	4	5	3	4	4	4	122	135	90%	3°
	terazione durante la Tavola rotonda	4	4	5	4	5	5	4	5	4	5	4	5	5	4	5	5	4	5	5	4	5	3	5	4	5	3	2	118	135	87%	5°
	Qualitò della moderazione	5	5	5	5	5	5	4	5	5	5	4	5	5	5	5	5	5	5	5	4	5	5	5	4	3	4	4	127	135	94%	1°
	e rilevanza del contenuto presentato	5	5	5	4	5	5	5	5	5	5	5	4	5	4	5	5	4	5	5	5	5	5	5	3	4	3	4	125	135	93%	2°
	taggiungimento delle tue aspettative	5	5	5	5	5	5	4	4	4	5	4	4	4	4	5	5	4	5	5	5	5	4	5	3	4	3	4	120	135	89%	4°
	ggiornamento delle tue conoscenze	5	5	5	5	4	5	3	4	5	5	5	2	5	4	5	5	3	4	5	5	5	4	5	3	5	4	3	118	135	87%	6°
	molto soddisfacente	5																														
	soddisfacente	4-3-2																														
	Insoddisfacente	1																														

27 evaluation questionnaires were compiled and collected in written form during the training. The results show great interest in the topic and a high level of satisfaction concerning the organization of the event and the content of the training.

Participants gave also some suggestions in the final open comments section of the survey:

- *Make sure that insiders create a common front for a dialogue with government institutions to ensure that there is a legislative update in order to be able to use biomass like neighbors Austria and Switzerland*
- *Improve audio quality (technical observation)*
- *The environmental aspects have not been investigated. I believe that it would be useful to have clear and transparent data to overcome mistrust and fears in those who have the responsibility to make choices and in the population*
- *More time for questions and interventions*

5.4. Fourth local training

Summary

1 *When was the training held?*

On March 22nd 2022, from 9:00 to 13:00, at Centro Culturale Casa Zanussi located in via Concordia 7, Pordenone (Friuli Venezia Giulia).

2 *Who were the speakers and participants?*

a. *Speakers:*

Matteo Mazzolini (APE FVG)
Samuele Giacometti (APE FVG)
Francesco Locatelli (APE FVG)
Riccardo Battisti (Ambiente Italia)

b. *Participants:*

REFERENTE	SOGGETTO	CATEGORIA
Cristina Amirante	Municipality of Pordenone	Administration
Luigi Anzelini	-	expert
Riccardo Battisti	Ambiente Italia Srl	Speaker / LP
Germana Bodi	-	expert
Francesca Bonemazzi	ARPA FVG	Regional environmental agency
Fabrizio Corte	-	expert
Francesco Da Re	-	expert
Matteo De Piccoli	Palazzetti Lelio Spa	Small company
Gianpiero Degano	-	expert
Vittorio Drigo	-	expert
Flavio Fabris	-	expert
Marina Giorgi	Professional association of architects	expert
Vanessa Gressani	Municipality of Arta Terme	Administration
Alessandro Ius	-	expert
Luciano Lionetti	-	expert
Maurizio Maniero	Autonomous Region FVG	Administration
Daniele Micheluz	Telefriuli	Media/press
Marco Mosco	Chiurlo Srl	Energy provider
Antonio Nonino	-	expert
Giacomo Pagot	-	expert
Franco Petrigh	Friul Pallet Snc	Small company
Valentina Ros	Autonomous Region Friuli Venezia Giulia	Administration

Federico Turi	Chiurlo Srl	Energy provider
Fabrizio Urru	-	expert
Marco Zanet	Municipality of Cordenons	Administration
Massimiliano Zampieri	APE FVG	PP
Matteo Mazzolini	APE FVG	Speaker / PP
Samuele Giacometti	APE FVG	Speaker / PP
Francesco Locatelli	APE FVG	Speaker / PP
Manuela Ortis	APE FVG	Speaker / PP

3 What was the content of the training?

On 22 March in Pordenone, Friuli Venezia Giulia, we organized the seminar "QM Quality management system - Heat from woody biomass and energy transition: opportunities for designers". The training was especially targeted to professional actors such as local engineers and architects.

It was the occasion to present the Q-guidelines, a cornerstone document of the QM system that supports and sets the criteria for planning, design, construction and operation of biomass-fuelled district heating networks. This system ensures efficient operation from an energy, ecological and economic point of view of the entire plant, avoiding oversizing and other mistakes made in the past also in our region.

The training was co-organized with the following: the councillor Cristina Amirante and the Municipality of Pordenone who sponsored the event, the president of the Friuli Venezia Giulia Technical Review Antonio Nonino, the president of the Order of Architects of Pordenone Marina Giorgi, the engineer Vittorio Drigo representing the Association of Engineers and Architects of Pordenone.

The presentations were the following:

Matteo Mazzolini, director of APE FVG

- *Heat from woody biomass and energy transition, opportunity for designers*
- *Financial evaluation of a district heating network*

Samuele Giacometti, APE FVG

- *Quality management in district heating, state of the art and perspectives*
- *QM Wood heating systems*
- *The QM quality management process*

Francesco Locatelli, APE FVG

- *Pre-feasibility studies of new plants and analysis of existing plants*
- *Plant optimization and monitoring*

- *Standard hydraulic Q-circuits*

Riccardo Battisti, Ambiente Italia

- *Woody biomass integrated with other renewable energy sources*

4 Conclusions, results and feedback

25 external participants joined the event, especially engineers and public authorities: after the four presentation a few questions from the public showed great interest in the topic and the will to further engage in the discussion and consult the available documents.

The Q-guidelines were distributed at the end of the event, in the new graphical format adopted by APE FVG and agreed upon with the international QM working group.

APE FVG has built a strong network of stakeholders that continues the work on small RES DH networks beyond the project's end. The QM system will also be presented by APE FVG at the Progetto Fuoco fair of national relevance in Verona at the beginning of May 2022.

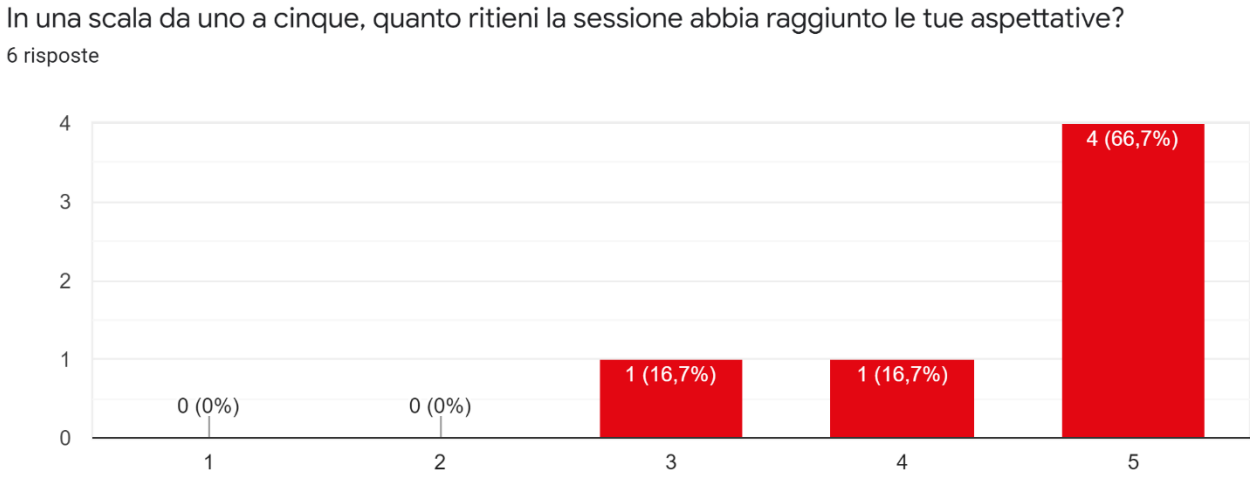
During the QM event a local TV reporter made some videoshooting and recorded a few interviews with the speakers and participants.


