Gemona del Friuli 30/04/2021

Efficient RES-based DH networks implementation: The ENTRAIN project in Friuli Venezia Giulia region

PROSPECT2030 |APE FVG| Francesco Locatelli

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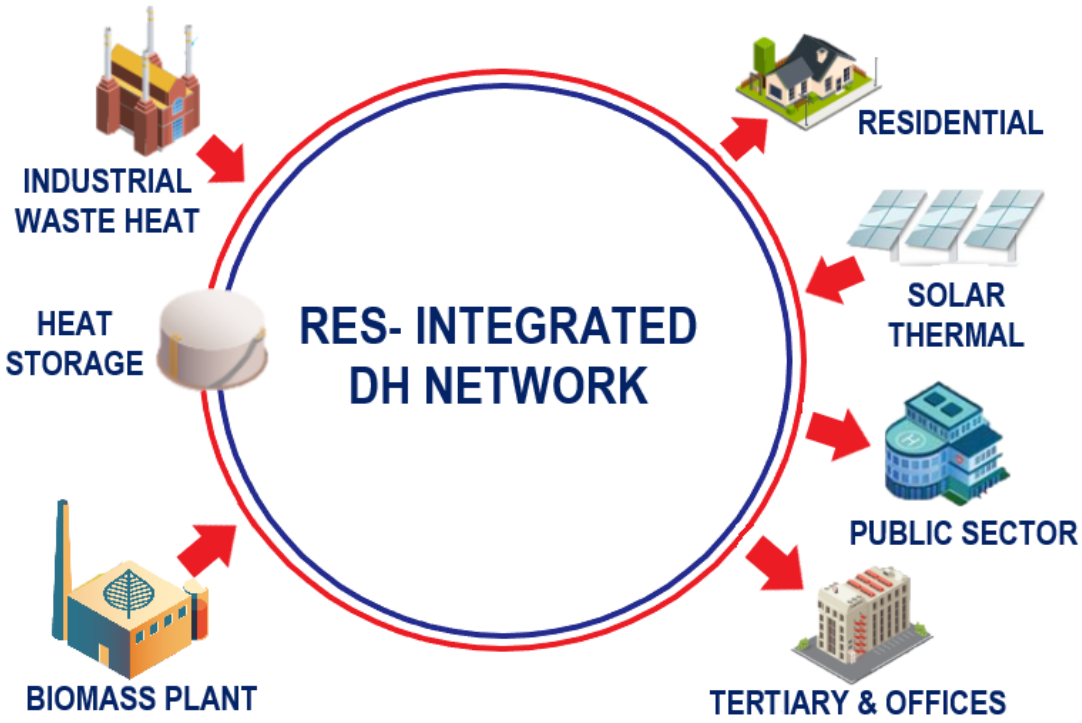
European Union European Regional Development Fund

RES-based DH systems can:

- Reduce CO2 emissions;
- Improve local air quality;
- Boost local economy;
- Provide cheaper heat;



BUT ONLY IF PLANNED, REALIZED AND OPERATED CORRECTLY!

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Mistakes have been made (and still are now) everywhere in Europe:

- Oversizing of plant and network components;
- Bad managements of public funds and incentives;
- Wrong operations, fuel supplied from distant areas.

Resulting in:

- Economic losses;
- Higher emissions on global and local level;
- Low social acceptance.

How to avoid this?

