Project final event -Brussels, March 17th, 2022

Supporting tools for renewable district heating

ENTRAIN, Ambiente Italia Srl, Riccardo Battisti

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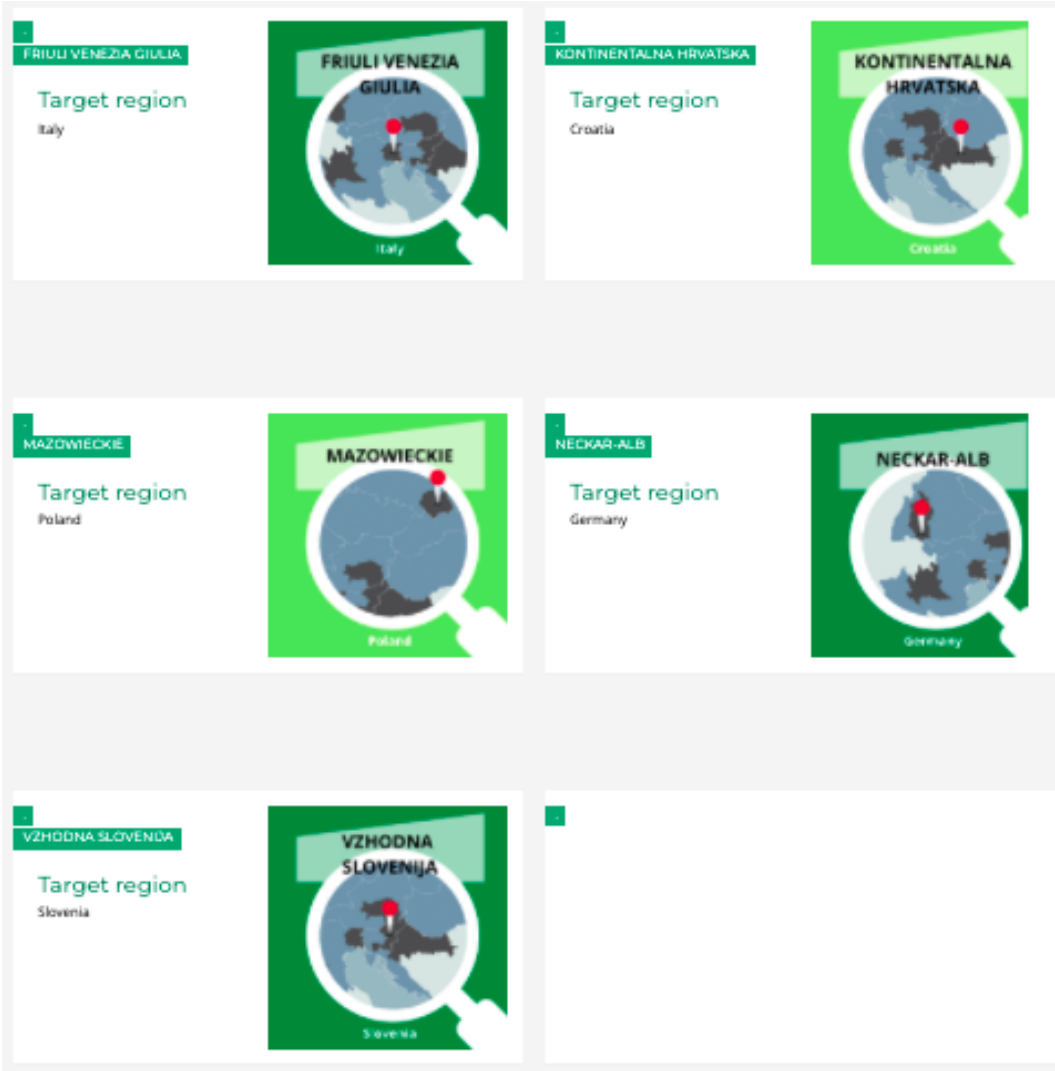

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AMBIENTEITALIA
we know green

REGEA

AEE INTEC

solites

APE

ENERGIEAGENTUR Steiermark

HCF Holzenergie-Fachverband Baden-Württemberg e.V.

Regionalverband Neckar-Alb

KSSENA

javne službe ptuj

POLSKA SIEĆ Energie Cités

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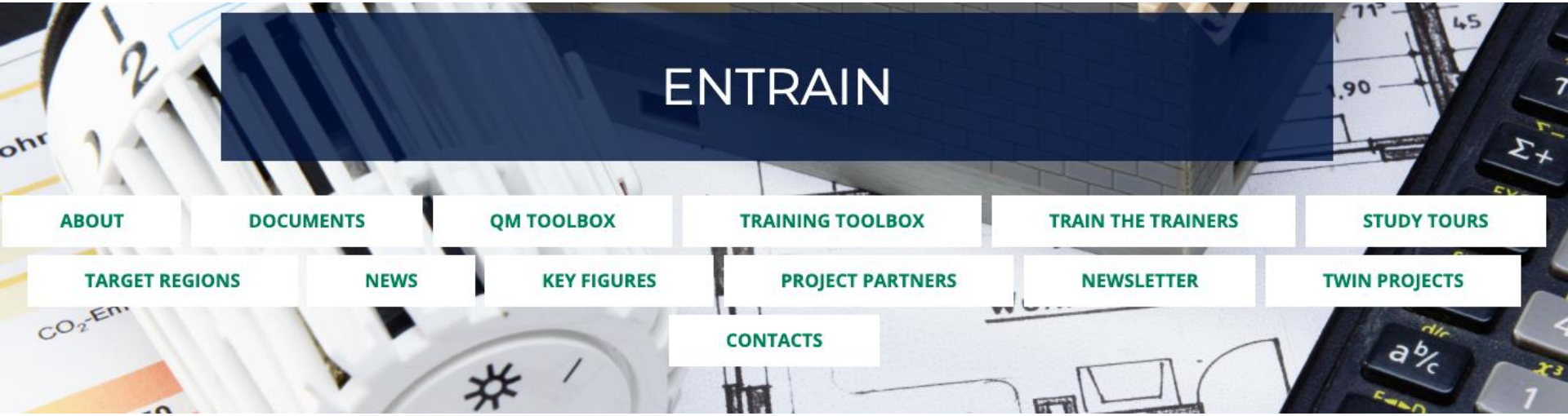

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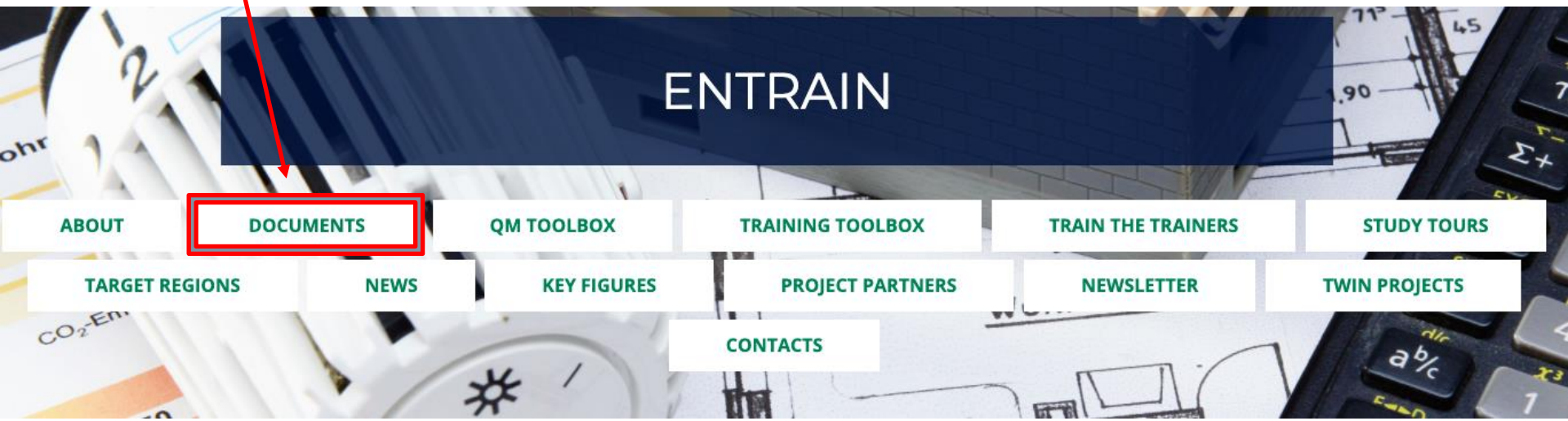
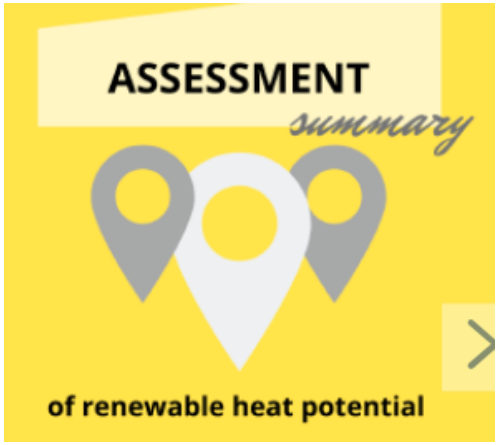
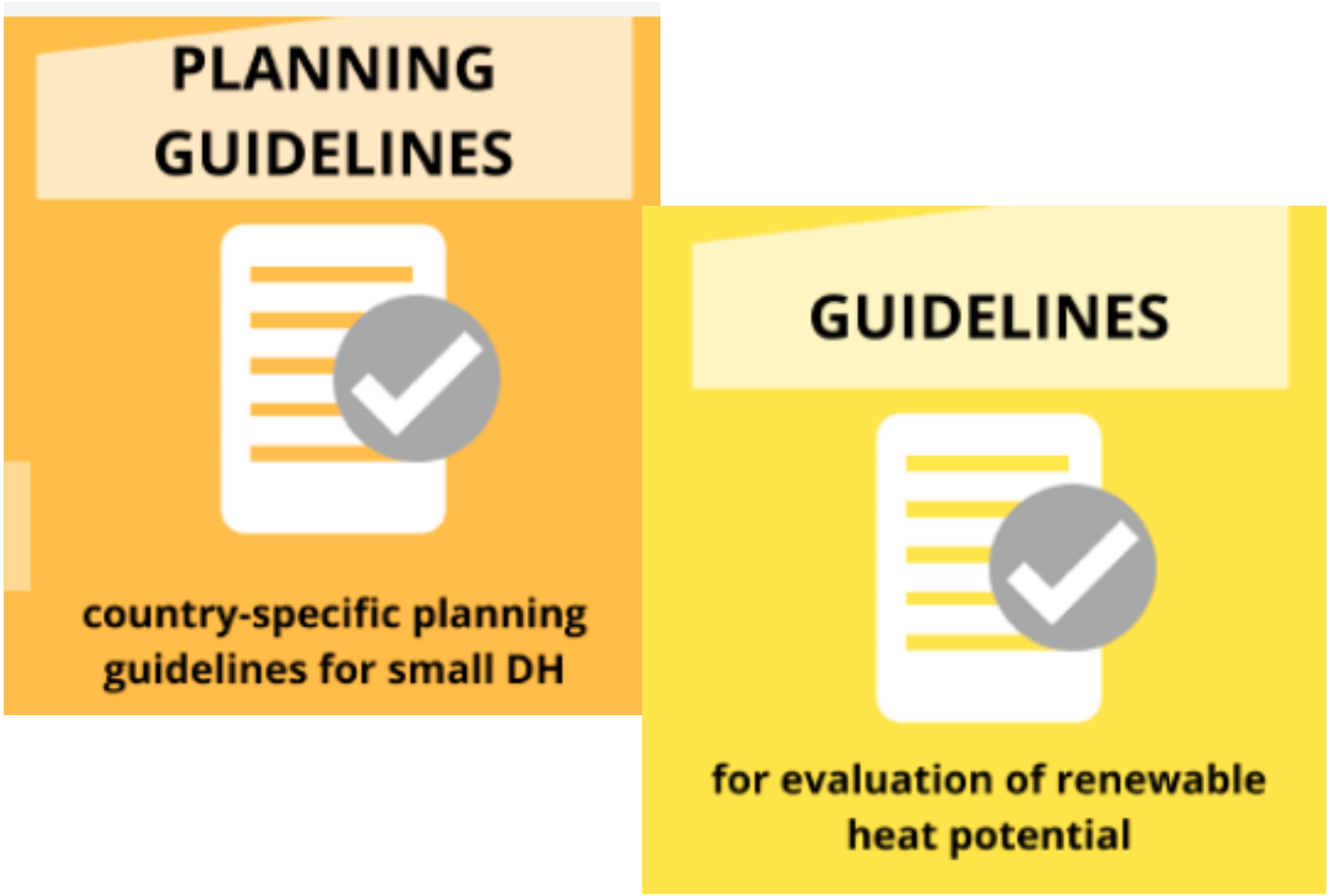



REGIONAL
ACTION PLANS
summary
overview of the 5 action plans


INITIAL SURVEY
summary
in the target areas


ASSESSMENT
summary
of renewable heat potential


PLANNING GUIDELINES
country-specific planning guidelines for small DH
GUIDELINES
for evaluation of renewable heat potential

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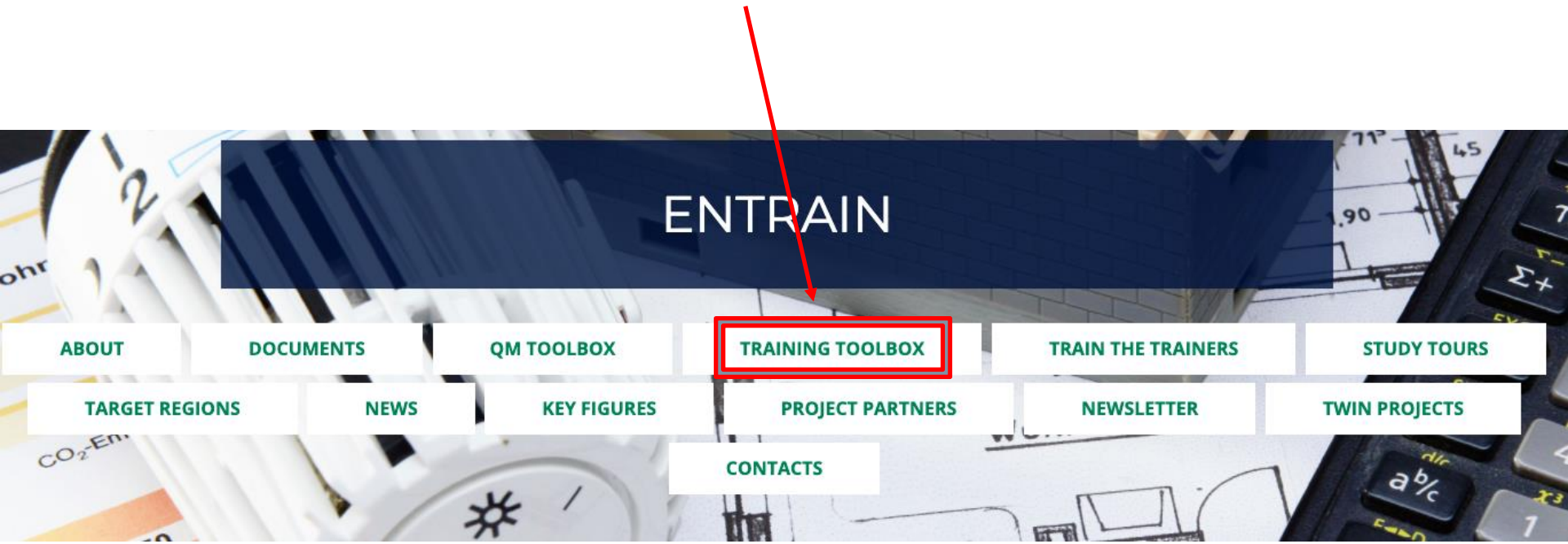