LA DOMANDA DI CALORE
Il primo criterio QM riguarda la densità di calore lineare
La vendita di calore giustifica la lunghezza della rete?
TAKING COOPERATION FORWARD
5


TAKING COOPERATION FORWARD
Biomassa legnosa integrata
ad altre fonti di energia rinnovabile
ENTRAIN

- Training evaluation

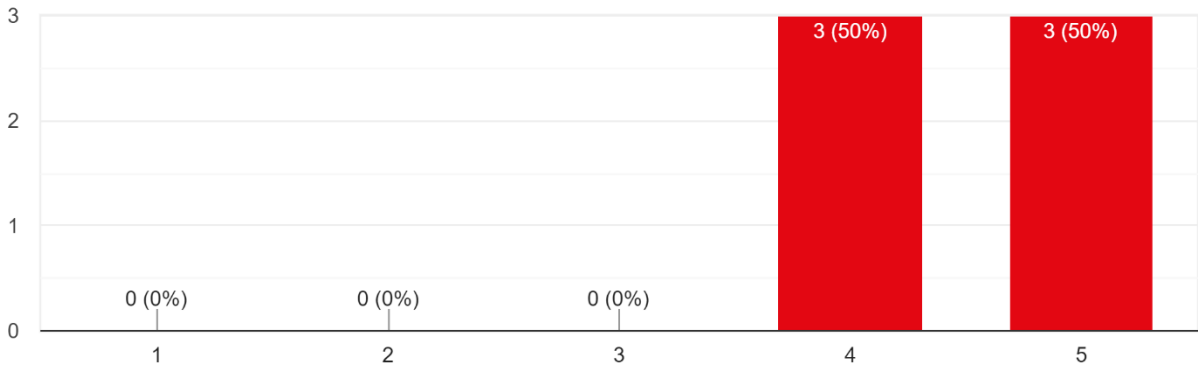
Satisfaction expressed in terms of meeting expectations:



Satisfaction expressed in terms of knowledge transfer:

In una scala da uno a cinque, quanto ritieni la sessione abbia contribuito ad aggiornare le tue conoscenze?

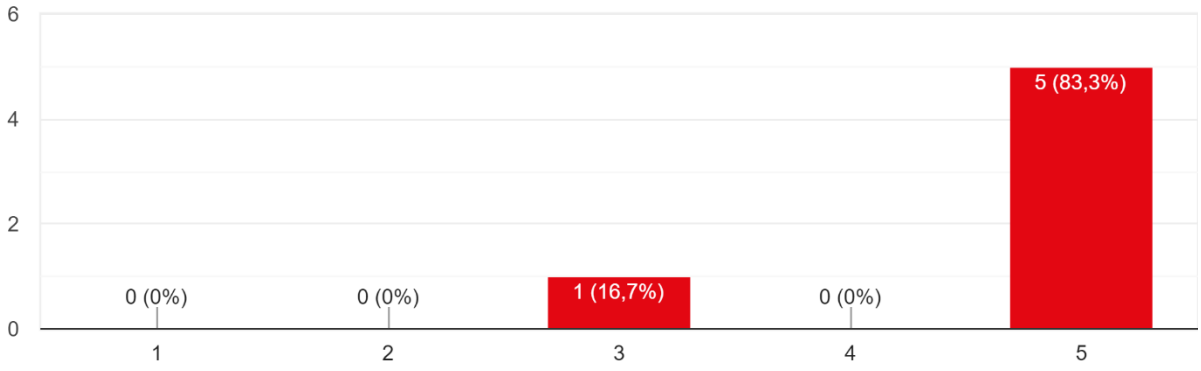
6 risposte



Satisfaction on the training content as a whole:

Quanto sei soddisfatto/a della sessione formativa nel suo complesso?

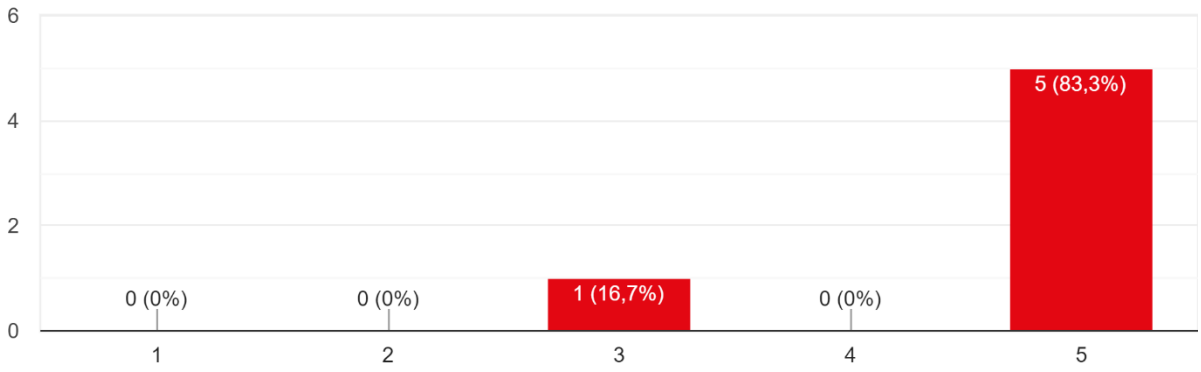
6 risposte



Satisfaction on presentation nr.1:

Quanto sei soddisfatto/a dell'intervento su "Valutazione finanziaria di una rete di teleriscaldamento" di Matteo Mazzolini?

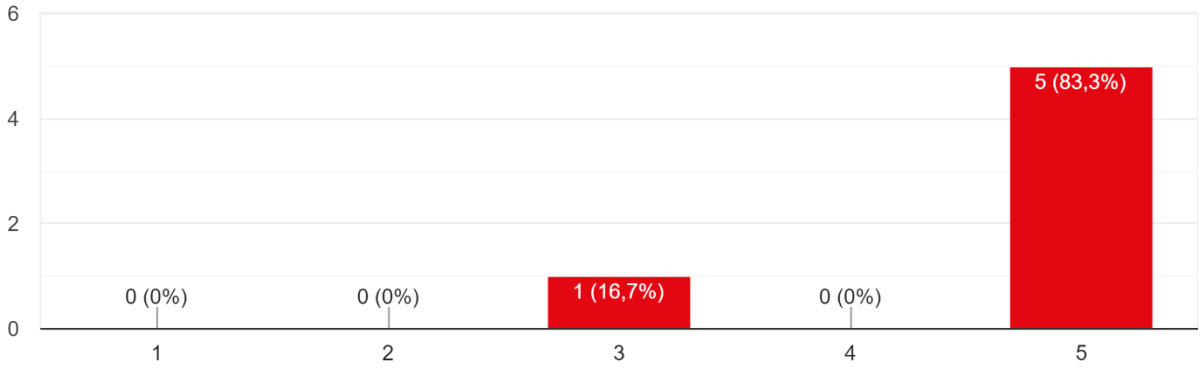
6 risposte



Satisfaction on presentation nr.2:

Quanto sei soddisfatto/a dell'intervento su "La gestione della qualità nel teleriscaldamento, stato dell'arte e prospettive / Il processo di gestione qualità QM" di Samuele Giacometti?