Learn from past experiences of others and apply standardized procedures:

➡ ADOPT A QUALITY MANAGEMENT SYSTEM

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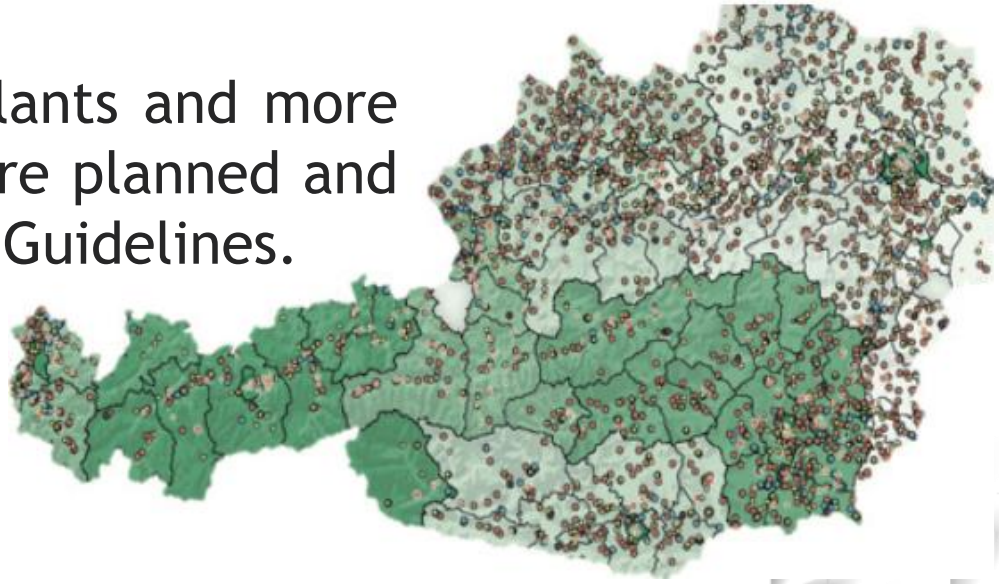
QM-Holzheizwerke is a quality management system for biomass-based DH networks.

QM Holzheizwerke

First developed in Switzerland in 1998, it was then adopted in Austria and Germany, and it is now being transferred to other regions in Europe.

In Austria alone, over 2.300 plants and more than 3.400 km of networks were planned and are managed following the QM-Guidelines.



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The goal of QM is to guarantee:

- Economical sustainability;
- Stable operations and low maintenance;
- Low emissions;
- High utilizations and low heat losses.

How?

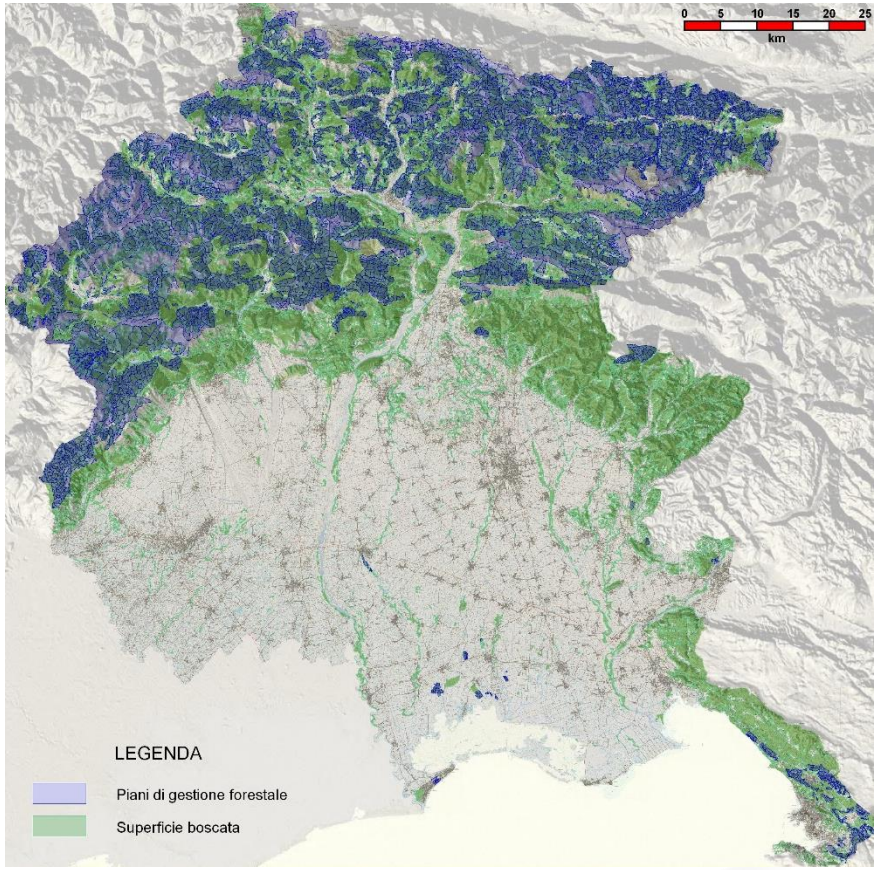
Sounds actually quite simple. Owner, planner and Q-Manager sit at the same table and officially define steps and goals:

- Objective Linear Heat Density [kWh/(m*y)] and Losses [%];
- Select and dimension components according to guidelines;
- Secure 70% of heat sales BEFORE building the plant;
- Monitoring of operations.

BIOMASS POTENTIAL

FVG region has a high untapped potential of wood biomass:

- 40% of the region is forest-covered (green+blue);
- Of which only 60% has a management plan (blue);
- Only 15% of the annual growth potential is actually used.

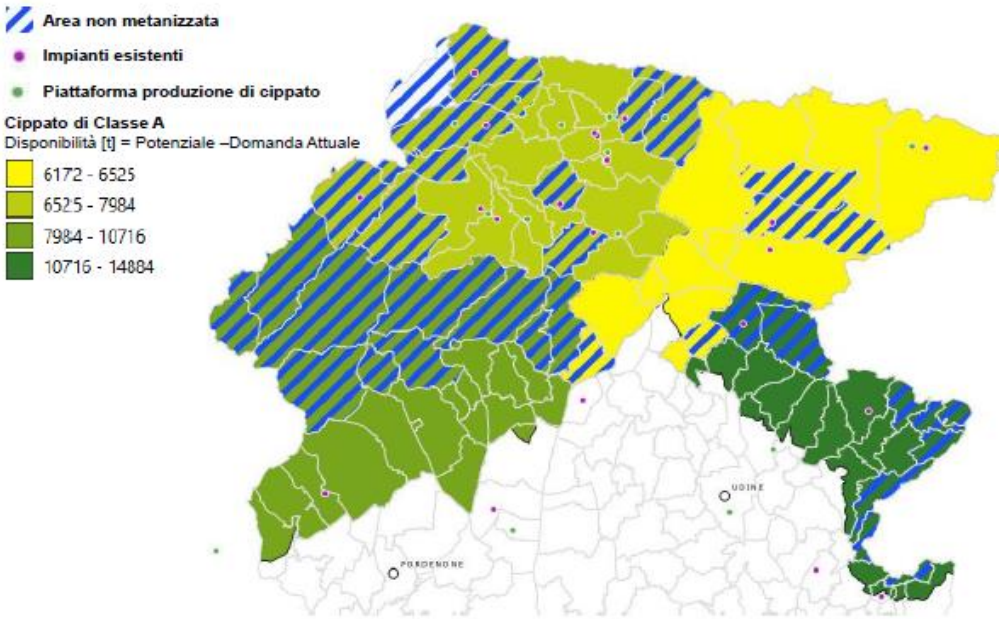


Forest coverage and available management plans

BIOMASS POTENTIAL

Moreover, class-A wood chip availability largely matches with non methanized areas, creating a perfectly local synergy opportunity.

Besides the potential, there is already a well established wood industry and logistic platforms.