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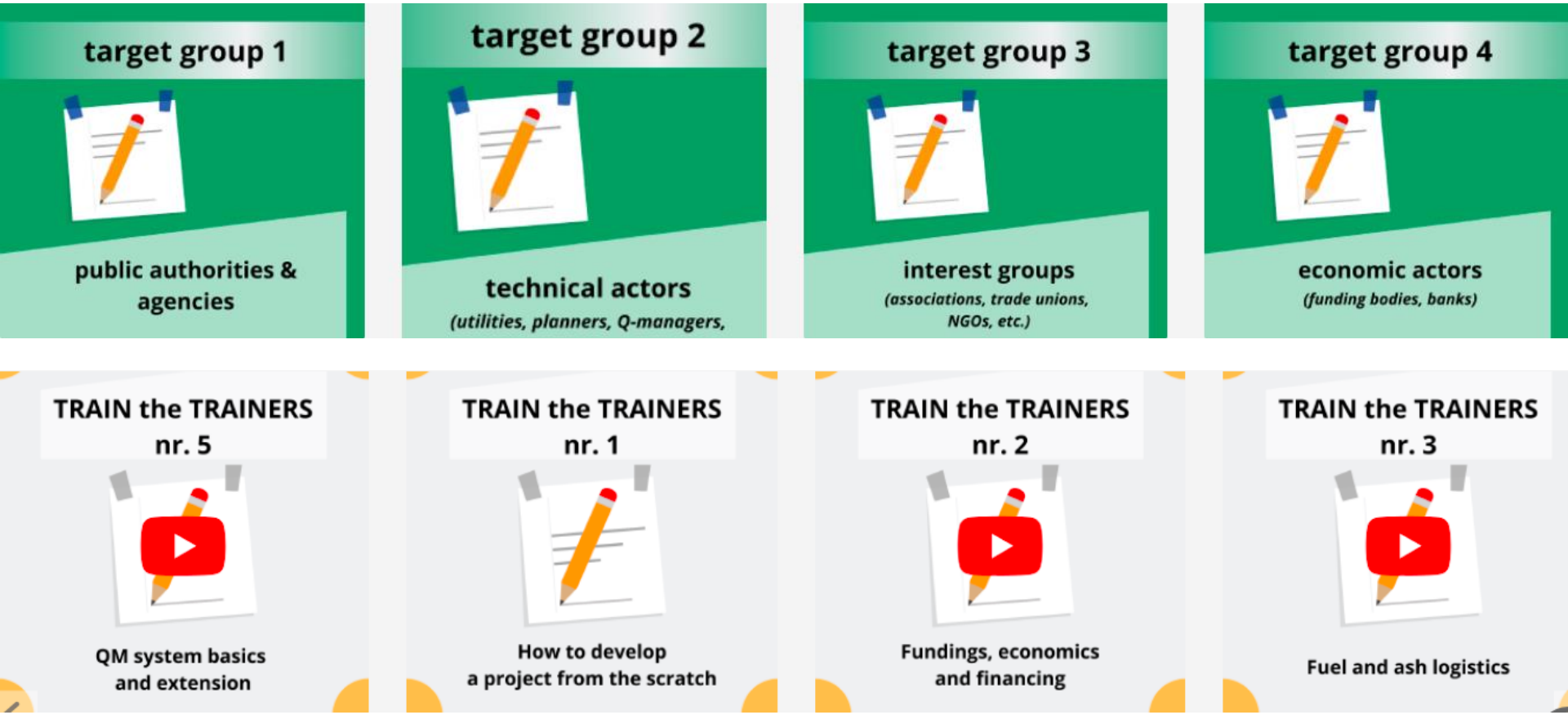

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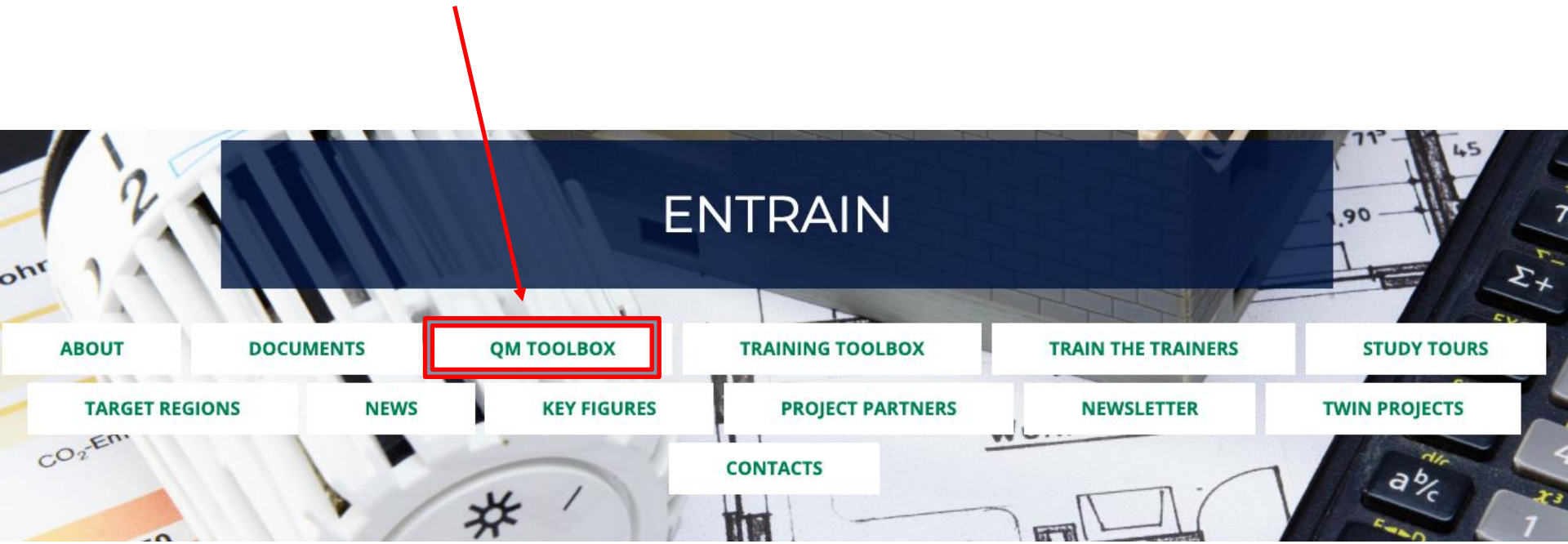


Q-GUIDELINES
QM
Biomass DH Plants
QM process and quality requirements
PLANNING HANDBOOK
QM
Biomass DH Plants
Professional planning
QM system doc.
QM
Biomass DH Plants
Standard hydraulic schemes Part 1
QM system doc.
QM
Biomass DH Plants
Standard hydraulic schemes Part 2
(short version)
QM system tool
QM
Biomass DH Plants
Economic Profitability Calculation

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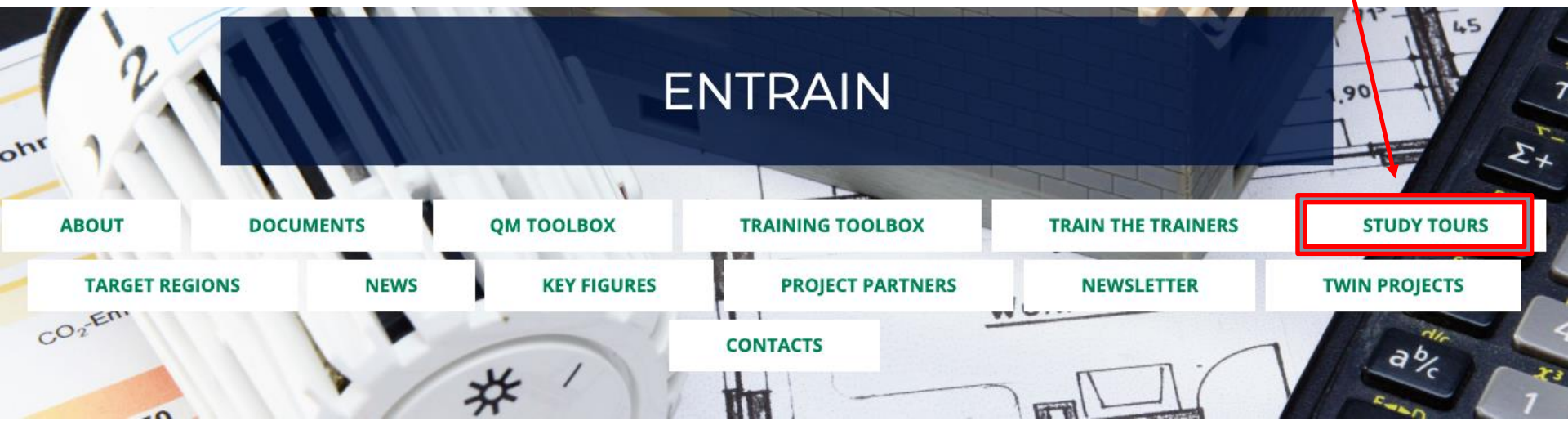

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A virtual study tour to the world's largest LTDH-grid

Since the pandemic prevents COOL DH project from welcoming visitors and arranging study tours, Lund Municipality and Kraftringen decided to arrange a virtual study
can join whenever you like. In this video Markus Paulsson, energy str
and Sara Kralmark, project manager at Kraftringen, guide us through
low temperature district heating grid in Lund.

(10:42 min)

Biggest solar-thermal plant of Berlin

In Berlin Köpenick, Vattenfall has commissioned the city's largest solar thermal plant to date (2018).

(2:05 min)

Randegg heating network - interviews

In August 2018, a solar thermal collector field will be commissioned in the Randegg heating network in addition to the biomass boilers. Bene Müller from Solarcomplex AG expects that the boilers will thus remain switched off during the summer months. (www.solare-waermenetze.de)

This video was created as part of the Solnet4.0 project.

https://www.youtube.com/watch?v=p74kCshN5i4 (0:36 min)
https://www.youtube.com/watch?v=hhT_Rya2jEk (6:05 min) https://www.youtube.com/watch?v=QxmqWxa9qPY (0:38 min)

Interview with Eckard Veil (Technical Managing Director Energie und Wasser Potsdam) about the

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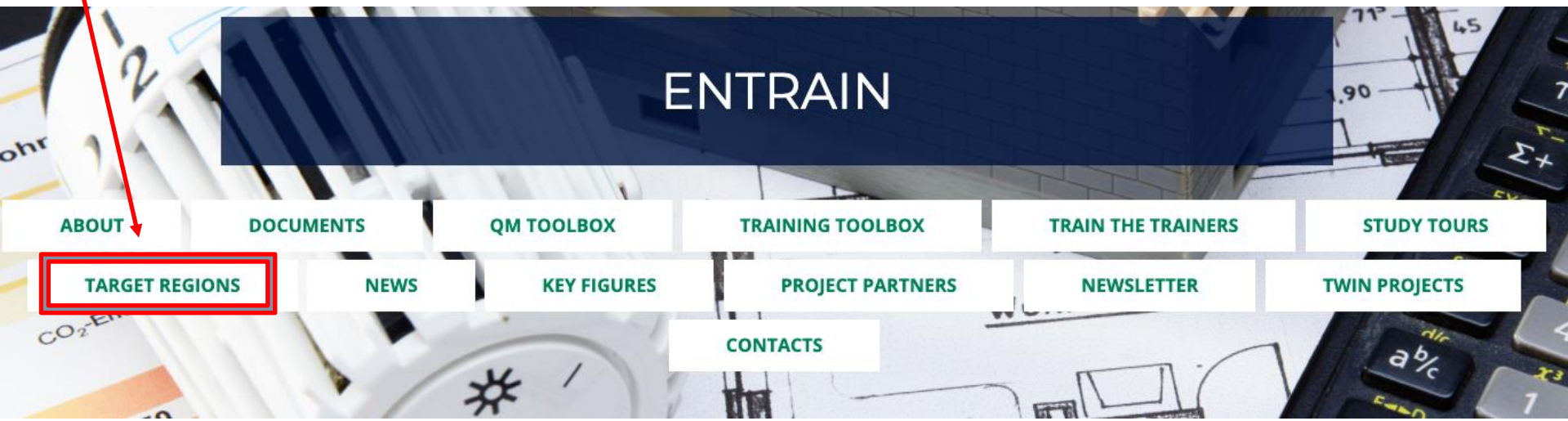

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 952873.

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RES DHC
Renewable Energy Sources for District Heating and Cooling

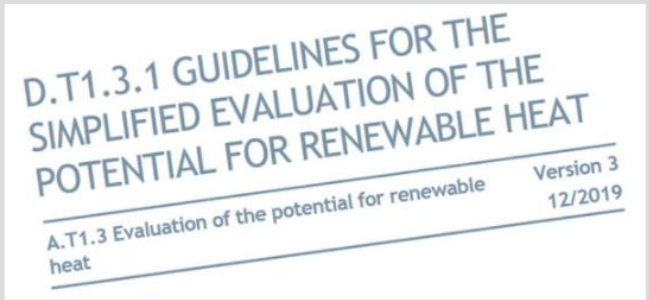
Toolbox

You are here: Home | Know-How | Toolbox

The right tools to move your project forward!

You want to decarbonize your DHC system, but you do not know exactly how? Or you already have some concrete ideas? Then you are sure to find a suitable tool here that will help you!

Many research projects and other institutions have already developed some useful tools and guidelines on the topic of decarbonizing DHC, which are available online and free of charge. The RES-DHC project elaborated this online toolbox out of them.



Guidelines for the Simplified Evaluation of the Potential for Renewable Heat

Heat Roadmap Europe

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 952873.

CONTATTI

AMBIENTEITALIA
we know green

Email: riccardo.battisti@ambienteitalia.it

https://it.linkedin.com/in/riccardobattisti

www.linkedin.com/company/ambiente-italia-srl

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@AI_AMBIT

And now…

To the ENTRAIN regions!

Project final event - Brussels, March 17th, 2022

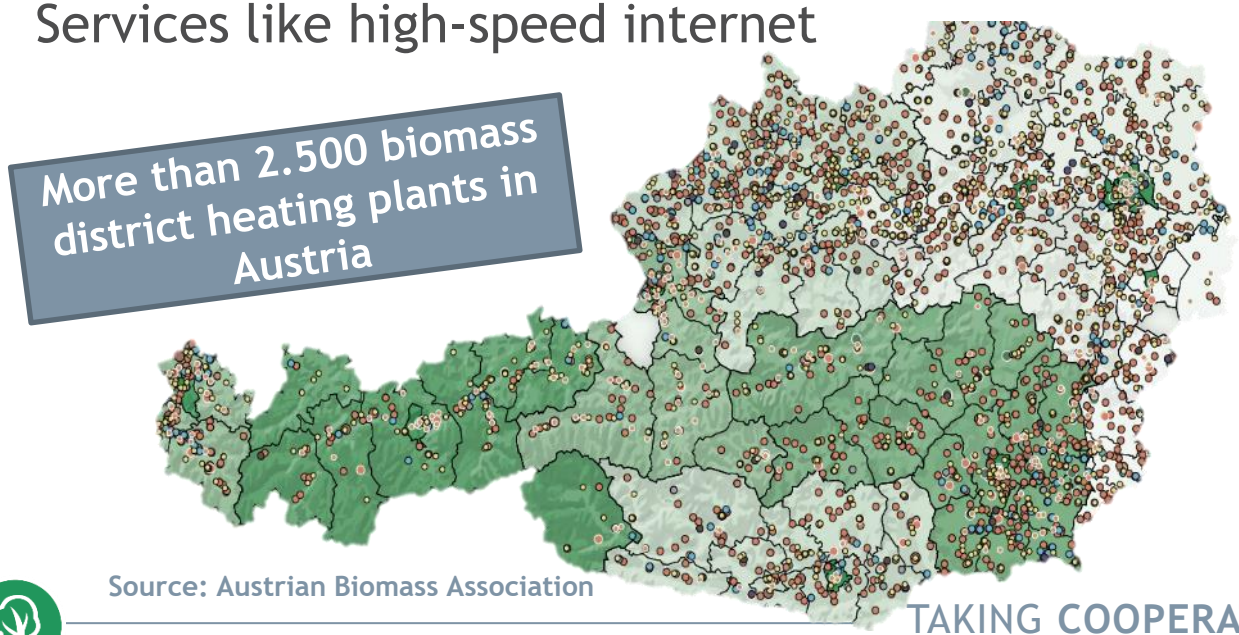
Consistent framework for RES DHC
The Austrian experience