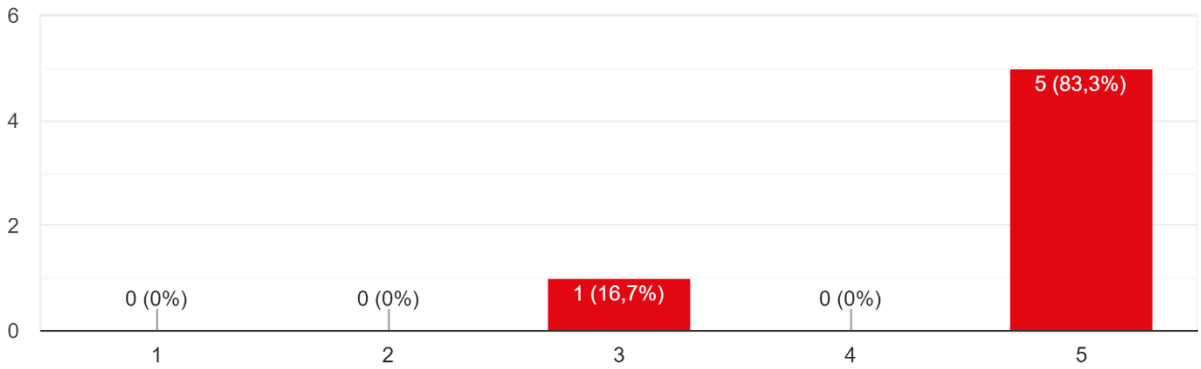
6 risposte



Satisfaction on presentation nr.3:

Quanto sei soddisfatto/a dell'intervento su "Pre-studi di fattibilità nuovi impianti ed analisi impianti esistenti / Ottimizzazione e monitoraggio impianto / ...circuiti idraulici standard" di Francesco Locatelli?

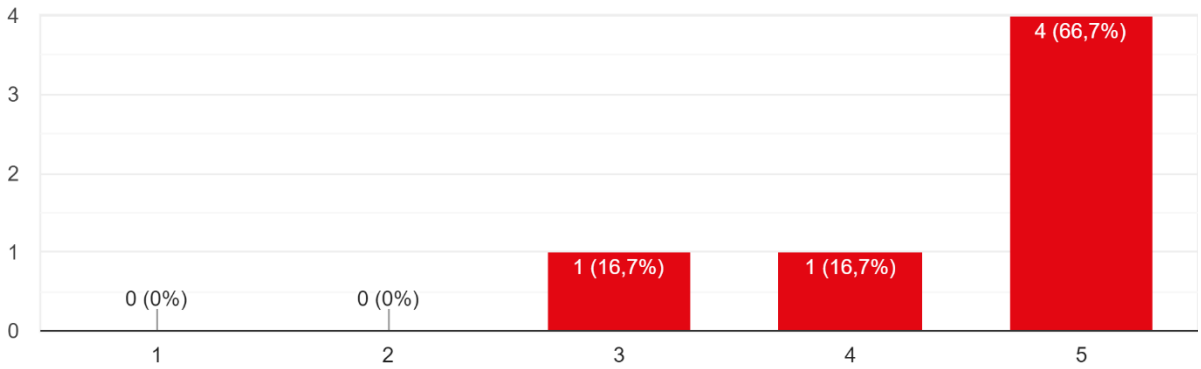
6 risposte



Satisfaction on presentation nr.4:

Quanto sei soddisfatto/a dell'intervento su "Biomassa legnosa integrata ad altre fonti di energia rinnovabile" di Riccardo Battisti?

6 risposte



- What elements of the training were most interesting for future work within the regional territory?

3 answers

Design criteria for district heating systems.

financial evaluation, pre-feasibility studies

elements of economic and financial analysis

- What elements would you like to deepen?

2 answers

Integration with other thermal renewable sources

the control and management of the plants

- Please indicate what you liked least about the training session and what you think could be improved:

1 answer

More space for interaction with participants.

6. LOCAL TRAININGS IN POLAND

6.1. First local training

Summary

The first local training took place on 24 November 2020 using the Zoom Webinar tool.

The speakers at the training were:

- Anna Lachowicz - Project Manager in PNEC
- Andrzej Rubczyński - Director for heating strategy in the Forum Energii
- Patrycja Płonka - Project Manager in PNEC
- Jarosław Osiak - professor at the University of Ecology and Management in Warsaw
- Patrick Geiger – Solites
- Dariusz Marczewski - Director of PEC in Płońsk

The participants were mostly employees of municipalities related to the heating sector in their regions, representatives of energy objects (municipal heating companies, biogas plants), as well as a representative of the Energy Regulatory Office. In the training, also participated members of the Regional Stakeholder Advisory Group and the target region in the project.

The aim of the training was to familiarize participants with the heating sector in Poland, its possibilities of cooperation with RES and to present existing good examples of objects that use local renewable energy sources for heat production.

The event started with an introduction to the ENTRAIN project itself by Ms. Anna Lachowicz. The main objective of the project, its stages, planned activities and expected results were discussed.

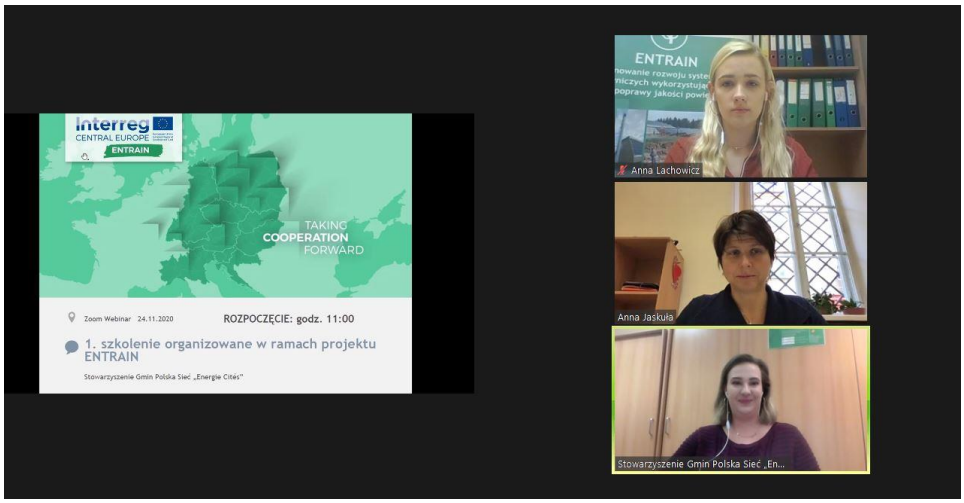
Next, Mr. Andrzej Rubczyński, presented the possibilities of using RES in the heating industry - the current state, potential, technologies. After discussing the current state of this sector and the fuel mix in Poland, he moved on to the future of this industry and the challenges.

Next presentation belong to Mrs. Patrycja Płonka, which theme was how to plan the development of heating systems using RES step by step. The investment process related to the installation of the heating system was discussed.

The next point of the training was a speech by Mr. Jarosław Osiak, devoted to estimating the local demand for district heating and local RES potential.