A-class biomass availability vs not methanized municipalities

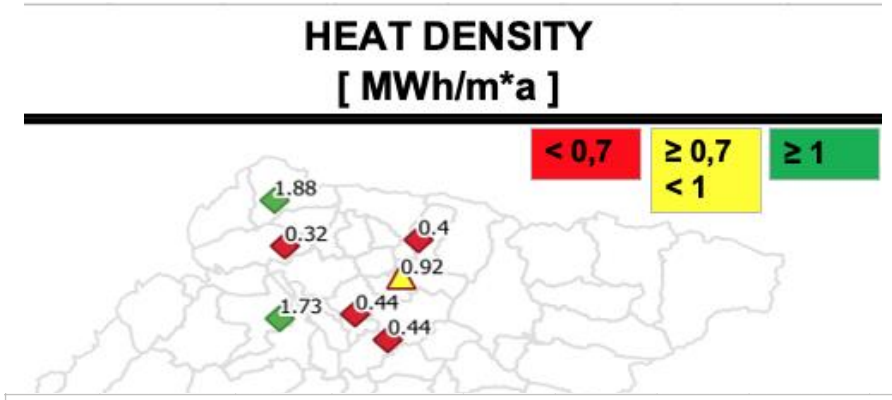
EXISTING PLANTS

Most of existing plants present negative economic balances and operating issues.

In fact they do not satisfy QM's main criteria:

*Heat Density > 1 MWh/(m*y)*

Meaning that the heat sales do not justify the pipes length! Moreover, high heat losses due to oversized pipes and bad sizing of boiler and heat storage worsen the situation.



ESCOMONTAGNA PLANTS

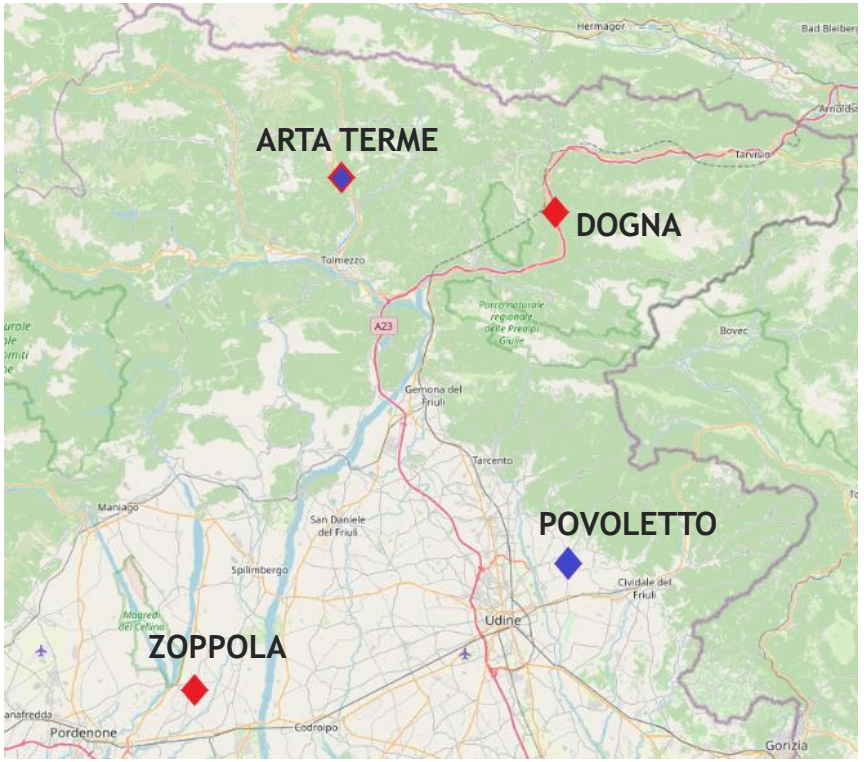
Heat exchanger ID	Municipality	Network lenght [m]	Annual heat sale [kWh/a]	Heat Density [kWh/m*a]	Heat Density [MWh/m*a]	Evalutaion	Annual net value of heat sold	Net heat sales price average [€/MWh]
1		86	162.182	**1888**	**1,888**	👍	10.439,46 €	64,37 €
2		1.292	518.056	**401**	**0,401**	👎	29.327,36 €	56,61 €
3		295	510.460	**1733**	**1,733**	👍	32.394,49 €	63,46 €
4		1.055	334.207	**317**	**0,317**	👎	21.273,65 €	63,65 €
5		414	182.588	**442**	**0,442**	👎	10.836,37 €	59,35 €
6		1.015	444.456	**438**	**0,438**	👎	23.186,18 €	52,17 €
7		9.009	8.292.800	**921**	**0,921**	👎	519.333,36 €	62,62 €
TOTALE		**13.166**	**10.444.749**	**793**	**0,793**	👎	**646.790,86 €**	**61,92 €**