ENTRAIN | AEE INTEC | Sabrina Metz

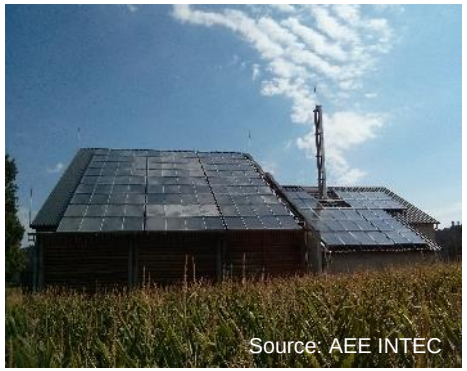
AEE INTEC

RENEWABLE DH IN AUSTRIA

- District heating grids are an important infrastructure
- Best Practice Examples: inclusion of alternative renewable heat sources to biomass (solar thermal, waste heat)
- Becoming more and more efficient:
  - Lower system temperatures and losses of the grids
  - Heat recovery systems in the plants
- Services like high-speed internet



Source: Austrian Biomass Association



AUSTRIAN FUNDING SCHEMES FOR RENEWABLE DH SYSTEMS

Funding for biomass district heating:

- Investment subsidies 25 – 30% (35%) of total investment
  - Engineering + quality management
  - Boiler house + components
  - Piping and electricity, Fuel storage
  - District heating network + substations


Source: QM Heizwerke database

Subsidies for

- New plants and networks
- Enlargement of existing plants/networks
- Plant optimisation
- Solar thermal plants – big solar (40-50% funding)
- Heat coupling (waste heat, ...)
- Heat pumps
- Innovative DH systems (combined technologies)

MAIN FUNDING CRITERIA

- Annual efficiency of plant + DH network > 75%
- Share of renewables in DH-system > 80%
  - average > 97 %
  - approx. 50% of plants have fossil backup-/peak load-boilers
- CO_2 savings required
  - funding limited with 1
- Emission limits [illegible] limits required

Nominal thermal power		≥ 5.000	≥ 10.000 kW
NOx * *[mg/Nm³]*			
Dust * *[mg/Nm³]*		50	

Biomass Plants and RES DH systems
QM for Biomass DH Plants obligatory

CURIA RATIONIUM
EUROPEAN COURT OF AUDITORS

- Heat delivery contracts for 75% of planed heat sale
  - before funding proposal is evaluated

QM
Biomass DH Plants
in Austria
klimaaktiv
QM Heizwerke

klimaaktiv

Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

BEST PRACTICE EXAMPLE MILLSTATT, CARINTHIA

Total output of installed biomass boilers	3.000 kW
Grid length	5,8 km
Nominal heat load of consumers	6.100 kW
Number of consumers	90
Initial operation year	2014

- High-efficiency district heating
- 2 biomass boilers
- Heat storage (70 m^3)
- Heat recovery: Flue gas condensation (20% of heat output per year)
- Low temperature grid
- Less then 10% net losses
- Optimisation of plant/network and on customer side
- Hydraulic optimization of heat consumers
- PV-system 50 KWp

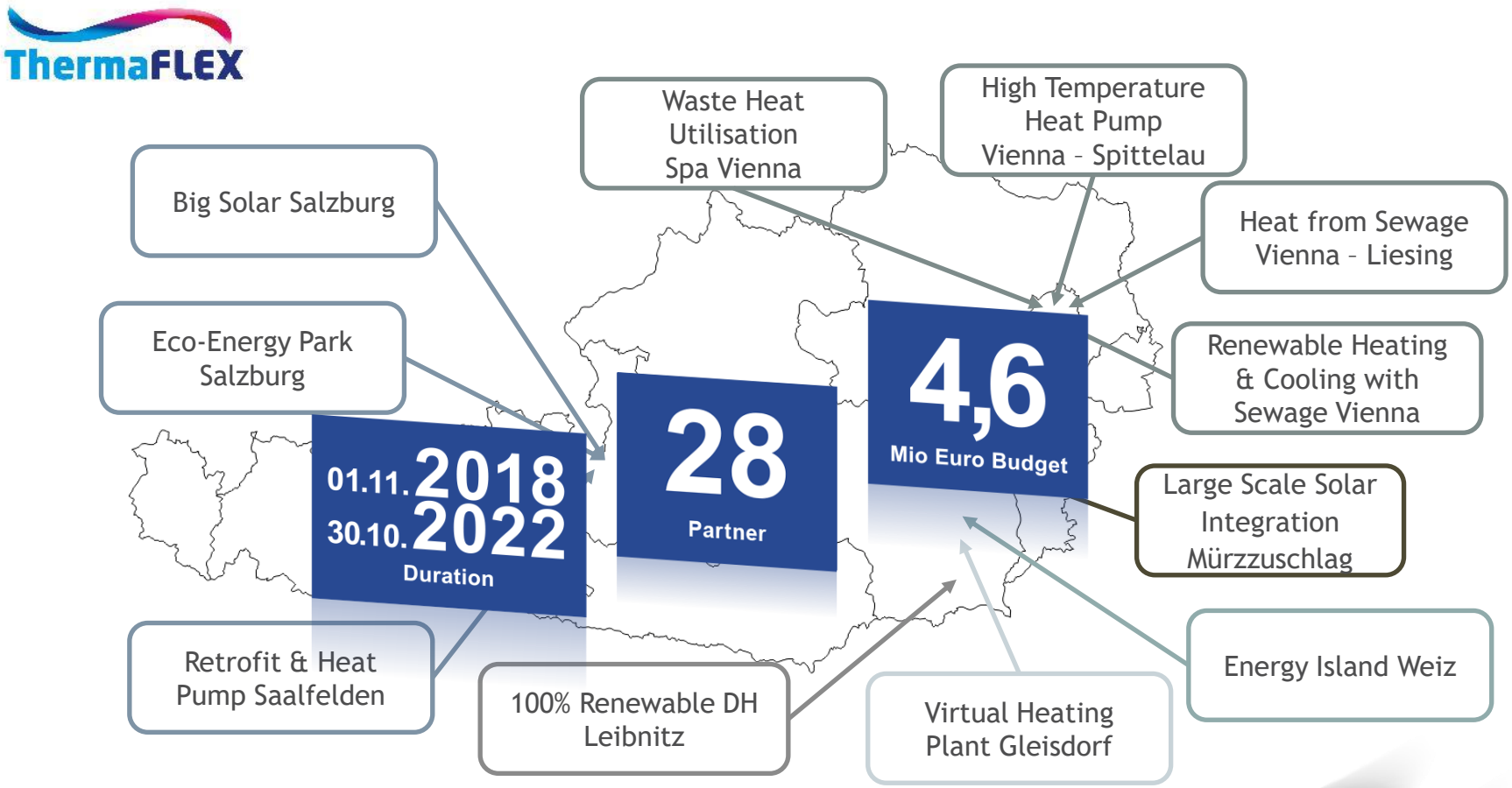
BIG SOLAR ST. RUPPRECHT

- 2003: 1st biomass DH plant in St. Rupprecht (Styria)
- 2011: Plant was extended by 2nd biomass boiler
- 2020: large-scale solar thermal plant
  - 1590 m^2 collector area
  - 138 m^3 buffer storage
  - Intelligent control
  - Covers total heat demand in summer
  - Can handle power peaks in winter
- One-year monitoring by AEE INTEC
  - Good results
  - Well designed control system
    - Biomass plant & solar plant (solar irradiaton)
- Funded by the Climate and Energy Fund "Large-scale solar plants“
- Awarded the Austrian Solar Prize 2021 by EUROSOLAR AUSTRIA
  - Gasokol
  - Nahwärme St. Rupprecht

More heat customers

Higher efficiency

FLAGSHIP PROJECT THERMAFLEX – DEMONSTRATION CASE STUDIES DH

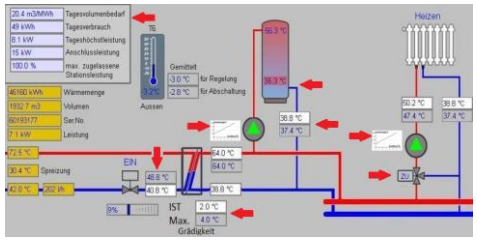


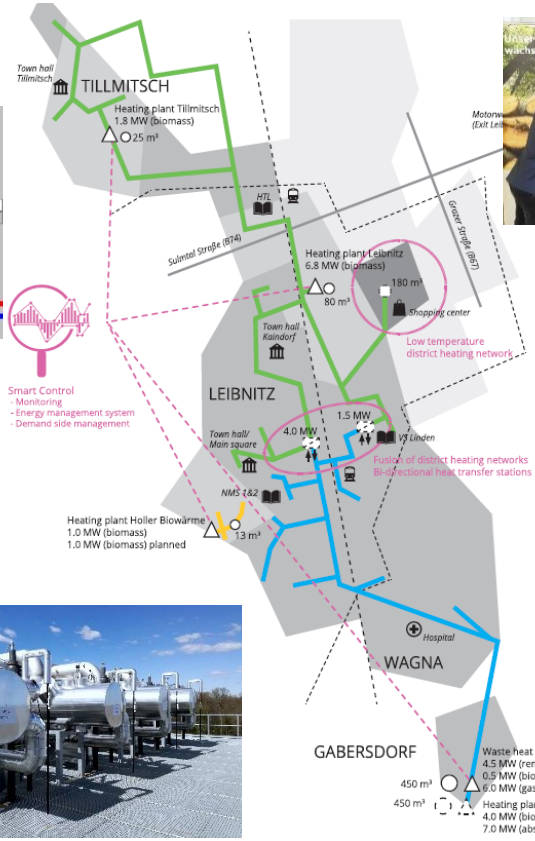
100% RENEWABLE DISTRICT HEATING LEIBNITZ – REGIONAL ENERGY HUB

ThermaFLEX

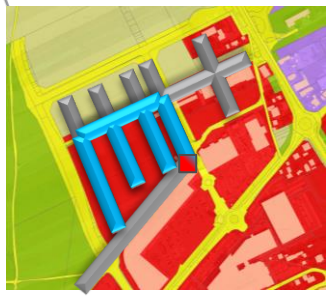
modernisation & optimisation of heating plants

smart control (EMS & DSM)





stakeholder & user integration



low-temperature DH solutions

Interconnection & massive expansion of DH networks

waste heat utilisation

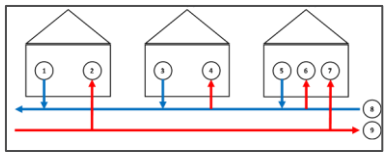
storage integration & management

Source: AEE INTEC

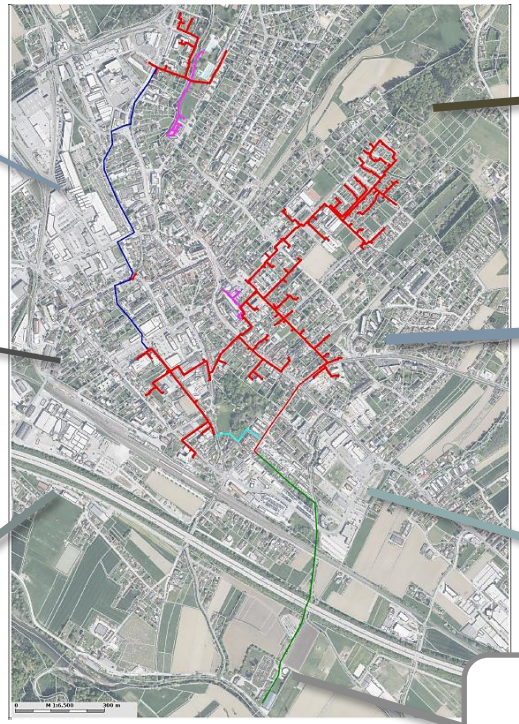
VIRTUAL HEATING PLANT GLEISDORF

Heat pump solutions

Supply from Return & low temperature branches



Central & decentral storage options



Source: Stadtwerke Gleisdorf

Monitoring and control

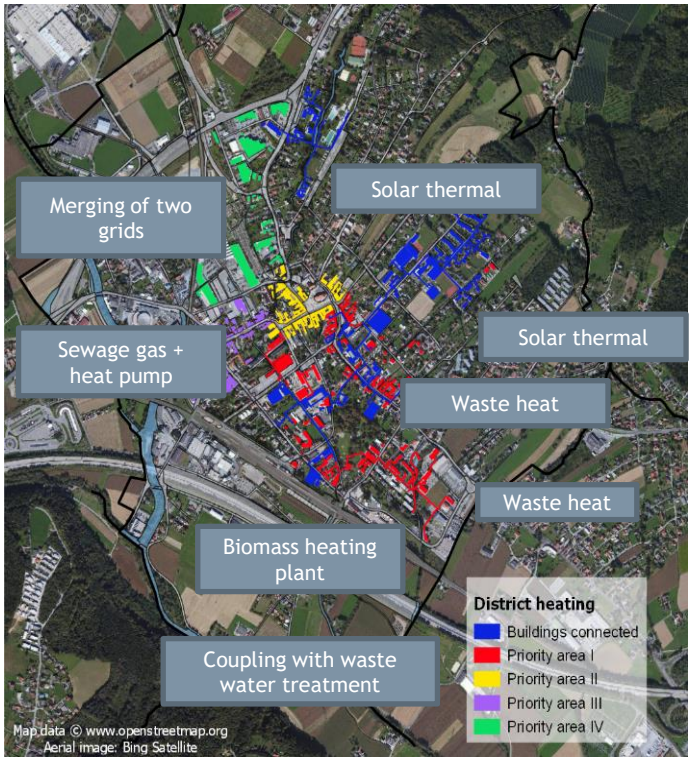
User & stakeholder integration

Embedding in spatial energy planning process

Integration Wastewater treatment plant

FRAMEWORK FOR FUTURE RES DHC

- Awareness of policy makers, operators and customers
  - Stakeholder integration and communication
- Strategic development of plants
  - Continuous optimisation and adaption vital
  - Long lasting process
- Funding with strict criteria
  - Coupled with QM for Biomass DH Plants
- Link to spatial energy planning
  - Grid densification and extension
  - New customers (switch to renewables)
- Knowhow concerning technology
  - Trained planners, ...
- Use options for improving DH and portfolio
  - All available renewable energy sources
  - Innovative projects – coupling and merging – DH as energy hub
  - Synergies with other infrastructure



THANK YOU!

Sabrina Metz
AEE INTEC
Feldgasse 19, A-8200 Gleisdorf

www.interreg-central.eu/entrain
www.biomass-dh-plants.com
www.aee-intec.at

s.metz@aee.at

+43 3112 5886-234

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Project final event - Brussels, March 17th, 2022

Quality in district heating
A story from Friuli Venezia Giulia (Italy)

ENTRAIN | APE FVG | Francesco Locatelli

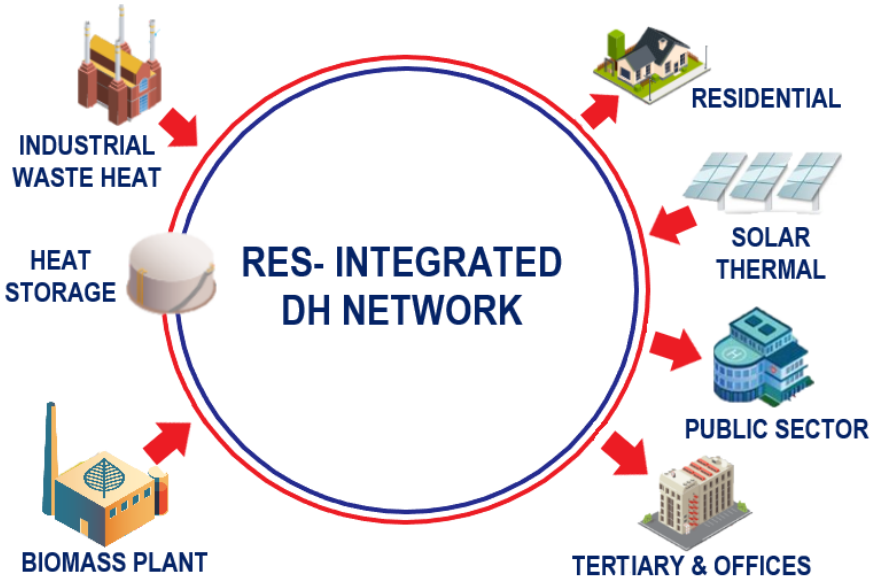
AGENDA

- Why **QM**?
- Implementation in FVG
    - Learning
    - Adapting
    - Spreading
    - Implementing
    - Two cases
    - Besides **QM**
- To do list:
    - Financing

RES-BASED DISTRICT HEATING

Great potential for new applications in many Italian alpine areas, where it could bring several benefits:

- Decarbonization of heating sector
- Improvement of local air quality
- Job creation in the local economy
- Affordable heat price, stable and independent from energy markets fluctuations



But only if planned and operated with quality!