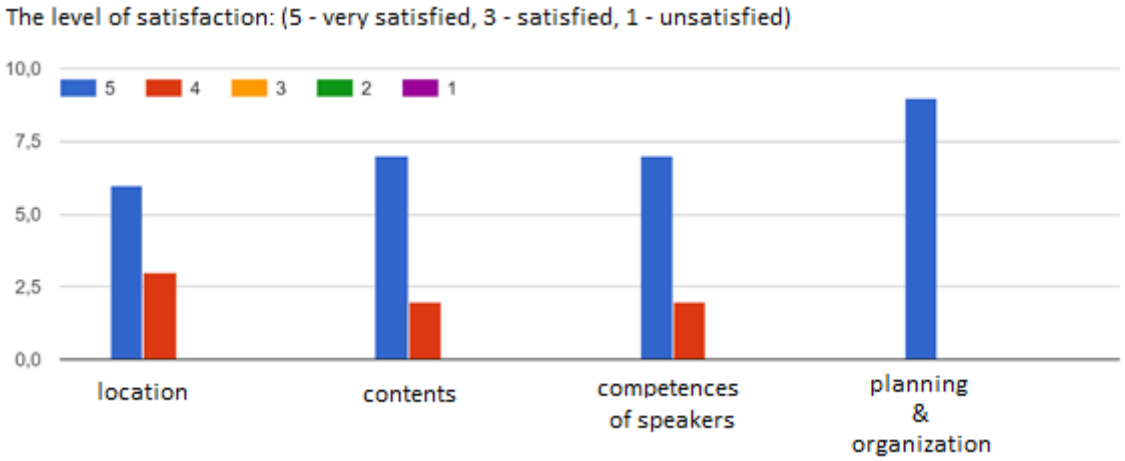
After break, the participants familiarized with the activities of Germany in the field of solar district heating system. This topic was presented by Mr. Patrick Geiger.

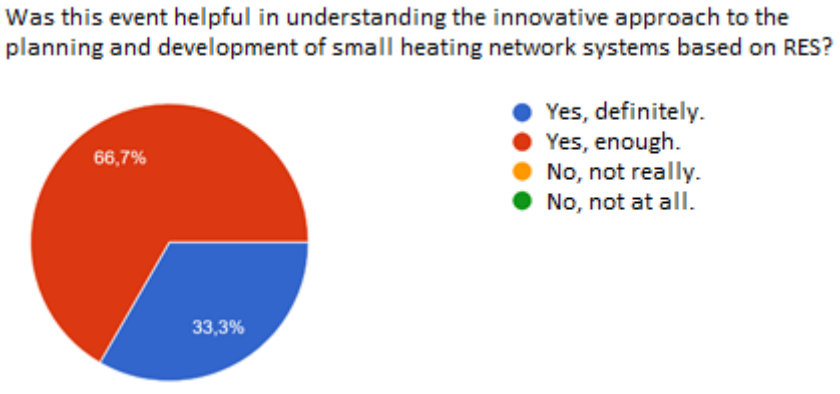
The last presentation about a good practice which is a biomass-fired CHP plant in Płońsk was made by Mr. Dariusz Marczewski.



- Training evaluation

The participants took part in an anonymous satisfaction survey. As the training was organized online, a survey was sent to participants as a Google Form. Answers to the selected questions can be found below:





The respondents also had the opportunity to express an additional opinion, which resulted for example in the following answers:

- „ *Good morning, definitely the most interesting are the lectures of real projects, i.e. examples taken from life. The more real examples there are, the more interesting the meetings will be.*"

- „*I will gladly participate in further conferences of this kind*"

The training and the survey allowed to identify important conclusions concerning future trainings:

1) The development of RES in district heating is a very interesting topic not only for municipalities, but also for the employees of energy facilities

2) Presentation of good practices significantly increases the interest of listeners

3) The competence and knowledge of the speakers of the first training was evaluated very positively, therefore further involvement of these speakers in further training is considered.

4) The topics of the next training will be adjusted to the needs of the target groups

6.2. Second local training

Summary

The second training was held on March 19, 2021 in an online format using the Zoom Webinar tool.

The speakers at the training were:

- Anna Lachowicz - Project Manager at the Association of Municipalities Polish Network "Energie Cités"
- Witold Retke - Manager of Operational Programmes Department from the Department of External Funds from National Fund for Environmental Protection and Water Management
- Dariusz Pinski - specialist from ZEC in Inowrocław
- Marcin Dwórznik - Faculty of Economic Sciences, University of Warsaw
- Piotr Olkiewicz - representative of SENVI company
- Christian Ramerstrofer - AEE Institut für Nachhaltige Technologien

Participants of the training were mostly employees of municipalities related to the heating sector, representatives of energy facilities, companies dealing with energy efficiency, members of associations of municipalities and cities, people representing the sector of education and research and analysis, as well as representatives of the Regional Advisory Team and representatives of the target region - Płońsk Energy Cluster.

The aim of the training was to familiarize participants with the economic aspects of the heating sector in Poland, possibilities of financing investments related to the development of small heating networks using RES.

The event started with the welcome by Ms. Patrycja Płonka and the presentation of the ENTRAIN project by Ms. Anna Lachowicz.

The next presentation was made by Mr. Witold Retke. He presented support programs available for the heating sector and introduced the subject of financing the energy transformation.

The next speaker was Mr. Dariusz Pinski, who characterized his company and the problems of the heating sector. He also presented an example of good practice - a pilot installation that uses heat pumps supported by photovoltaic installation to produce heat.

Then there was a presentation of Mr. Marcin Dwórznik, who presented an economic analysis of the use of solar power plant on the example of Thermal Energy Company.

The next presentation was given by Mr. Piotr Olkiewicz. He presented technical

and economic feasibility of the use of municipal waste and sewage sludge in the heating plant.

After the break, there was the last speaker - Christian Ramerstorfer, who presented an example of good practice from Austria - biomass heating plants. He talked about the development of this technology and QM Holzheizwerke quality management system.

Training evaluation

Participants of the training took part in the anonymous satisfaction survey. Due to the fact that the event took place in online form, also the survey concerning this event was conducted in the same formula. Based on its results and the course of the whole training the following conclusions were made:

- Half of the respondents had participated in ENTRAIN events in the past. Their re-participation suggests that they found previous events in which they participated valuable. This equal distribution of those who had attended ENTRAIN events in the past and those who attended for the first time indicates that the information channels used by PNEC to inform about the training and other learning events are very effective.
- The majority of respondents rated the location, the content, the competence of the speakers, and the planning and organization of the event as very high.
- For all respondents, the training provided enough knowledge to understand innovative approaches to planning and developing small heat network systems.
- The topic of financing investments related to the development of small district heating networks using RES turned out to be very interesting.
- The presence of the representatives of the National Fund for Environmental Protection and Water Management as a speaker at the training courses significantly increases the interest of listeners and their active participation.
- Competence and knowledge of the speakers at the second training were assessed very positively, therefore it is considered to engage them in further events under ENTRAIN project and other events organized by PNEC.