Heat density of some DH networks in the alpine area

1 - REQUALIFY

APE FVG supported 4 local municipalities in developing requalification plans following the Q-Guidelines:

- Expansions with high Heat Density;
- Densification of heat demand along existing grids;
- Substitution and optimal sizing of boilers and storages.



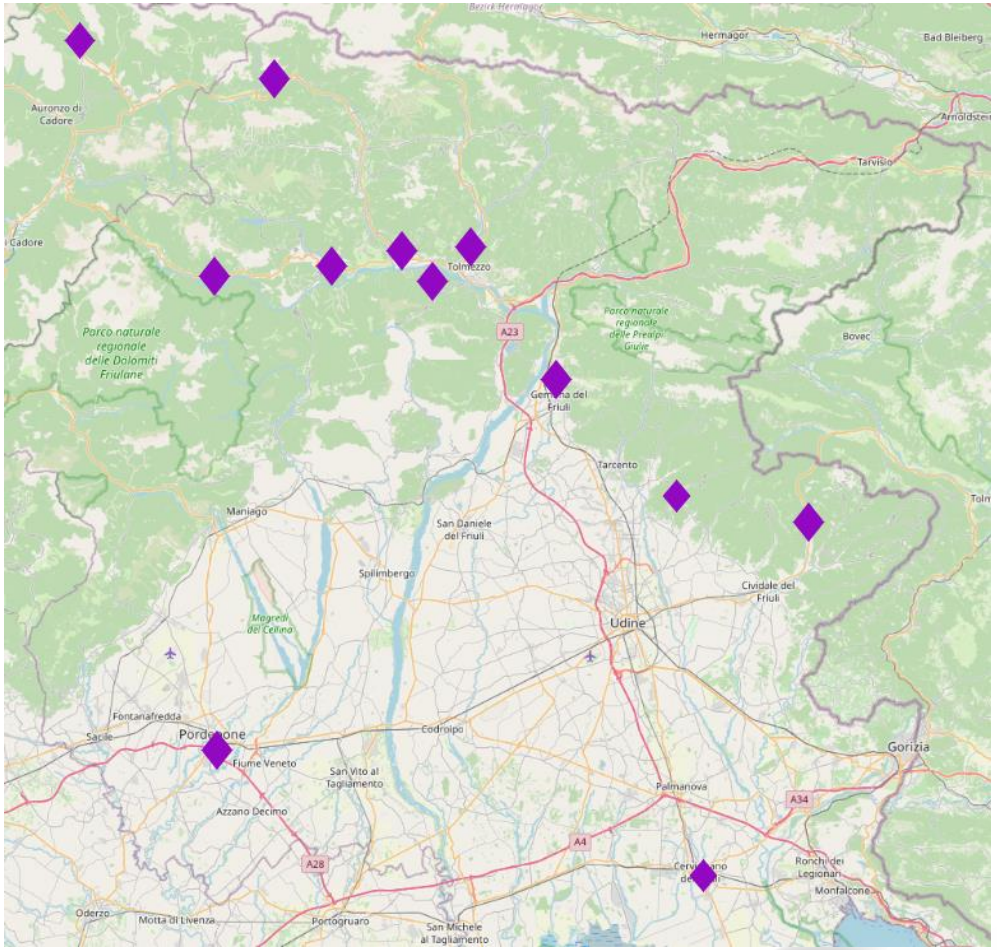
Grid expansion with high density
Boiler substitution from fossil to biomass
Grid densification & boiler substitution