QUALITY IS NEEDED!

Mistakes have been made in the past:

- Wrong or superficial planning
- Wrong sizing of plant components
- Bad management of public funds and incentives
- Combustible imported from distant areas

All this turns a RES-based DH investment into:

- An economic burden for the local administration
- Higher local emissions
- Public distrust in the technology

A quality management standard is needed!

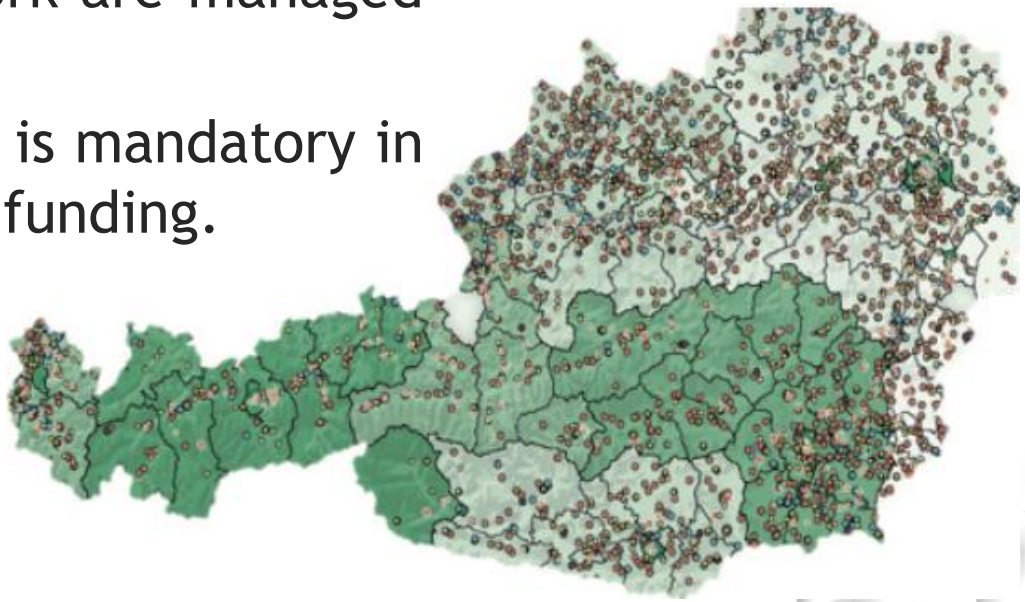
QM - HOLZHEIZWERKE

QM-Holzheizwerke is a quality management system for biomass based DH, first developed in Switzerland and with over 20 years of successful experiences.

In Austria alone more than 2.300 plants and more than 3.400 km of network are managed according to **QM**.

Moreover, the adoption of **QM** is mandatory in order to be eligible for public funding.

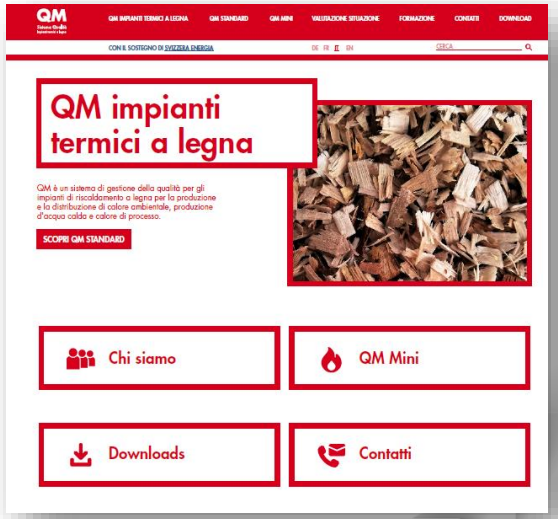
QM Holzheizwerke



WE JOINED THE TEAM

APE FVG joined the international ARGE working group, which manages and keeps developing the **QM** standard.

APE FVG developed the visual kit for **QM** branding and is about to launch the **QM** Italian website.

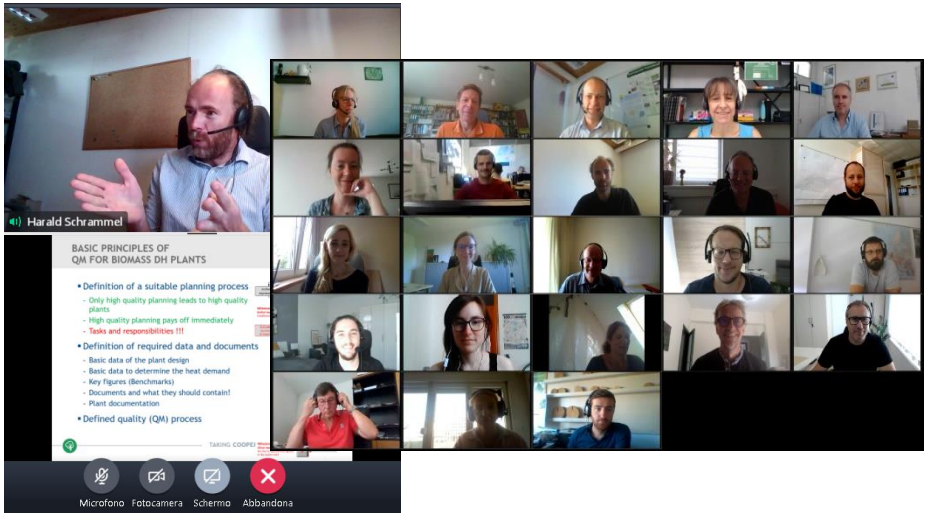


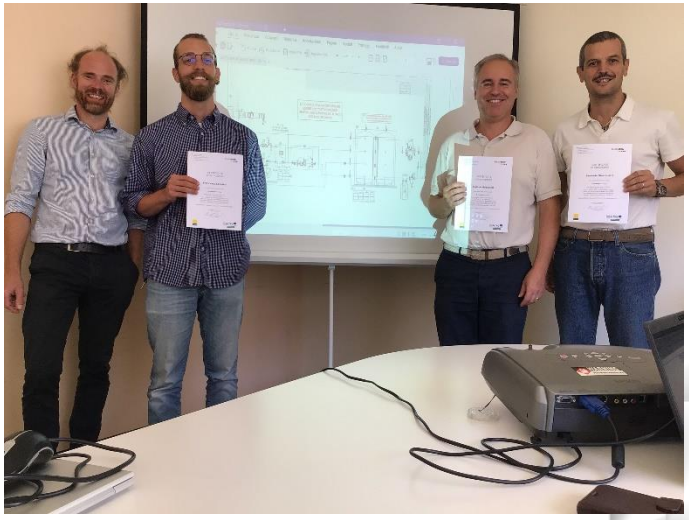
qm.ape.fvg.it

WE WERE TRAINED

- 5 train-the-trainer sessions, tackling multiple aspects of RES-DH, from air quality to solar thermal integration, to optimization of operations

- 4 days split in 2 in-person training sessions to become the first Italian Q-Managers!





AND WE TRAINED!

- Events for PAs, mayors and Regional officials
- Materials and training for municipal technicians
- ECTS courses for engineers and project designers (coming up next week)
- National fairs (upcoming in May)

QM contents were tailored to the needs of the target audience

A LOT OF TRANSLATION AND ADAPTATION

With the help of the ENTRAIN Partners we:

- Translated all the **QM** documentation
  - Q-Guidelines, with the addition of an introduction from AIEL (wood energy Italian association) to get more visibility;
  - Technical manuals
  - Planning Handbook
  - Milestone checklists

- Translated and adapted all the excel tools that will also be presented during the **QM** trainings.

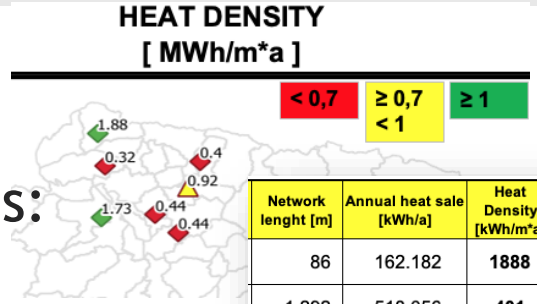
All the material will be available on our new italian website!

WHILE WORKING ON THE GROUND

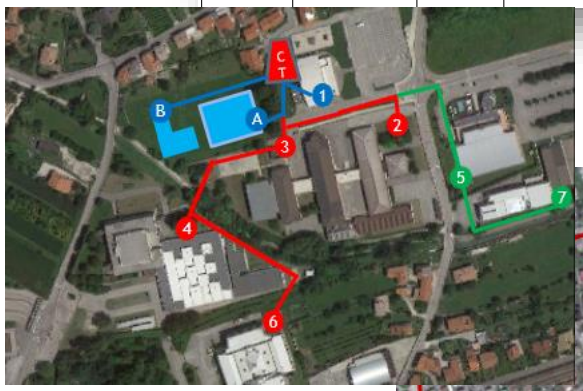
We provided free technical assistance to public administrations:

- technical and economic analyses of 9 active DH plants, identifying planning and operational issues
- development of 17 pre-feasibility studies for new DH plants or revamping of old ones.

Always in compliance with the QM principles



Network lenght [m]	Annual heat sale [kWh/a]	Heat Density [kWh/m*a]	Heat Density [MWh/m*a]	Evalutaion	Annual net value of heat sold	Net heat sales price average [€/MWh]
86	162.182	**1888**	**1,888**		10.439,46 €	64,37 €
1.292	518.056	**401**	**0,401**		29.327,36 €	56,61 €
295	510.460	**1733**	**1,733**		32.394,49 €	63,46 €
1.055	334.207	**317**	**0,317**		21.273,65 €	63,65 €
414	182.588	**442**	**0,442**		10.836,37 €	59,35 €
1.015	444.456	**438**	**0,438**		23.186,18 €	52,17 €
9.009	8.292.800	**921**	**0,921**		519.333,36 €	62,62 €



ONE BIG RESULT – SOCCHIEVE

Lunghezza rete	1.000	[m]	
Fabbisogno di cippato di legno con umidità < 30% - stimato nel progetto	128	[t]	DATI DI PROGETTO
Calore ottenibile da cippato di legno con umidità < 30%	3.000	[kWh/t]	
Calore vendibile da cippato di legno con umidità < 30%	2.400	[kWh/t]	
Calore ottenibile da cippato di legno con umidità < 30%	384.000	[kWh/t]	
Calore vendibile da cippato di legno con umidità < 30%	307.200	[kWh/t]	
Densità di calore lineare	**307**	**[kWh/m*a]**	
Lunghezza rete ammissibile	307	[m]	

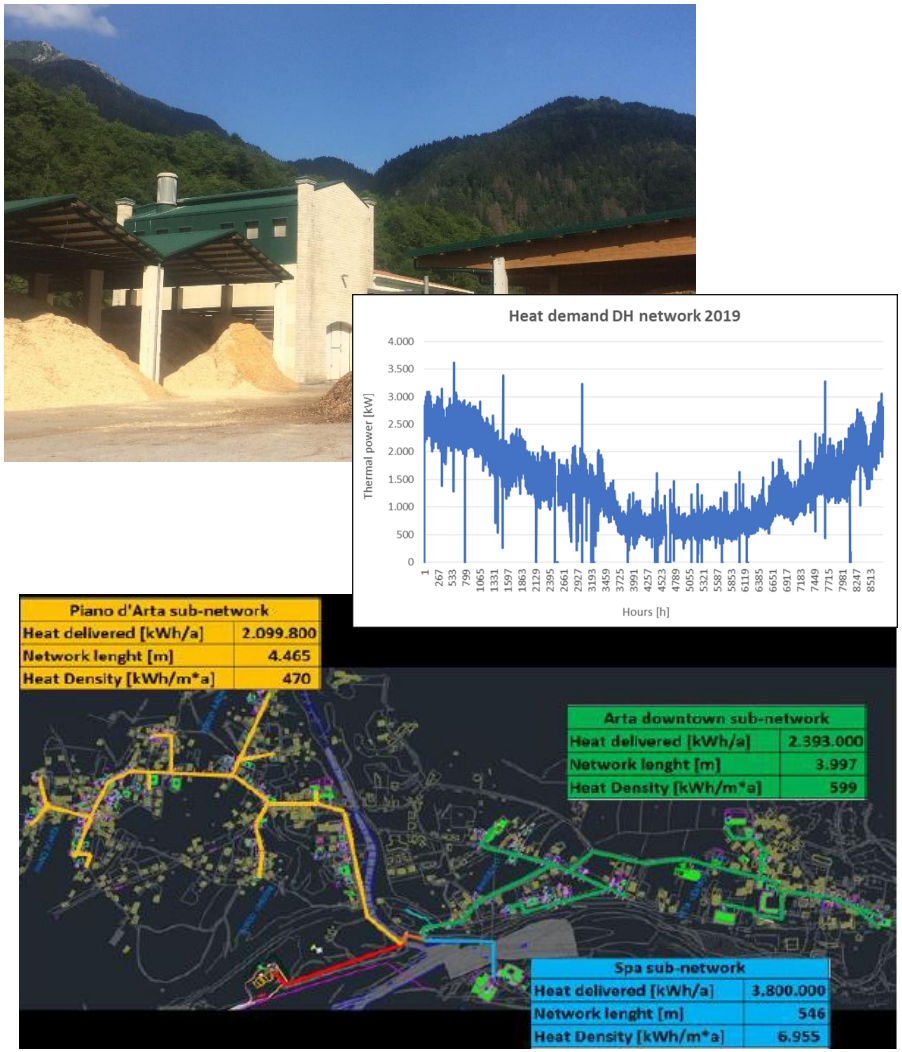
Edificio [ID]	Rete totale [m]	Rete per edificio [m]	Valore minimo di domanda calore all'anno [kWh]	Cippato con umidità < 30%
1	25	25	25.000	10
	75			
	75			
	75			
2	100	325	325.000	135
3	200	200	200.000	83
	75			
	100			
	25			
4	50	250	250.000	104
	150			
5	50	200	200.000	83
Totale	1.000		1.000.000	417

The Region funded a biomass DH project in the Municipality of Socchieve for 450.000 out of 600.000 euros.

The Municipality asked APE FVG to perform an analysis of the project. The boiler was largely oversized and a 1 km network was needed to supply only 5 buildings with a relatively low heat demand.

The local administration turned down the funding!

THE BIG OPPORTUNITY - ARTA TERME



- Largest DH in FVG (5 MW, 9 km)
- ORC cogeneration unit which often causes issues and shut downs
- No heat storage
- 2 out of 3 network branches with very low linear heat density
- Operations driven by electricity sales only due to incentive
- Most of heat dissipated
- Fragile economic balance
- Situation after 2023?