6.3. Third local training

Summary

The speakers at the training were:

- Anna Fijas - Project Manager at the Association of Municipalities Polish Network "Energie Cités"
- Piotr Kleinschmidt - Forum Energii
- Rafał Kobyłecki, BEng, PhD, DSc, Prof. CUT - Faculty of Infrastructure and Environment, Czestochowa Univeristy of Technology
- Karol Sztekler, BEng, PhD - Faculty of Energy and Fuels, AGH University of Science and Technology
- Janusz Fic - President of Krośnieński Holding Komunalny Sp. z o.o.
- Paweł Jastrzębski - Innovation Director at MPEC S.A. in Kraków

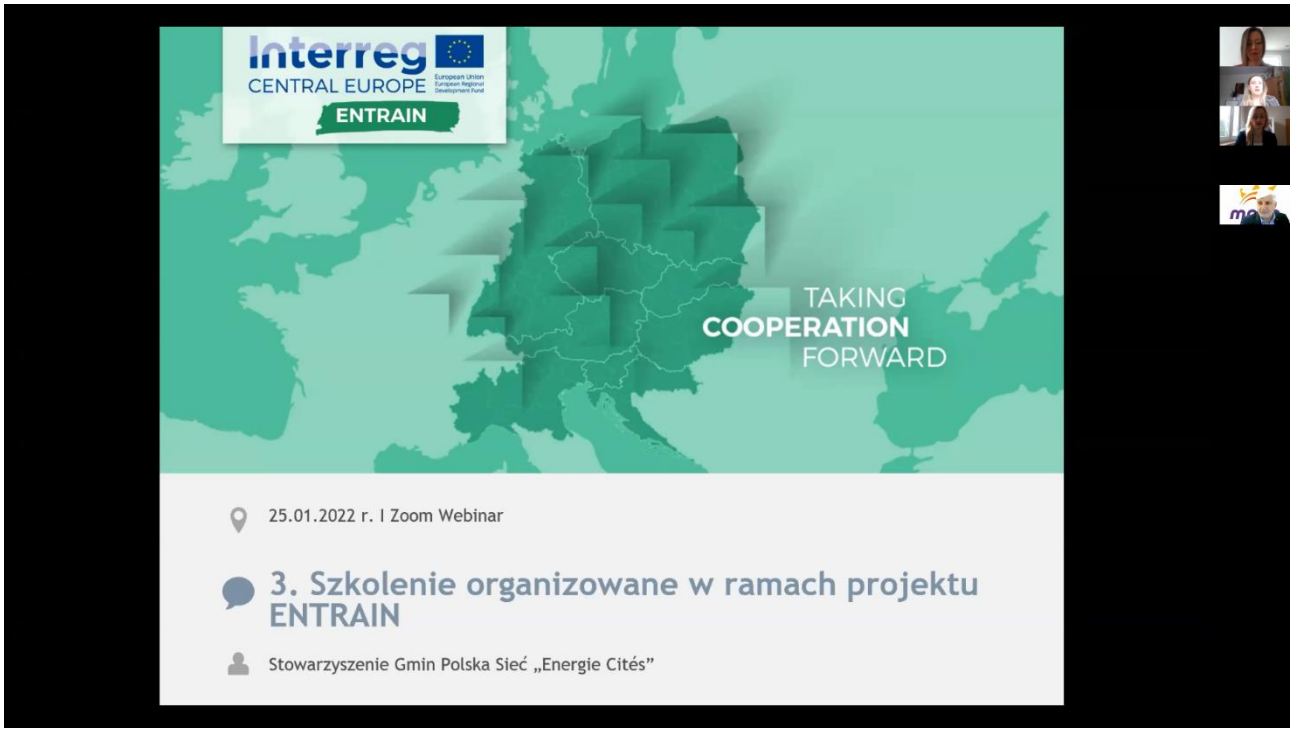
Environmental aspects related to the development of small district heating networks based on renewable energy sources were the topic of the third local training organised within the international project ENTRAIN. The event took place on 25 January 2022 in an online format.

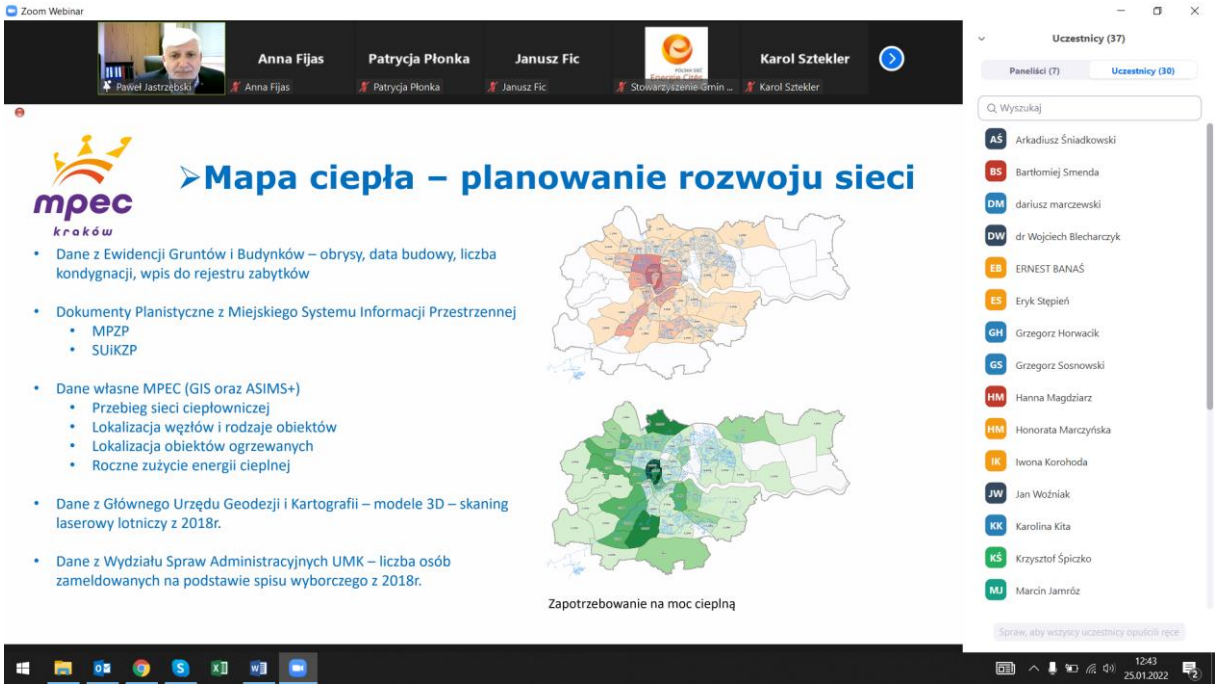
The event was opened by Patrycja Płonka - Project Manager of the Association of Municipalities Polish Network "Energie Cités", who welcomed and introduced the participants to the topic of the

meeting. After the introductory words, Anna Fijas, also a project manager in PNEC, presented the activities of the Association and the detailed scope of the ENTRIAN project - its objectives, stages and activities that have been carried out.

After a short introduction, the first speaker was Piotr Kleinschmidt from the Forum Energii. He discussed the current state of the heating sector in Poland and then focused on the sector's impact on air quality and climate. As we found out, the heating sector is responsible for 25% of the national CO2 emissions. It is therefore necessary to implement a new business model in district heating, which is presented in the report The district heating company of the future. New business model. The next speaker was Rafał Kobyłecki, PhD from the Częstochowa University of Technology, who presented selected technologies for cleaning gases from energy conversion processes. He also pointed out how many factors depend on the quality of combustion and the resulting undesirable products. PhD Karol Sztekler from the AGH University of Science and Technology characterised the use of adsorption units to produce cold from system heat and waste heat and RES. It is estimated that the cooling sector currently consumes about 20% of the total global electricity production.

After the speech of the AGH University of Science and Technology representative and a short break, the time came for a speech by Janusz Fic - President of Krosno Municipal Holding, who spoke about fuel diversification in the CHP plant. This enterprise uses a cogeneration unit, a biomass boiler and an energy unit fired with fuel based on municipal waste sorting residues. In the area of the municipality there is also an Energy Cluster established jointly with the Municipality of Krosno and the Carpathian State University, whose aim is to provide electricity for all units of the City of Krosno and the university. The last speaker was Paweł Jastrzębski from the Municipal Heat Supply Company in Kraków, who presented a pilot of the first RES implementation programme in Poland through the use of heat pumps as a solution for buildings beyond the reach of the district heating network.