THE BIG OPPORTUNITY - ARTA TERME

Two actions foreseen:

- Densification of heat demand along the grid. APE checked the density of each new potential customer to select those which can improve the situation

ID colleg.	ID	VIA	NUMERO CIVICO	RAMO DI RETE	Potenza scambiatore richiesta [kW]	Potenza scambiatore concessa [kW]	Distanza dalla rete esistente [m]	Stima della domanda di calore annuale [kWh]	Densità di calore lineare [kWh/m*a]
1	29	Umberto I	46	Arta	30	30	8,36	17.000	2023
2	64	Umberto I	69/B	Arta	30	30	11,2	17.000	1510
3	70	Umberto I	48	Arta	30	30	6,46	17.000	2618
4	89	Marconi	24	Piano d'Arta	30	30	13,67	17.000	1237
5	90	Marconi	17	Piano d'Arta	30	30	1,36	17.000	10294
6	108	Umberto I	13	Arta	30	30	2,41	17.000	7017
7	116	Marconi	13 - 15	Piano d'Arta	30+30	30+30	1,03	34.000	38237
8	117	Marconi	16	Piano d'Arta	30	30	13,67	17.000	1237
9	121	Marconi	10	Piano d'Arta	50	50	9,55	40.000	4124
10	19	Comelli	20	Piano d'Arta	30	30	5,63	17.000	3004
11	21	Comelli	2	Piano d'Arta	30	30	2,04	17.000	14314
12	32	Comelli	21	Piano d'Arta	30	30	4,68	17.000	3613
13	107	Comelli	16	Piano d'Arta	30	30	1,6	17.000	10563
14	34	Fontana	61	Arta	30	30	2,04	17.000	8290
15	35	Fontana	63	Arta	30	30	2,04	17.000	8290
17	39	Fontana	69	Arta	30	30	3,26	17.000	1826
19	41	Fontana	25	Arta	30	30	3,81	17.000	4438
20	43	Fontana	29	Arta	80	100	29,38	88.000	2668
21	45	Fontana	49/A	Arta	50	50	16,35	40.000	5382
22	46	Fontana	46	Arta	30	30	1,32	17.000	22121
24	10	Umberto I	65	Arta	30	30	11,77	17.000	1437

- Revamping of the power plant:
  - Remove the ORC unit
  - Downsize the wood chip boiler
  - Install a large heat storage

VOCE	Anno 2019	Opzione B	Opzione C	Opzione D
RICAVI - COSTI	**-115.272,84 €**	**359.157,21 €**	**-46.408,52 €**	**-26.096,28 €**
TOTALE RICAVI	**1.133.900,56 €**	**1.220.966,25 €**	**661.058,30 €**	**661.058,30 €**
Vendita di energia termica	596.631,87 €	596.631,87 €	596.631,87 €	596.631,87 €
[MWh/a]	9.039	9.039	9.039	9.039
Vendita di energia elettrica	472.842,26 €	559.907,95 €	0,00 €	0,00 €
[MWh/a]	1.689	2.000	-	-
TOTALE COSTI	**1.249.173,40 €**	**861.809,04 €**	**707.466,82 €**	**687.154,58 €**
Utilizzi cippato/stangame	563.908,34 €	295.820,77 €	254.220,97 €	244.976,57 €
[t/a]	12.200	6.400	5.500	5.300
Utilizzi metano/azoto	99.385,42 €	18.000,15 €	18.000,15 €	15.000,12 €
Metano [Smc/a]	165.641	30.000	30.000	25.000
Materiale di consumo	50.808,83 €	30.000,00 €	20.000,00 €	15.000,00 €
Manut./riparaz. Beni di terzi	71.715,49 €	71.715,49 €	57.372,00 €	35.857,00 €
Trasporto ceneri	19.014,08 €	9.897,74 €	8.595,41 €	8.334,94 €
[t]	73	38	33	32
Prestazioni di terzi	28.784,82 €	15.000,00 €	12.000,00 €	8.250,00 €
Luce e forza motrice	101.282,89 €	63.063,00 €	57.330,00 €	43.953,00 €
[MWh/a]	530	330	300	230
Dipendenti	169.739,02 €	120.007,79 €	105.606,86 €	96.006,23 €
[ore/anno]	5.304	3.750	3.300	3.000
Manutenzioni e riparazioni	11.282,10 €	11.282,10 €	11.282,10 €	9.026,00 €
Cellulari	6.761,98 €	6.761,98	6.761,98	5.071,49
Assicurazioni	39.893,31 €	39.893,31 €	25.930,65 €	7.500,00 €
Prestazioni amministrative	14.319,13 €	10.000,00 €	10.000,00 €	7.500,00 €
Ammortamenti	**1.911,28 €**	**100.000,00 €**	**50.000,00 €**	**125.000,00 €**

THERE'S MORE BESIDES QM

We are working on setting up a cooperative business model that connects directly the local production of wood chips to the local production of heat, creating a stable and sustainable supply chain that impacts the local community in the long term.

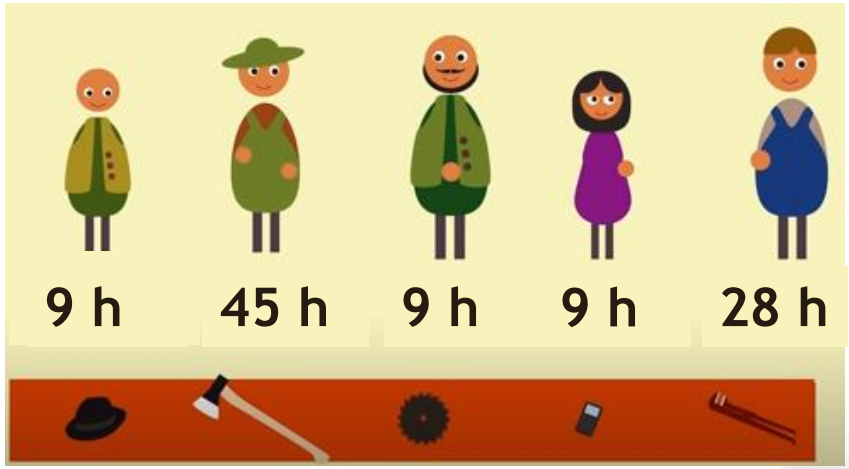


Image credits to Austrian Bioenergy Association

WHAT'S STILL MISSING

We are working hard
to make the region FVG implement
QM as a mandatory requirement
in order to access public funding.

But we are confident we'll make it happen!

GRAZIE!

Francesco Locatelli
APE FVG
UD - 33013 - Gemona del Friuli, Via Santa Lucia, 19

www.interreg-central.eu/entrain
http://www.ape.fvg.it/entrain/

+39 351 7487485

Francesco.locatelli@ape.fvg.it

@ENTRAIN_project

Project final event - Brussels, March 17th, 2022

Solar & biomass for local community energy in Neckar-Alb

ENTRAIN | Holzenenergie-Fachverband Baden-Württemberg e.V. | Johanna Eichermüller | Steinbeis Forschungsinstitut Solites | Patrick Geiger

THE NECKAR-ALB TEAM

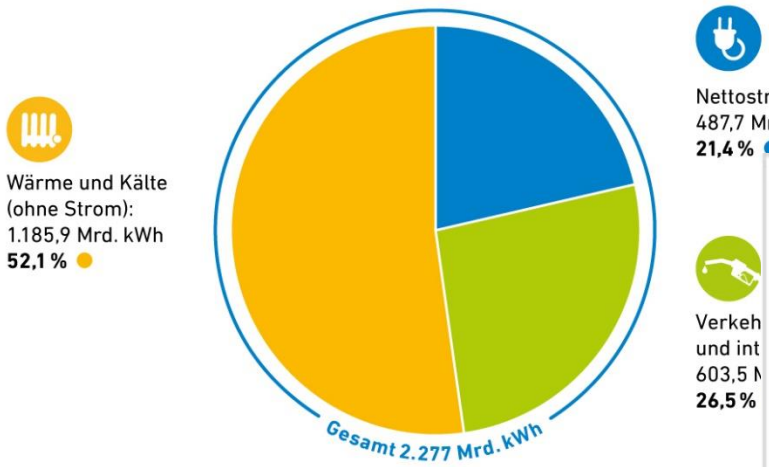
Regional Association Neckar-Alb
Spatial Planning

Wood Energy Association BW
Know-How for the energy efficient ulitization of biomass heat

Steinbeis Research Institute Solites
Knowledge on future energy systems with a focus on solar thermal

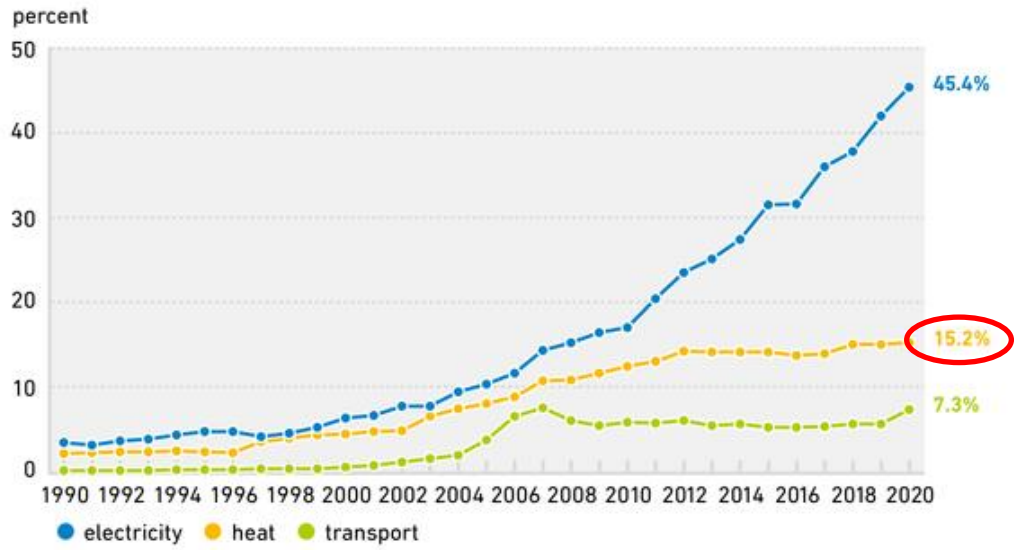
HEAT TRANSITION – STATUS QUO

Final energy consumption by sectors in Germany 2020 (billion kilowatt hours)



Quelle: eigene Darstellung auf Basis von AGEB, AGEE-Stat; Stand: 3/2021

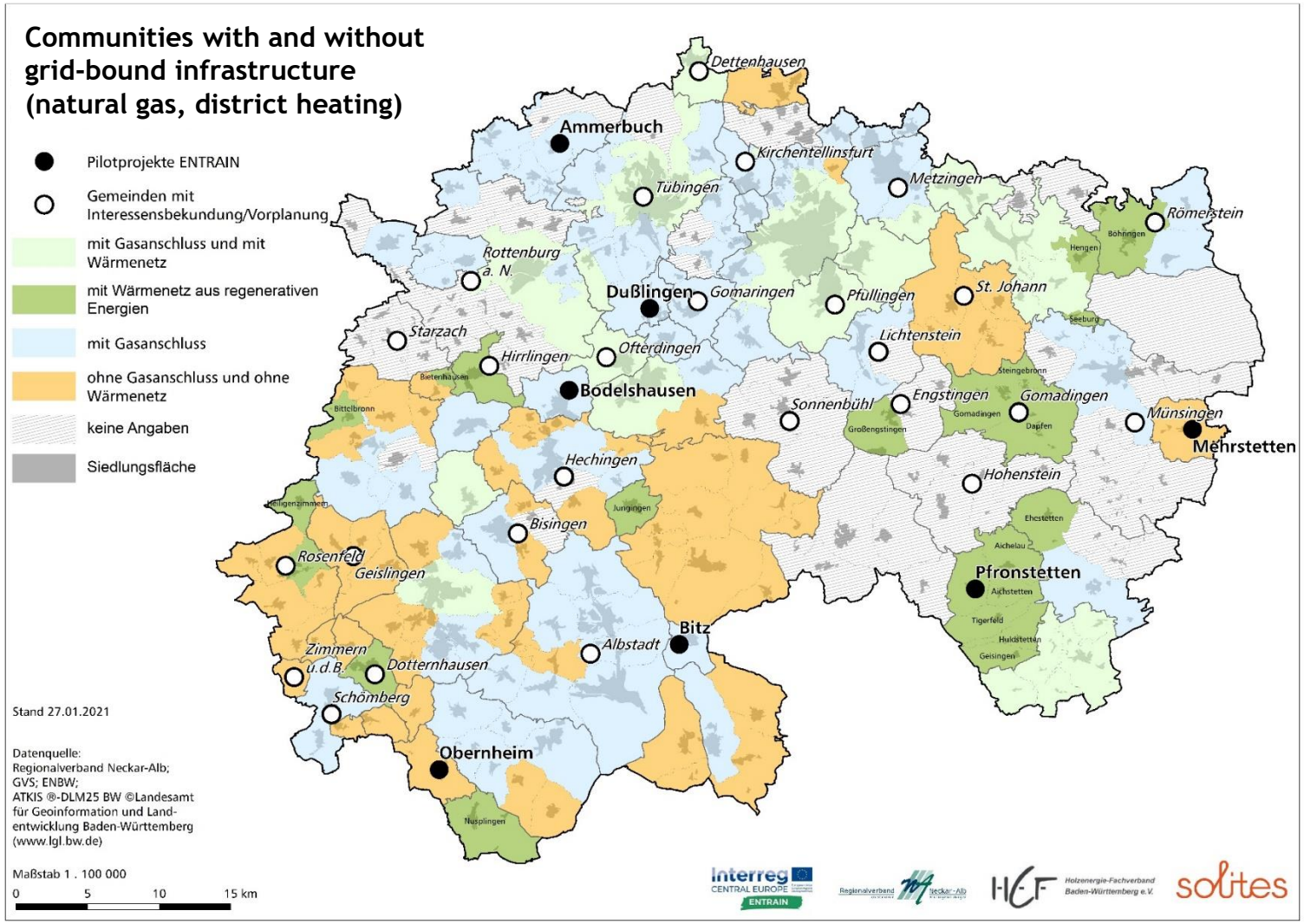
Share of renewable energy in Germany's final energy consumption 1990–2020



Source: AGEE-Stat; as of: 2/2021

RENEWABLE ENERGY AGENCY

REGION NECKAR-ALB - STATUS QUO



OVERVIEW

Main barriers for RES DH development in the Neckar-Alb region

Increased planning efforts

Competition for space

Lack of awareness

OVERVIEW

Main barriers for RES DH development in the Neckar-Alb region

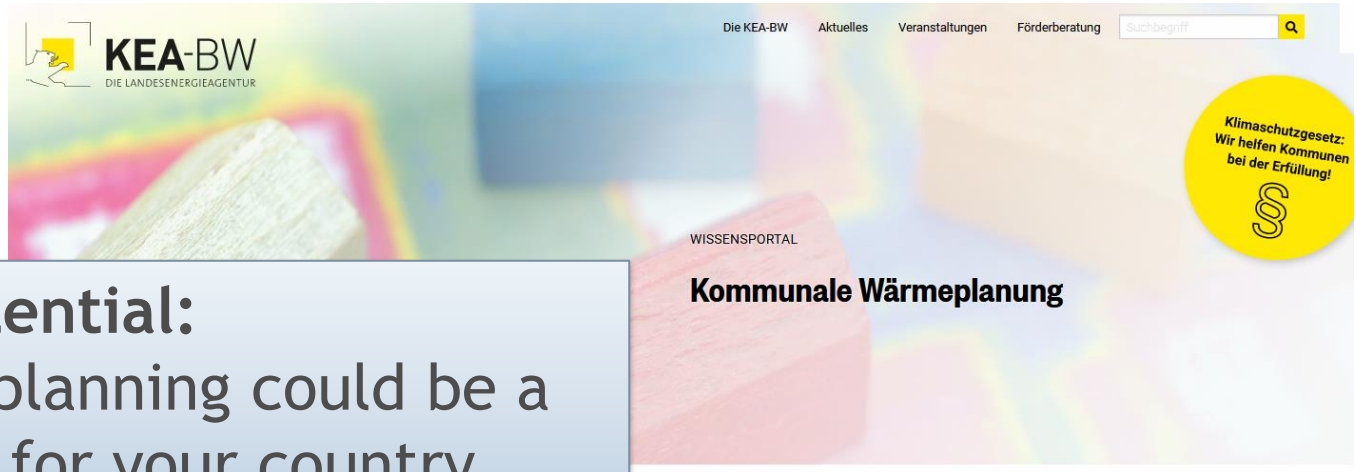
Increased planning efforts

Competition for space

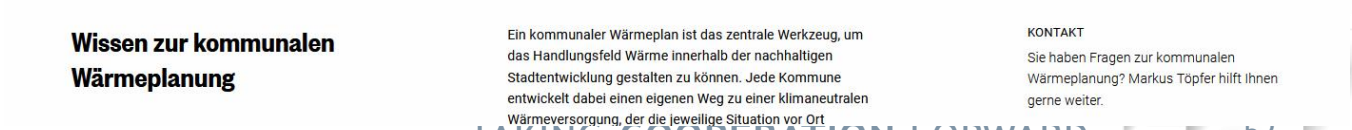
Lack of awareness

HEAT PLANNING

- Municipal heat planning is supported on state level
  - Obligatory for towns > 20.000 inhabitants in BW
  - Incentives for smaller towns
  - Adoption also on federal level under development