Link to the event's report on our Association's website (polish and English version):

http://www.pnec.org.pl/en/3-aktualnoci-kat/822-podsumowanie-trzeciego-szkolenia-zorganizowanego-w-ramach-projektu-entrain

Training evaluation

- Some of the participants already took part in previous events organized within the ENTRAIN project. We are glad that our trainings are interesting and helpful in terms of transferred knowledge about the development of small district heating systems based on RES. Probably our social media and information channels, where the information about upcoming trainings and later reports and materials are posted, also work well.
- The training provided a lot of interesting information on environmental aspects related to the development of small district heating systems, not only in technical but also in practical way.
- During the training there were many questions from participants concerning speakers' statements related to the future of district heating, energy transition and RES development. Content and competence of the speakers were at a very high level, and thus it is possible to involve them again in future events organized by PNEC.

The topics of the next training will be adjusted to the needs of the target groups.

6.4. Fourth local training

Summary

The speakers at the training were:

- Anna Fijas - Project Manager at the Association of Municipalities Polish Network "Energie Cités"
- prof. Andrzej J. Osiadacz D.Sc. – Faculty of Building Services, Hydro and Environmental Engineering at the Warsaw University of Technology
- Łukasz Kamiński - Director of Energy Efficiency from Egain Poland
- Tomasz Mania - Association of Polish Heat Pump / University of Bydgoszcz
- Andrzej Piotrowski - Veolia Energy Poland
- Radosław Żegalski – CEO of MPEC Sp. z o.o. in Łomża

Optimisation and operation of small district heating networks using renewable energy sources was the topic of the fourth local training organised within the ENTRAIN project. The event took place on 15 February 2022 and was the last of a series of four training courses, each dedicated to different aspect of district heating.

The training started with a short welcome and introduction of participants to the subject matter of the meeting as well as the scope of the ENTRAIN project, under which we met, was presented.

The first speaker was Prof. Andrzej Osiadacz, D.Sc. from the Faculty of Building Services, Hydro and Environmental Engineering at the Warsaw University of Technology. The presentation covered the topic of simulation and optimisation programmes and their application in the management of district heating networks. The professor drew attention to the main objective of network management, i.e. minimisation of its operating costs. He also presented the basic factors which should be taken into account during network optimisation and the sources of data for calculation packages.

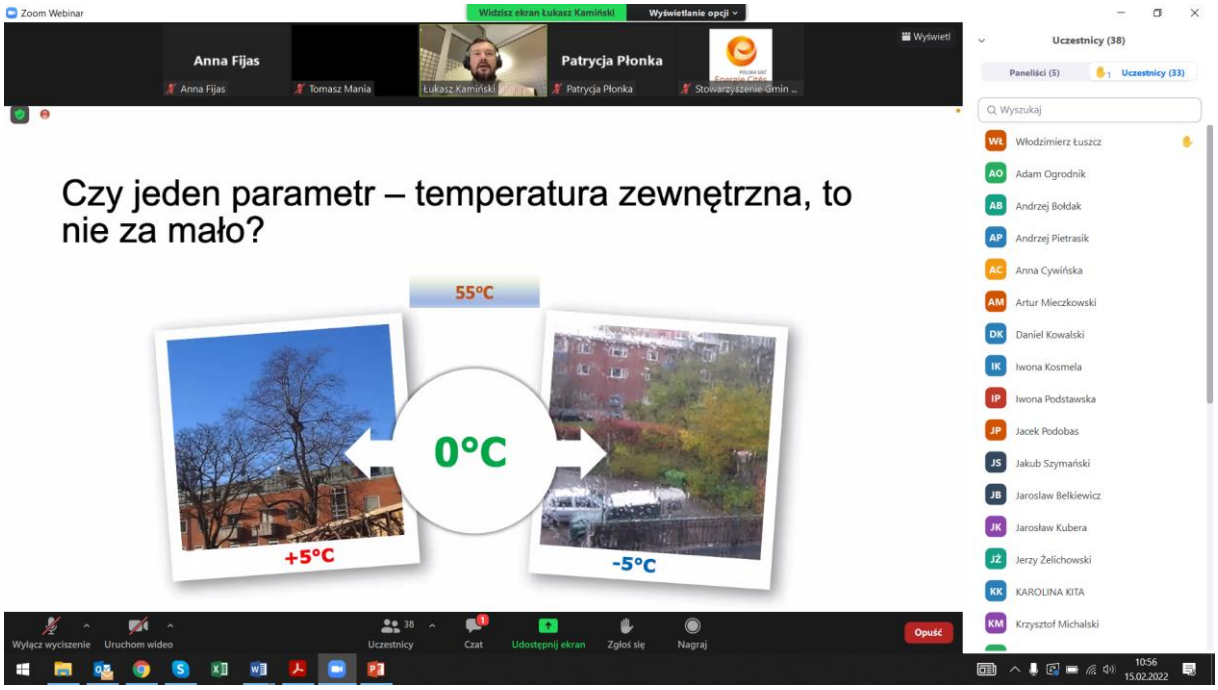
The second speaker was Mr. Łukasz Kamiński, Director for Energy Efficiency from Egain Poland, who spoke about the possibilities of using a building heat management to improve the efficiency of installations and reduce energy consumption. The participants learned, among other things, what variables are taken into account when creating algorithms for controlling heat quantity in buildings, what are the basic elements of such systems and how they work. Then, on the example of Polkowice Municipal Office building, the benefits of using a management system were presented. The use of such system brings energy savings of about 15% for residential buildings and 20% for public buildings.

The next presentation, covering the practical application of heat and cold storage systems, was delivered by Mr. Tomasz Mania, CEO of the Association of Polish Heat Pump and a representative of the University of Bydgoszcz. He presented various heat and cold storage technologies and examples of their application in Poland and abroad.

After a short break, the floor was taken by Mr. Andrzej Piotrowski form Veolia Energy Poland. The presentation covered the extension of the heat plant in Zamość with a small RDF heat plant, during

which the investment schedule was presented and the importance of public education in the implementation of such investments was emphasised. Additionally, the speaker characterised the situation in Poland and Europe, regarding energy recovery plants, and indicated that they are fully safe for the local residents.

The last speaker was the CEO of MPEC Sp. z o.o. in Łomża, Mr. Radosław Żegalski. His speech concerned the installation of biomass combustion in MPEC in Łomża. He presented the parameters of this installation, energy data and the environmental and economic benefits resulting from its use, and also spoke about the next investments planned by the company.


Zoom Webinar
Widzisz ekran Łukasz Kamiński
Wyświetlanie opcji
Anna Fijas
Tomasz Mania
Łukasz Kamiński
Patrycja Płonka
Stowarzyszenie Gmin ...
Wyświetl
Uczestnicy (38)
Panelisci (5)
Uczestnicy (33)
Wyszukaj
Włodzimierz Łuszcz
Adam Ogrodnik
Andrzej Bołdak
Andrzej Pietrasik
Anna Cywińska
Artur Mieczkowski
Daniel Kowalski
Iwona Kosmela
Iwona Podstawska
Jacek Podobas
Jakub Szymański
Jarosław Belkiewicz
Jarosław Kubera
Jerzy Żelichowski
KAROLINA KITA
Krzysztof Michalski
Czy jeden parametr – temperatura zewnętrzna, to nie za mało?
55°C
0°C
+5°C
-5°C
Wyłącz wyciszenie
Uruchom wideo
Uczestnicy
Czat
Udostępnij ekran
Zgłoś się
Nagraj
Opuść
10:56
15.02.2022


Zoom Webinar
Anna Fijas
Radosław Żegalski
Andrzej Piotrowski
Patrycja Płonka
Stowarzyszenie Gmin ...
Łukasz Kamiński
Nagranie
Dlaczego potrzebne są instalacje termicznego przekształcania odpadów?
surowce
energia
ciepło
energia
ZOE
Zakład Odzysku Energii
nierecyklingowalna frakcja resztkowa powstała po procesach odzysku i recyklingu odpadów komunalnych
PRODUKCJA
KONSUMPCJA I UŻYCIE
RECYKLING
produkt
Zapobieganie
Przygotowanie do ponownego wykorzystania
Recykling
Inna metoda odzysku
Likwidacja
Opcja najbardziej pożądana
Opcja najmniej pożądana
9
12:11
15.02.2022

Training evaluation

- A large part of the participants had already taken part in previous local trainings organized within the ENTRAIN project. This means that our training series was useful and interesting for our participants and with each training enriched their knowledge about the development of small district heating networks using renewable energy sources.
- The training on optimization of district heating systems covered many technical aspects in a very practical way.
- Our speakers were very well prepared, which was also appreciated by the participants, who asked them questions to make their speeches more detailed.
- Participants showed great interest in receiving the materials from this training and those who did not attend the previous meetings are also willing to familiarize themselves with the recordings of the first, second and third local training within the ENTRAIN project.

7. LOCAL TRAININGS IN SLOVENIA

7.1. First local training

Summary

The first local training with local stakeholders was organized together with the second meeting of local stakeholders (2nd RSAG meeting) on June 10, 2020, in Ptuj (Slovenia). The meeting was attended by a total of 7 participants, excluding project partners responsible for the organization and lectures. The local training was attended by experts in the field of energy and district heating systems, and also local decision-makers who take care of energy policy in the local environment. The training was extremely successful and useful for all participants.

Training evaluation

Together with the 2nd RSAG meeting, the participants assessed the local training on pre-prepared questionnaires. The questionnaires were based on the ENTRAIN project proposal and translated into the national language.

Local training was rated excellent (5), which means that participants were extremely satisfied with the 1st local training. As the technical and professional staff was also present at the meeting, they were already familiar with certain things (such as the preliminary feasibility study, etc.), but the training was still interesting and useful for them.

THE QUESTIONNAIRE FOCUSED ON:

- Suitability of the event location
- Content of prepared material
- Staff assistance
- Event planning and organization
- Was the event useful in the future?

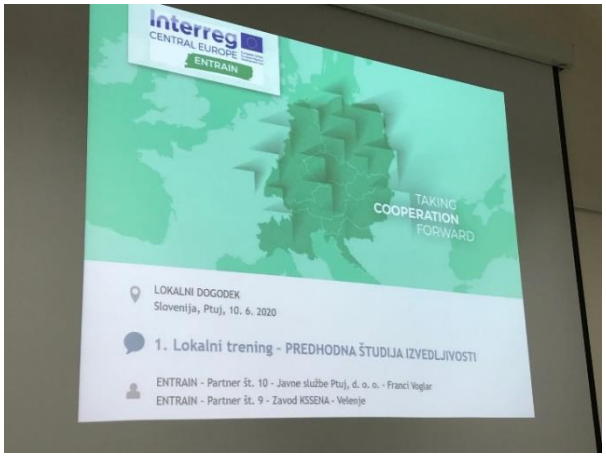
SUMMARY OF QUESTIONAIRE

HAVE YOU EVER PARTICIPATED IN ENTRAIN EVENTS?	YES	NO
VOTES	6	1

OVERALL SATISFACTION:	RATING
Location of the event?	4.9
Content?	4.7
Staff assistance?	5.0

Planning and organization?	4.9
WAS THE EVENT USEFUL FOR THE FUTURE INNOVATIVE PLANNING AND DEVELOPMENT OF SMALL DISTRICT HEATING NETWORKS ON RES?	VOTES
Yes, definitely!	4
Yes, it was!	3
Not really!	0
Not at all!	0
HOW DID YOU FIND OUT ABOUT THE EVENT?	VOTES
Internet?	0
Invitation?	6
Acquaintance?	0
Other?	1

PICTURES OF THE EVENT



7.2. Second local training

Summary

The 2nd local training was organized together with the 3rd meeting of local stakeholders (3rd RSAG) online, via the Microsoft Teams online platform. The training took place on January 20, 2021, starting at 9 p.m. The meeting was attended by about 14 participants, including 8 participants who attended the training for the first time. The training was attended by energy experts as well as individuals who take care of energy development and orientations at both the local and regional level. The topic of the training was “Economics and financing of district heating systems based on renewable energy sources. The content of the training was held in accordance with the agenda. The training was successfully completed and useful for all participants.

- Training evaluation

For the needs of the training evaluation, we prepare an online survey on the satisfaction of the participants. The rating was given by 11 out of a total of 14 participants at the event. Overall, the event was rated 4,8 which is great for us and very encouraging going forward. A summary of the research is attached below.

General assessment of the event and content:

How satisfied were you with the whole webinar?	4,8
How to evaluate the presentation: "Economic feasibility of RES DHS (Wood biomas)" - (Voglar F.)	4,6
How to evaluate the presentation: "Comparison of heating costs" - (Mozgan S.)	4,4
How to evaluate the presentation: "Economic feasibility of the solar system" - (Jurko N.)	4,6
How to evaluate the presentation: "Grants for the construction of RES DHS" - (Voglar F.)	4,8

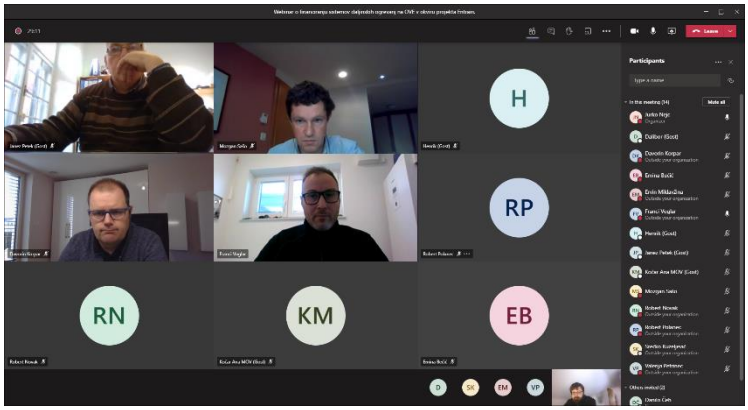
Choosing the most effective presentation:

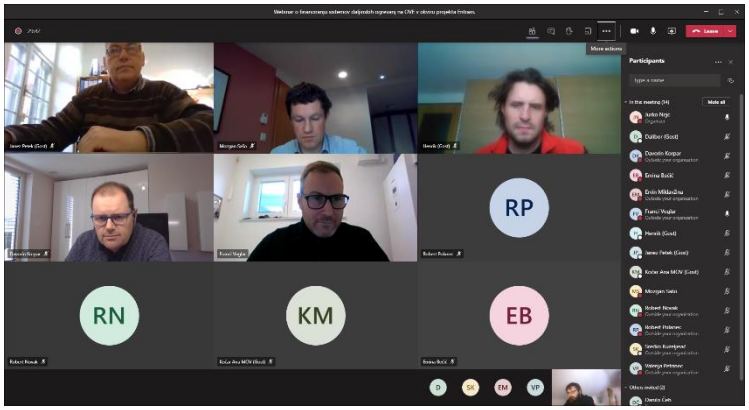
Which of the presentations was most important for your future work? [Economic feasibility of RES DHS (Wood biomas)]	6,0
Which of the presentations was most important to you for your future work? [Comparison of heating costs]	4,0
Which of the presentations was most important to you for your future work? [Economic feasibility of solar heating]	5,0
Which of the presentations was most important to you for your future work? [Grants for the construction of RES DHS]	3,0