Replication potential:
Municipal heat planning could be a role model also for your country



OVERVIEW

Main barriers for RES DH development in the Neckar-Alb region

Increased planning efforts

Competition for space

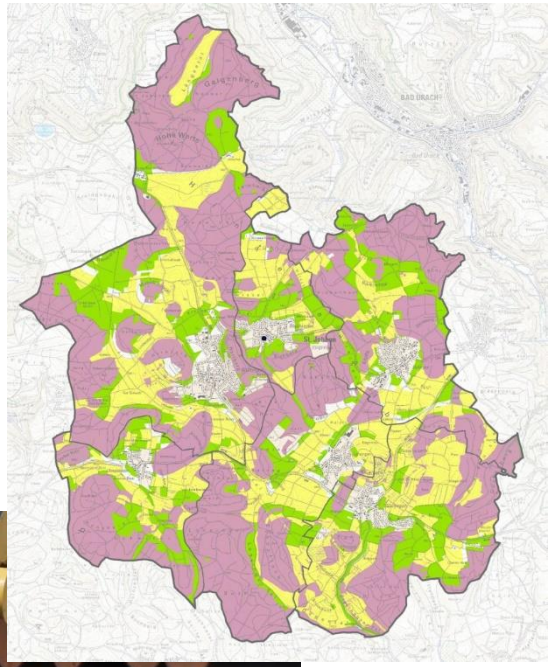
Lack of awareness

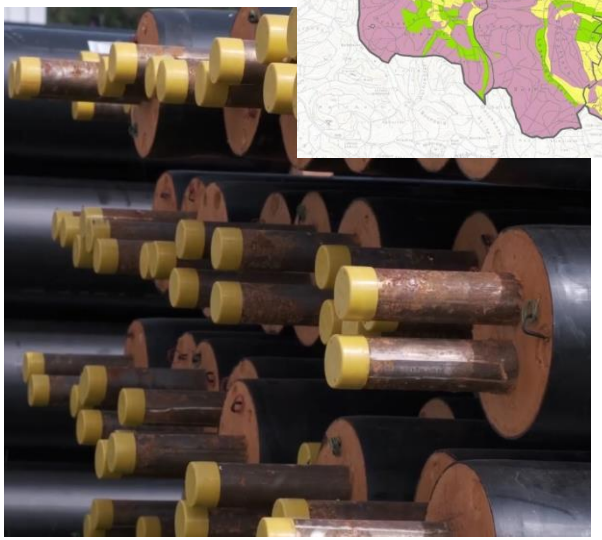
REGIONAL SPATIAL PLANNING

- Structural change:
  Municipalities must provide areas for the local utilization of RES

- Joint planning has proven to be an efficient measure

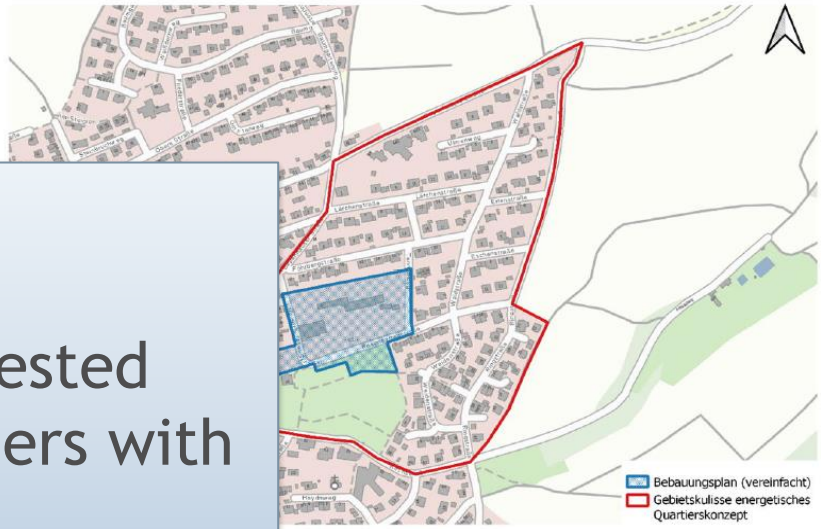
- Regional plan was changed to **define dedicated spaces** for utilization of solar energy in outer area





DETAILED SPATIAL SCREENING

- The case of Entringen
  - New residential construction (DH fueled by wood pellets)
  - Possible enlargement (solar thermal and wood chips boilers)
- GIS-based visualization and analysis
  - Suitable sites heating central, solar thermal field
  - Fuel logistics
  - Pipeline routes



Replication potential:
Find and secure suitable areas!
Energy agencies can support interested municipalities, companies or farmers with (small) analyses

OVERVIEW

Main barriers for RES DH development in the Neckar-Alb region

Increased planning efforts

Competition for space

Lack of awareness

A SENSE OF COMMUNITY

The case of Breitenholz:

How a citizen-led initiative overcame barriers towards 100% renewable heat

- Initiated by local energy cooperative
- First project in heating
- Contribution 1.000 € for citizens

A SENSE OF COMMUNITY

- 750 inhabitants, 252 buildings (75% oil heating)
- 100% renewable: Wood chips boilers + large solar thermal
- Hard work: Convince people to connect to the DH system
  - 3 years planning time
  - Optimisation of the grid and additional customers made it feasible

Replication potential:
Engage and inspire citizens, decision makers and utilities in your area!

CONCLUSION

From barriers towards success factors for RES DH development in the Neckar-Alb region

Strong support for planning efforts

Political support and dedicated spaces

Engaging local stakeholders

CONTACT

Solites – Steinbeis Forschungsinstitut für solare und zukunftsfähige thermische Energiesysteme
M. Eng. Patrick Geiger
Meitnerstr. 8, D-70563 Stuttgart
geiger@solites.de

www.wärmewende-neckaralb.de

Holzenergie-Fachverband Baden-Württemberg e.V.

M. Sc. Johanna Eichermüller
Schadenweilerhof, D-72108 Rottenburg
eichermueller@holzenergie-bw.de

Project partners: Regionalverband Neckar-Alb (Oberzentrum Reutlingen/Tübingen)

Sabine Mall-Eder, Dieter Neth, Joachim Zacher, Dr. Dirk Seidemann

solites

Patrick Geiger

HEF

Johanna Eichermüller, Prof.Dr.-Ing. Harald Thorwarth

In cooperation with:

agentur für klimaschutz kreis tübingen

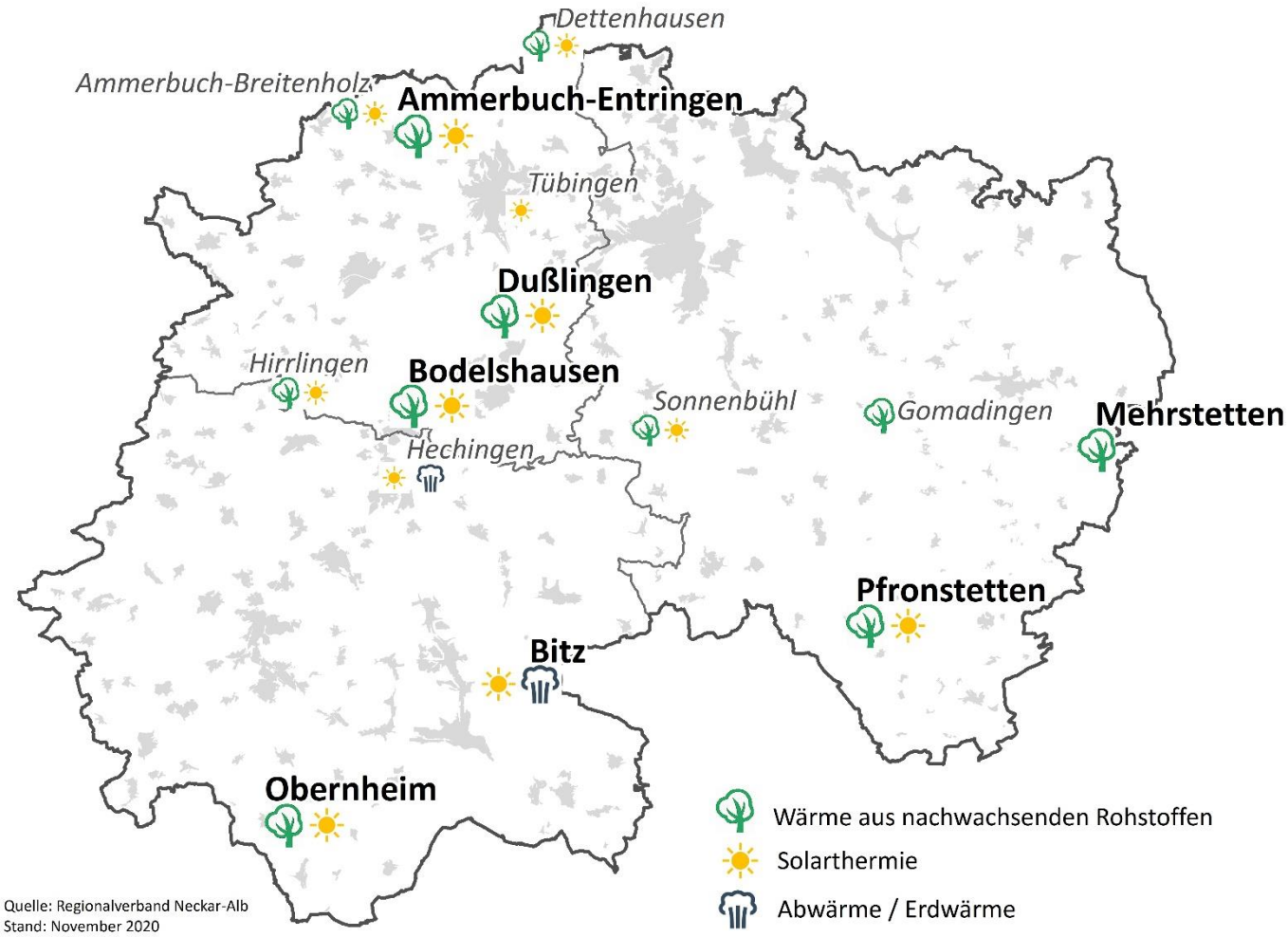
Energie Agentur Zollernalb

KlimaschutzAgentur Landkreis Reutlingen

Co-financed by:

Baden-Württemberg
Ministerium für Umwelt, Klima und Energiewirtschaft

THANK YOU FOR YOUR ATTENTION!



Project final event - Brussels, March 17th, 2022

Setting up an enabling policy framework for RES DHC in Poland

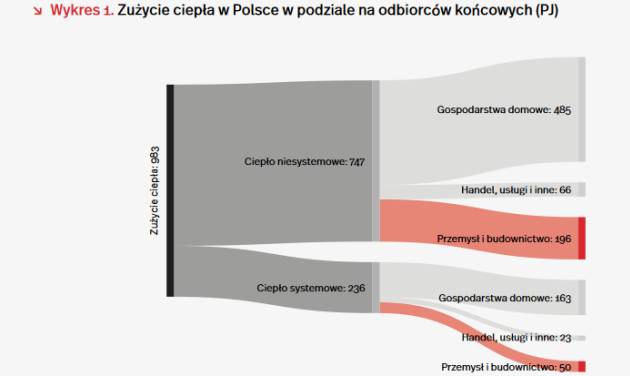
ENTRAIN| Association of Municipalities Polish Network„Enegie Cites” |Patrycja Płonka

POLISH ENERGY SECTOR

- Polish energy sector, including DH sector, is still very much based on fossil fuels (coal, natural gas), however the share of RES is steadily increasing;
- In 2018 RES share in the overall energy mix (gross energy consumption) came to **11,16%**
- The main sources of renewable energy are: solid biofuels (68,88%), wind (12,55%) and liquid biofuels (10,33%).
- The share of different RES is changing in time, with the growing tendency for biofuels, biogas and solar energy, and decreasing tendency for wind and water energy.
- Further RES use potential: the largest one is associated with wind energy, however current legal frameworks are very restrictive when it comes to setting up new on-shore wind farms. In practice the largest investment potnetial is related with the off-shore farms and on-land renewable energy generation can be – for now – mostly based on biofules, with the support of solar energy.
- NPfC&E: National targets until 2030:
  - ✓ 14% RES share in transportation
  - ✓ 21-23% RES share in final energy consumtion (gross)
  - ✓ Annual increase of RES share in DH&C of 1,1 pp.
  - ✓ The 23% RES share target can be achieved only if there are additional funds for just transition granted to Poland.

DH SECTOR IN POLAND

- The DH sector in Poland is well developed, with the steady increase of the DH network lenght (following ERO the lenght of the DH networks managed by licensed utilities reached 21,4 ths km in 2018).

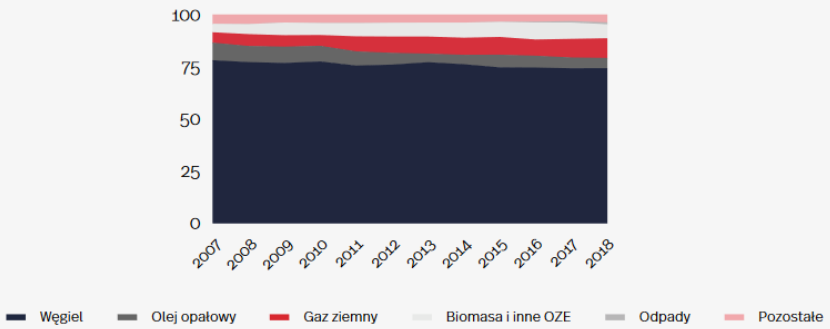


- Most of the DH utilities are controlled – wholely or partially – by local slef-governments, although more and more often part of the shares is purchased by strategic investors.
- Approx. 61% of generated heat is co-generated with electricity.

DH SECTOR IN POLAND

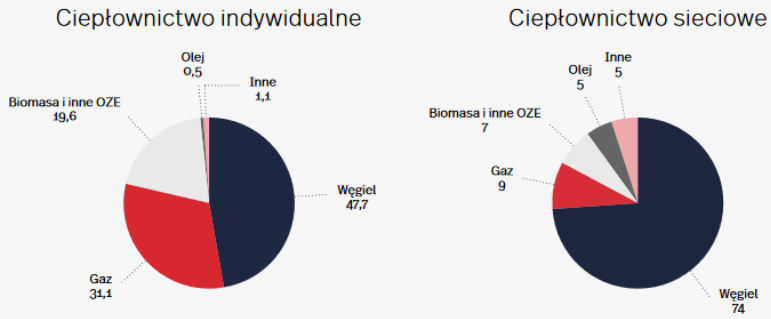
- The main fuel used in DH in coal (74,0%), although the share of other energy sources, mostly biomass, is steadily increasing.

Wykres 3. Struktura paliwowa w ciepłownictwie sieciowym (w proc.)



Źródło: URE (2019).

Wykres 4. Struktura zużycia paliw w ciepłownictwie indywidualnym i sieciowym (w proc.)



Źródło: Forum Energii (2019a); URE (2019).