Overall rating and comments:

Which topic would be interesting for you in the future and would you like to listen to?	Flue gas cleaning from RES DHS - Wood biomass.	Modern approaches to RES DH planning (shining examples)	
Tell us what you liked about the meeting and the webinar. what could be improved.	Everything was OK.	Excellent organization and moderation of the event	The webinar lasted long enough, suitable, interesting and useful topics were presented
How did you find out about this event?	9 x - Based on the invitation	1 x - Friend invited me	

Photos from the event:





7.3. Third local training

- Summary

local training was organized together with the 4th RSAG meeting. The training was organized "online" through the online platform Microsoft Teams. 3. Local training started at 11:30 am according to the agenda sent to all participants. The training was attended by a total of 21 participants coming from various organizations, companies and institutions. According to the topic - "Emissions, air quality, fuel and ash logistics in district heating systems on wood biomass", the training was attended by experts from various fields of their work, both in the field of energy and other professionals. The topic was very interesting and in a way even desirable, as there is a lack of rich experience in this field. In any case, the training was very successful and had a very important impact on both the participants and the organizers of the training.

- Training evaluation

We prepared an online survey for all participants, in which they assessed both the organization of the event and the prepared content. The evaluation was given by a total of 14 participants, who generally rated the event with a score of 4.7, which for us represents the fact that we performed the event perfectly. A summary of the research is attached below.

How satisfied were you with the 3rd local training?	4,7
How would you rate the presentation: Emissions and air quality?	4,8
How would you rate the presentation: Ash and how to handle it (Ash and how to handle it)?	4,8
How would you rate the presentation: Emission limits in Slovenia - legislation?	4,7
How would you rate the presentation: Basics of flue gas cleaning?	4,8

Which of the presentations was most important to you for your future work? [Emissions and air quality]	4 votes
Which of the presentations was most important to you for your future work? [Ash and how to handle it.]	2 votes
Which of the presentations was most important to you for your future work? [Emission limits in Slovenia – legislation]	5 votes
Which of the presentations was most important to you for your future work? [Basics of flue gas cleaning.]	3 votes

Which topic would be interesting for you in the future and would you like to listen to it?	No answers given		
Trust us, how did you like the training or what could you improve?	Great organization	There have been many examples from practice.	Great!
How did you find out about this event?	9 x Based on the invitation	2 x Based on a friend's invitation	3 x Through social networks

Photos from the event

1.1. Fourth local training

Summary

local training was organized together with the last 4th meeting of local stakeholders (4th RSAG meeting). The training was organized "online" through the online platform Microsoft Teams. 4. Local training started at 13:15 according to the agenda sent to all participants. The training was attended by a total of 21 participants coming from various organizations, companies and institutions. This time the topic was "Operation and optimization of district heating systems based on renewable energy sources". The training was attended by energy experts as well as experts from other fields. The topic aroused great interest among almost all participants, as it can be seen that energy experts in our field do not have extensive experience in this field. In any case, the training was very successful and had a very important impact on both the participants and the organizers of the training.

Training evaluation

As in the third local training, this time we prepared an online survey on the satisfaction of participants at the event, as well as the satisfaction of the presentations that were presented. The evaluation was given by a total of 14 participants, who generally rated the event with a rating. In general, the event was rated with a score of 4.8, which for us represents the fact that we performed the event perfectly. A summary of the research is attached below.

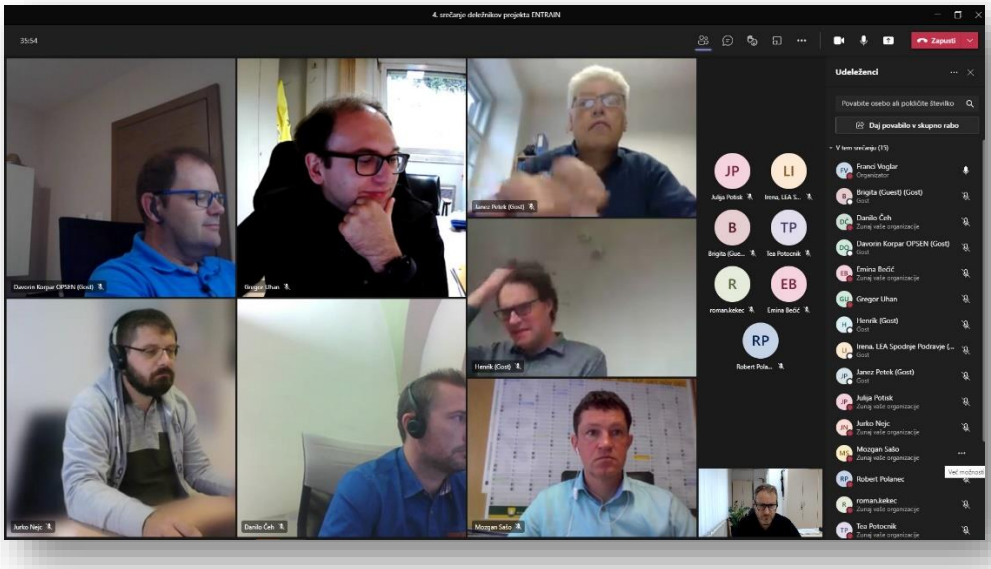
How satisfied were you with the 4th local training?	4,8
How would you rate the presentation: Operation of biomass district heating plants?	4,8
How would you rate the presentation: Practical examples for optimization of district heating systems?	4,9
How would you rate the presentation: Plant monitoring according to QM (Plant monitoring according to QM-system)?	4,7

Which of the presentations was most important to you for your future work? [Operation of biomass district heating plants?]	8 votes
Which of the presentations was most important to you for your future work? [Practical examples for optimization of district heating systems?]	4 votes
Which of the presentations was most important to you for your future work? [Plant monitoring according to QM-system?]	4 votes

Which topic would be interesting for you in the future and would you like to listen to it?	No answers given

Trust us, how did you like the training or what could you improve?	1 x Great organization		1 x Great!
How did you find out about this event?	9 x Based on the invitation	2 x Based on a friend's invitation	3 x Through social networks

Photos from the event



8. CONCLUSIONS

Within the train the trainer sessions and the local trainings the contents funding/economy, operation and optimisation, consumer relations, emissions/air quality, fuel and ash logistic (as defined for Output O.T2.3 target group oriented training sessions) were addressed. Overall, a comprehensive knowledge transfer on these defined and further relevant topics took place.

Within the local trainings the most important target groups could be reached.

All trainings (train the trainer as well as local trainings) were evaluated by the organising partners. As can be seen from the results of the training evaluations, the satisfaction level of the reached stakeholders is generally very high.

Valuable feedback from the audience and requests from participants (during the trainings and also from the evaluation questionnaires) concerning the content of the trainings have been considered for the setup of upcoming trainings.

Due to the Covid crisis, all trainings have been performed as webinars instead of personal meetings. An initial disadvantage through the need for re-organisation of the whole setting was given. However, the performance of the trainings as webinars showed important advantages by being able to (easier) reached a larger group of participants and easy recordings of the training sessions. These recordings can still be used for training purposes individually, also beyond the project. Therefore, webinars have been performed until the end of the project (even if the pandemic situation would have allowed personal meetings again).

All training materials are freely available to interested parties at the project website (www.interreg-central.eu/Content.Node/ENTRAIN.html - see section “Training Toolbox”).