- Coal domination in DH systems is a major problem, among others due more and more restrictive standards of gas (SOx, NOx) and partulicate matter emissions, as well as the increasing price of CO2 emission allowances -> **there is necessity to gradually switch to RES!**

DH SECTOR IN POLAND

- Considering DH heating, the most important RES, which can be used in new/modernised systems are the following: **solar energy, biomass** and **biogas** (produced mainly at the biogas plants at landfill sites and sewage treatment plants). In some regions of the country there is also good access to geaothermal energy, which can be used both for energy and recreation/mediacal purposes;
- The largest „practical" potential is associated with **solid biofuels**, which – in 2016 – where the main RES used for heat generation (95,67%). The second and the third one are the **biogas (4,21%) and municipal waste (0,115%).**
- Also in case of new installations biomass is considered to be the most important energy source. In some regions there is also considrable geathermal energy potential. Another option, but stil rarely used in Polish DH systems, are **solar thermal collectors** (which can be installed at the undeveloped city areas or unused roofs) and using unbalanced electricity from wind power plants **("Power to heat" technologies).**

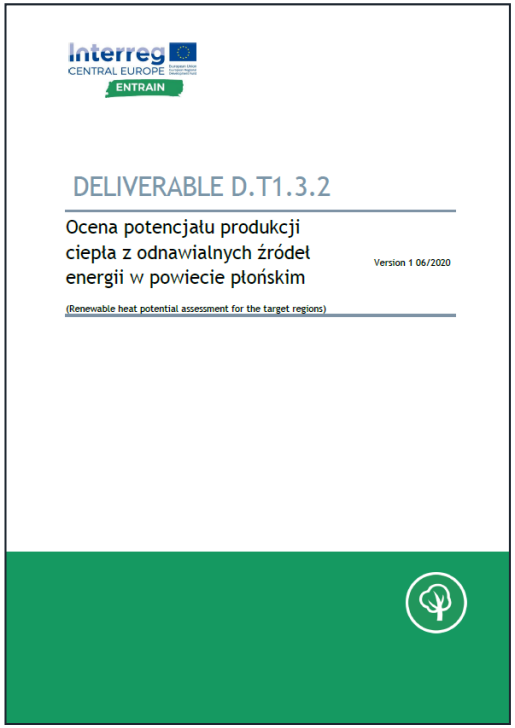
DECARBONISATION OF DH SECTOR IN POLAND: BARRIERS

Main barrriers for RES DH development:

- lack of comprehensive local strategies supporting DH sector decarbonisation
- unfavourable national legislation (frequent and often unfavourable changes in law, lack of clarity of some of the provisions, „Anti-wind mill" act)
- administration procedures (complexity of adminisration procedures and large amount of decisions and permits that need to be obtained to install and launch RES installation)
- relatively long payback periods resulting from high investment costs
- limited budgets of local authorities and utilities
- large competition when applying for external funds
- local community's opposition towards some investments
- NIMBY approach
- fear of change

SOLUTION: SETTING UP LOCAL POLICY FRAMEWORK

Including provisions concerning the development of district heating systems and increasing RES use in district heating systems in Sustainable Energy and Climate Action Plans and Low-Emission Development Programmes – based on the analyses done within the ENTRAIN project

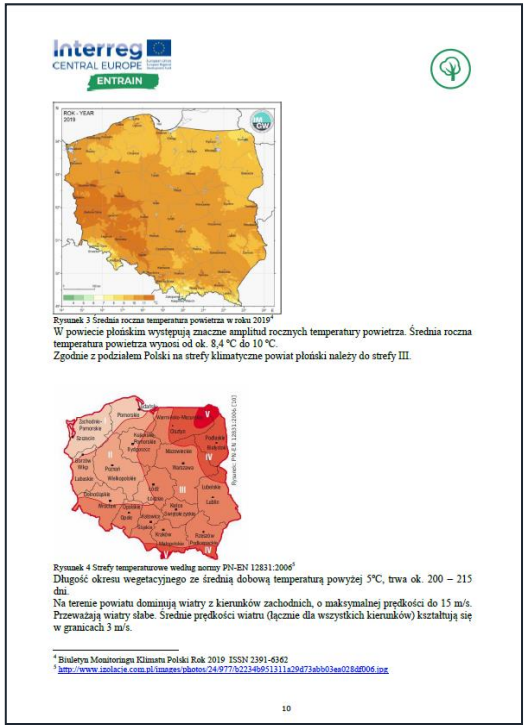


DELIVERABLE D.T1.3.2

Ocena potencjału produkcji ciepła z odnawialnych źródeł energii w powiecie płońskim

Version 1 06/2020

(Renewable heat potential assessment for the target regions)



Rysunek 3 Średnia roczna temperatura powietrza w roku 2019[4]

W powiecie płońskim występują znaczne amplitud rocznych temperatury powietrza. Średnia roczna temperatura powietrza wynosi od ok. 8,4 °C do 10 °C.

Zgodnie z podziałem Polski na strefy klimatyczne powiat płoński należy do strefy III.

Rysunek 4 Strefy temperaturowe według normy PN-EN 12831:2006[5]

Długość okresu wegetacyjnego ze średnią dobową temperaturą powyżej 5°C, trwa ok. 200 – 215 dni.

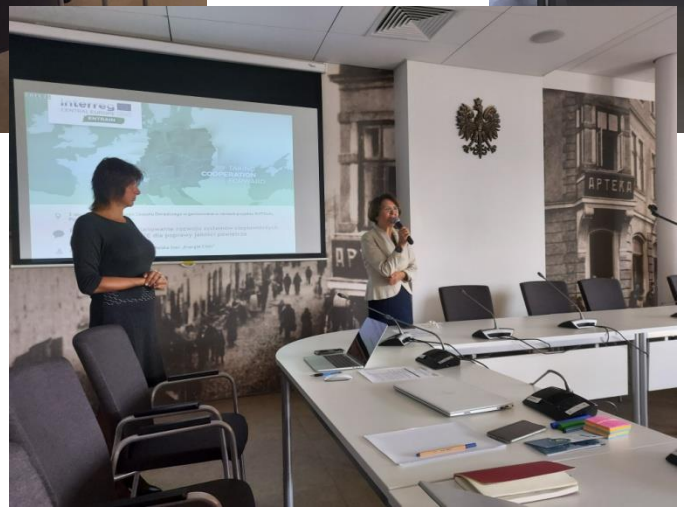
Na terenie powiatu dominują wiatry z kierunków zachodnich, o maksymalnej prędkości do 15 m/s. Przeważają wiatry słabe. Średnie prędkości wiatru (łącznie dla wszystkich kierunków) kształtują się w granicach 3 m/s.

[4] Biuletyn Monitoringu Klimatu Polski Rok 2019 ISSN 2391-6362

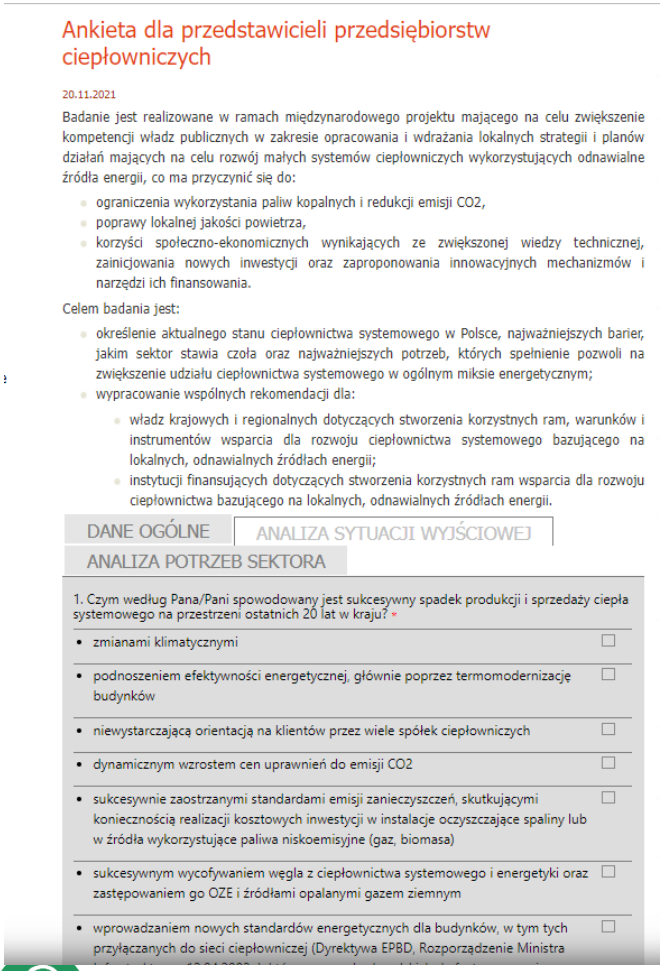
[5] http://www.izolacja.com.pl/images/photos/24/977/b2234b951311a29d73abb03aa0284df006.jpg

10

What do we need to further develop RES-based DH systems?



What do we need to further develop RES-based DH systems?



Ankieta dla przedstawicieli przedsiębiorstw ciepłowniczych

20.11.2021

Badanie jest realizowane w ramach międzynarodowego projektu mającego na celu zwiększenie kompetencji władz publicznych w zakresie opracowania i wdrażania lokalnych strategii i planów działań mających na celu rozwój małych systemów ciepłowniczych wykorzystujących odnawialne źródła energii, co ma przyczynić się do:

- ograniczenia wykorzystania paliw kopalnych i redukcji emisji CO_2,
- poprawy lokalnej jakości powietrza,
- korzyści społeczno-ekonomicznych wynikających ze zwiększonej wiedzy technicznej, zainicjowania nowych inwestycji oraz zaproponowania innowacyjnych mechanizmów i narzędzi ich finansowania.

Celem badania jest:

- określenie aktualnego stanu ciepłownictwa systemowego w Polsce, najważniejszych barier, jakim sektor stawia czoła oraz najważniejszych potrzeb, których spełnienie pozwoli na zwiększenie udziału ciepłownictwa systemowego w ogólnym miksie energetycznym;
- wypracowanie wspólnych rekomendacji dla:
  - władz krajowych i regionalnych dotyczących stworzenia korzystnych ram, warunków i instrumentów wsparcia dla rozwoju ciepłownictwa systemowego bazującego na lokalnych, odnawialnych źródłach energii;
  - instytucji finansujących dotyczących stworzenia korzystnych ram wsparcia dla rozwoju ciepłownictwa bazującego na lokalnych, odnawialnych źródłach energii.

DANE OGÓLNE | ANALIZA SYTUACJI WYJŚCIOWEJ | ANALIZA POTRZEB SEKTORA

1. Czym według Pana/Pani spowodowany jest sukcesywny spadek produkcji i sprzedaży ciepła systemowego na przestrzeni ostatnich 20 lat w kraju? *

- zmianami klimatycznymi ☐
- podnoszeniem efektywności energetycznej, głównie poprzez termomodernizację budynków ☐
- niewystarczającą orientacją na klientów przez wiele spółek ciepłowniczych ☐
- dynamicznym wzrostem cen uprawnień do emisji CO_2 ☐
- sukcesywnie zaostrzanymi standardami emisji zanieczyszczeń, skutkującymi koniecznością realizacji kosztowych inwestycji w instalacje oczyszczające spaliny lub w źródła wykorzystujące paliwa niskoemisyjne (gaz, biomasa) ☐
- sukcesywnym wycofywaniem węgla z ciepłownictwa systemowego i energetyki oraz zastępowaniem go OZE i źródłami opalanymi gazem ziemnym ☐
- wprowadzaniem nowych standardów energetycznych dla budynków, w tym tych przyłączanych do sieci ciepłowniczej (Dyrektywa EPBD, Rozporządzenie Ministra ☐

General data

Analysis of the baseline situation, barriers and opportunities

Analysis of the needs of the sector concerning:

- Legal frameworks
- Financial frameworks

KEY FINDINGS: ACTIONS NEEDED TO INCREASE RES USE IN THE DISTRICT HEATING SECTOR

- coordinated actions concerning sector's decarbonisation
- increasing external funding for investments
- simplification of formal and legal procedures
- development of a comprehensive medium- and long-term strategy for the district heating development
- implementation of legal solutions facilitating RES integration into local district heating networks
- implementation of co-finaning and loan programmes facilitating transition of the sector (built from the funds received from the sale of the emission allowances)
- clear and stable legal provisions concerning planning the development of DH systems
- transition of the DH sector in a way that will not contribute to the strengthening of the energy poverty
- development of the national potential of the production and installation of RES-based DH systems
- stabilisation of the legal frameworks for the use of different types of RES to be bale to plan investments safely at least 15 years ahead

KEY FINDINGS: NECESSARY REGULATORY/LEGAL CHANGES

- when setting up tarrifs, rewarding actionc increasing RES share in heat generation
- introduction of the obligation to use low-parameter heating solutions in new buildings, as well as the buildings being subject to thermo-modernisation
- simplification of the procedures concerning emission and integrated allowances
- simplification of the procedure of obtaining construction allowances
- ensuring long-term legal stability
- ensiring support from local authorities
- definition of the emission performacne and the requirements for different types of fuels (biomass, RDF), as well as the clear statement how long they could be used

KEY FINDINGS: NECESSARY FINANCIAL AND NON-FINANCIAL SUPPORT

Financial support

- reference prices ensuring profitability of the RES-generated heat
- reduction of the VAT for the consumers of district heat generated from RES
- subsidies for the proces of heat generated from RES
- subsidies and low-interest loans
- development and launching of dedicated programmes promoting EPC/ESCO formula
- capital support for the DH companies, which have problems with ensuring financial liquidity

Non-financial support

- stability of the legal frameworks
- reduction of the costs of CO2 emissions for the energy trabsformation period
- trainings and information material concerning the transformation of the DH sector
- simplification of the procedures of granting permits, licensces and agreements

KEY FINDINGS: MOST NECESSARY SUPPORT FROM PUBLIC INSTITUTIONS

- implementation of support mechanisms for the modern heating technologies
- development of legal acts based on clear strategic targets
- increasing and supporting R&D in the field of RES use and materials science
- development of a comprehensive strategy for the heat supply (both concerning district and individual heat provision)
- using funds from the purchase of CO2 emission allowances to fund the modernisation/transition of the DH sector
- development of education poragmmes that will ensure qualified engineering an technical staff supporting development of RES-based DH systems

PASSING ON THE NEEDS: VERTICAL WORKSHOP; WARSAW, 18.01.2022

PASSING ON THE NEEDS: PUBLIC CONSULTATION OF SUPPORT PROGRAMMES

ENTRAIN input to consultation of the FENiKS programme (the largest funding programme supporting infrastructure and environmental action)

Key messages:

- Polish DH sector requires deep modernisation, inlcluding increasing RES share in heat generation
- The FENiKS programme, being the largest programme financing environmental and air protection, should strongly suppirt such investments

Patrycja Płonka
Stowarzyszenie Gmin Polska Sieć „Energie Cites”

www.interreg-central.eu/ENTRAIN

patrycja.plonka@pnec.org.pl

+48 (12) 429 17 93

facebook.com/Entrain

linkedin.com/in/Entrain

twitter.com/Entrain

Project final event - Brussels, March 17th, 2022

GEOTHERMAL ENERGY FOR DISTRICT HEATING IN CROATIA

ENTRAIN| REGEA |Martina Krizmanić Pećnik

FACTS ABOUT CITY OF KARLOVAC

- situated in central Croatia, close to neighbouring Slovenia, Bosnia and Herzegovina at the intersection of the country's most important highways
  - Surface area: 402 km2
  - Population: 49.594 (2021)
- Karlovac is framed by four rivers - Kupa, Korana, Dobra and Mrežnica
- Karlovac area is known as an area with large geothermal potential

PILOT CITY OF KARLOVAC

- Exploring the possibilities to utilize geothermal energy by mapping geothermal potential in Karlovac, which included:
  - spatial analysis of space heating and domestic hot water preparation needs,
  - the potential for the use of RES in DHS and
  - the exploitation of geothermal energy for DHS development.

DESCRIPTION OF THE PROJECT

- The highest water temperature at the well was registered during well logging at 140°C.
- Karlovac has gas operated DHN but is looking for geothermal source in order to lower prices for consumers and lower CO2 emissions in the city.
- Gradska toplana - tradition of almost 50 years, since 1968.
- The DHS is a typical one for a smaller city (around 50 thousand inhabitants) - 22.1 km long.
- The boilers in the DH company are long past normal lifetime.
- It is highly possible to use water from the existing geothermal wells in Karlovac to support at least 50% of the district heating system.
- By connecting the geothermal wells to the Karlovac district heating system, it is possible to save considerable amounts of fossil fuel (gas).

PROJECT PHASES AND ACTIVITIES (1)

- City of Karlovac founded the company GeotermiKA d.o.o. for research and exploitation of geothermal water for the needs of the existing heating system and to produce electricity for the needs of public facilities
- GeothermiKA received a permit for exploration of geothermal springs for Karlovac 1 in December 2019, and it is valid for 5 years.
- Gradska Toplana received finacial resources through national ITI scheme for modernization of Karlovac's district heating system (replace parts of hot water pipes, manholes and equipment at the transmission part of thermal substations, modernize the pumping plant and chemical water treatment plant and implement the SCADA system)
- The City of Karlovac receives financial EU support for investments in geothermal potentials for project documentation (feasibility studies) from the European City Facility (EUCF)

PROJECT PHASES AND ACTIVITIES (2)

- After the company GeotermiKA d.o.o. complete the testing of wells and determine the quality and temperature of water, it is necessary to determine which is the best way to exploit geothermal energy in the Karlovac County
- If the possibility arises, Karlovac should start the process of installing a heating plant on geothermal energy and connecting to the existing district heating system, but, if possible, start expanding the existing district heating system.
- In this way, thanks to geothermal energy, the City of Karlovac could become energy independent.
- REGEA is supporting the city to transform the process and deliver a Green spatial and zoning plan, the first one of its kind in Croatia.

ECONOMIC DATA

- geothermal energy is the cities strongest option and can be viable long term if adequate sources of energy and funding are discovered at favourable locations.
  - REGEA will work on continuous research of available and eligible funding options (public, EU funds and private) to match the requirements of the identified project in Karlovac.
  - HEP (national electric company) and INA (national oil company) will recognize this potential and reach for the hot water from Croatian depths as an opportunity to expand their portfolio, each of them in their own way.

Geothermal energy - economic data	
Load factor	90 %
Unit investment cost	2710 EUR (without borehole)
Unit maintenance cost	22,6 EUR/year
Annual increase in maintenance costs	1 %
Annual fuel consumption	0 kWh/year
Fuel price	0,04 EUR/kWh
Annual increase in fuel prices	0
Annual energy production	7884 kWh/year
Equipment life	25 years
Discount rate	5 %
LCOH (Levelized cost of heat)	26,39 EUR/MWh

CURRENT STATUS OF DHS IN CROATIA

- The majority of DHS are in national ownership, as well as the distribution network, it could be said that a proper development of DHS and energy transition to renewable energy and higher energy efficiency is a national interest.
- There is no significant political support.
- Also, DHS in most of cities have significant problems with the optimization, especially since there is a lot of smaller DHS systems instead of larger ones.
- It should be mentioned that there are several DHS systems which supply only heat or domestic hot water, while, in general, most of DHS supply both.
- There are no direct subsidies for DHS on national, regional or local level

TECHNICAL ISSUES WITH DH IN CROATIA

- Old buildings with inadequate insulation
- Vertical piping in buildings
- High supply temperatures
- Almost no utilization of renewables and waste heat (outside of CHP)
- Old and inefficient district heating systems
- High losses both in heat and water
- Often no supply of DHW even when CHP is used
- Inadequate measurements and control

WHAT NEEDS TO CHANGE

- Higher building renovation rate
- Enhanced spatial planning and mapping
- Revitalization of old heat pipelines
- Liberalization of the market
- Increased RES share in heating and cooling
- Political support - subsidies from national level

LESSONS LEARNED

- Besides Karlovac, additional **12 cities in Croatia use DHS** at least on a small scale
- **Increased awareness of the benefits of fuel switch**, it is only matter of time when these cities will make a step forward and actively start integrating DH in spatial plans and connecting building stock to DHS
- **Replication potential is strong** in the entire Croatia as DH system were similarly designed and built
- **Challenge** - to adapt some of the proposed measures to the language of spatial planning for them to be properly adapted to the plans they were being integrated in
- All municipalities, cities and regions have spatial planning practices across Europe and often lack the capacity or experiences to properly integrate energy and climate into them.
- **Lighthouse example** of how to develop and implement green spatial plans thus enabling local and regional governments to tailor their development pathways explicitly and directly

Thank you for your attention!

Martina Krizmanić Pećnik, project leader

www.regea.org

mkpecnik@regea.org

00385 99 202 6425

https://www.facebook.com/regeaSZhr

https://twitter.com/RegeaAgency

https://www.linkedin.com/company/north-west-croatia-regional-energy-agency-regea-

Project final event - Brussels, March 17th, 2022

Efficient renovation of existing district heating

ENTRAIN|KSSENA|Nejc Jurko| JAVNE SLUŽBE Ptuj|Franci Voglar

Slovenia:

Slovenia lies in Central Europe, between the Alps, the Pannonian Plain and the Adriatic. The total area of the territory measures 20,273 km2. The length of the border is 1.370 km, of which 318 km with Austria, 670 km with Croatia, 102 km with Hungary and 280 km with Italy. The length of the coastline is 46.6 km.

Source: www.kam.si

LOCAL AREA

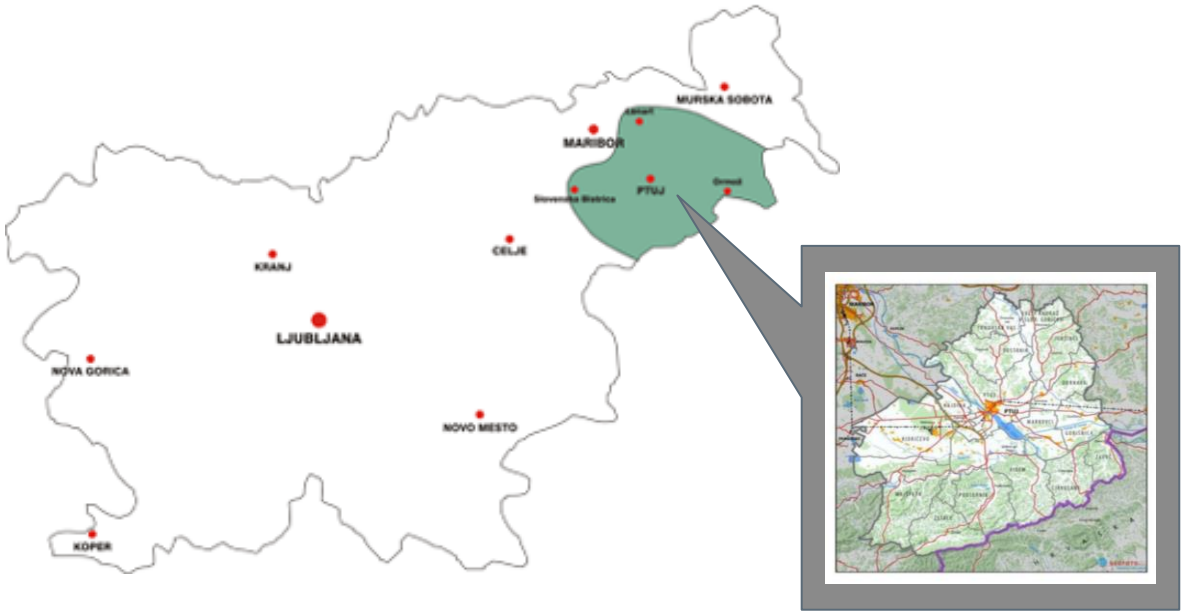
Regions:

- Pomurska region, Podravska region, Koroška region, Savinjska region, Zasavska region, Spodnjeposavska region, Jugovzhodna Slovenija, Osrednjeslovenska region, Gorenjska region, Notranjsko - kraška region, Goriška region, Obalno - kraška region.

Source: upload.wikimedia.org

LOCAL AREA:

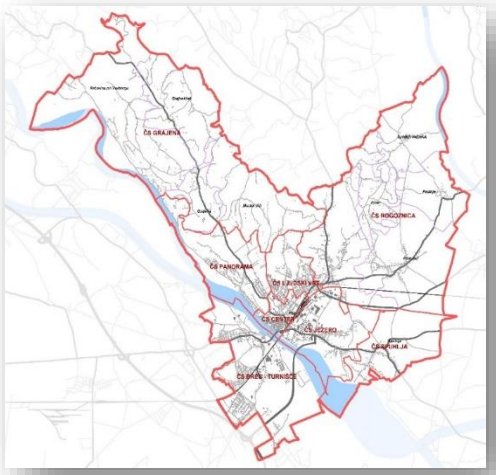
Lower Podravje region:



Source: www.tednik.si

Municipality of Ptuj:

Statistical data about the city of Ptuj:
Area: 66, 7 km2
Population: 23,530 (1/1/2020)
Elevation: 232 m



Energy use and supply:

Dwellings:

Fuel oil consumption (30%) causes higher gas emissions than wood biomass consumption (40%). This is an individual use of this energy source, which means individual fireboxes. Some households switched to natural gas heating (14%), mainly in urban centers where no other energy sources can be used.

Public buildings:

Public buildings are heated by heating oil, natural gas, DH, common boiler rooms and LPG. Most buildings do not have solar collectors or heat pumps installed, and they heat all domestic hot water by central heating to non-renewable energy sources or electricity.

Industry and crafts:

Fossil fuels are mostly used, with 79% of the energy consumed coming from natural gas and 19% from extra light heating oil. Average awareness of economic operators about RES and EE. Companies do not have energy managers involved.

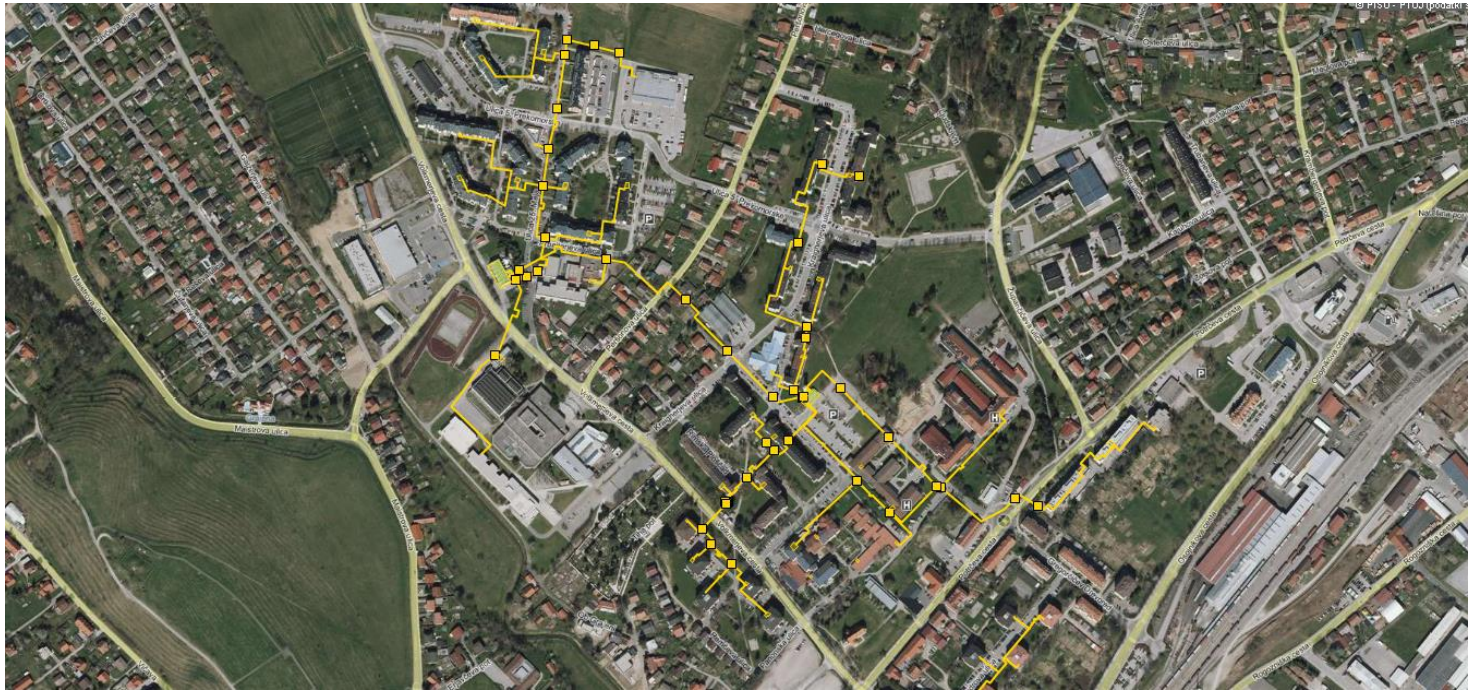
PILOT PROJECT

DHS of Ptuj:

Main boiler room – EO1

Existing boiler plant

DHS of Ptuj: - DHS grid



Existing DHS network

PILOT PROJECT

The reconstruction project includes two phases, namely:

Phase I. - Reconstruction of the existing district heating boiler room and transition to RES.

Phase I. represents the reconstruction of the existing boiler room. Two of the three boilers will be removed from the boiler room. The first will be replaced by a new wood biomass boiler and the second by a new gas boiler. An old spare boiler remains inside the boiler room.

Biomass boiler power: 3,2 MW

Gas boiler power: 6,7 MW

Spare boiler: 7,0 MW

PILOT PROJECT

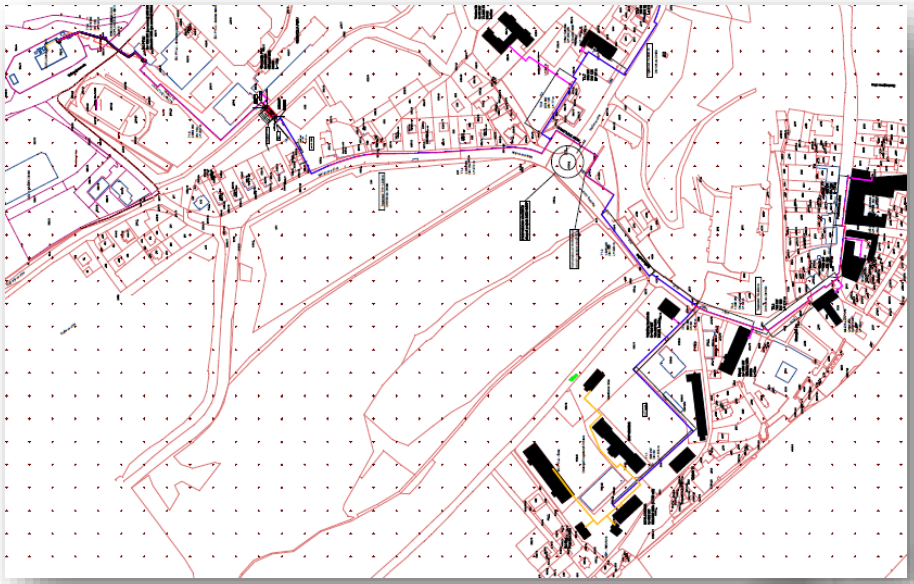
The reconstruction project includes two phases, namely:

Phase II. - Expansion of the district heating network and connection of new users.

Phase II. represent the expansion of the network and the connection of new customers. The lenght of the new DH network would be 2.000 m.

New connection power: 2 MW

New additional heat consuption: 1.900 MWh



PILOT PROJECT

ACTIVITIES:

1. Idea for modernization and transition to RES DH

2. Planning a project to obtain a building permit

3. Execution of the public procurement for obtaining tenders for the reconstruction

4. Creating a project for implementation

5. Completion of project documentation and implementation of public procurement

6. Preparation of the Grant Application

7. Obtaining a grant

PILOT PROJECT

PROJECT VALUE:

Phase I. – 2,6 mio EUR

Phase II. – 1,0 mio EUR

The funds were tendered by the Ministry of Infrastructure of the Republic of Slovenia. 20 million EUR was reserved for such projects in the tender.

The reconstruction project of DO Ptuj applied for the mentioned tender and obtained non-refundable financial resources in the amount of 1.2 million EUR.

PILOT PROJECT

TECHNICAL ASPECTS:

- modernization of the old boiler room
- lowering the temperature regime (increase efficiency)
- Automation of the production process
- Use of QM standard - unification

ENVIRONMENTAL ASPECTS:

- reduction of CO2 emissions (approx. 1,900 tCO2)
- transition to renewable energy sources
- Reducing the use of fossil fuels
- Cleaner air in the local area

PILOT PROJECT

SOCIO-ECONOMIC ASPECT:

- reducing dependence on imported energy
- Use of fuels of the local environment (wood biomass)
- Raising local community awareness of the use of RES
- Encouraging the design of DHS based on RES

PILOT PROJECT

3D animation of the new boiler room

CONCLUSION

The pilot case from Ptuj is an excellent proof that even older district heating systems can be efficiently transformed into efficient heating systems based on renewable energy sources.

Thanks to the ENTRAIN project, which showed us the way to undertake the renovation and in what way. According to the guidelines of the QM system, this can be effectively regulated.

THANK YOU FOR YOUR ATTENTION

Nejc Jurko, Franci Voglar
Zavod Kssena Velenje, Javne službe Ptuj, d. o. o.

www.interreg-central.eu/entrain

nejc.jurko@kssena.velenje.eu, franci.voglar@jsp.si

+386 51 30 83 87, +386 2 620 73 60

@EntrainSlovenia