2 - PLAN NEW PLANTS

APE FVG developed 12 new pre-feasibility plans:

- Heat demand evaluation;
- Possible layout;
- Hand out of QM material to municipalities and planners;

Possible configuration in Gemona del Friuli



New pre-feasibility studies

LOCAL FOREST TO LOCAL HEAT

Moreover we are working on connecting the local forests (especially those owned by municipalities) to the new planned DH networks, by unifying the tender for the forest management and heat supply to the town.

This brings benefits to:

- Municipalities (revenue from unused forest potential);
- Local forestry companies;
- Local inhabitants.

IN A STABLE WAY FOR 15-20 YEARS!

LOCAL BENEFITS - 1

Gemona del Friuli case study (still under evaluation):

- Schools & Gyms district;
- About 3,1 GWh of yearly heat demand;
- About 219.000 EUR of gas & oil supply;

Even with some price reduction to final costumers it means

200.000 EUR INTO THE LOCAL ECONOMY EACH YEAR

LOCAL BENEFITS - 2

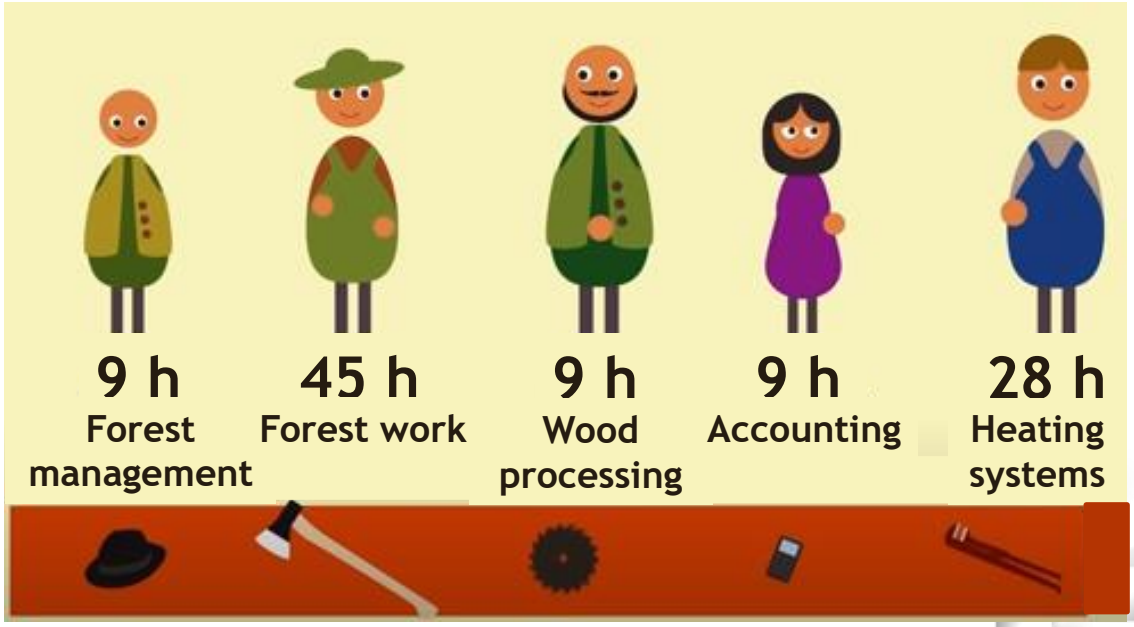
Besides money, the benefits are especially relevant regarding local job creation. For the same amount of final energy, each energy vector requires locally an amount of working hours:


100 h


13 h


6,5 h

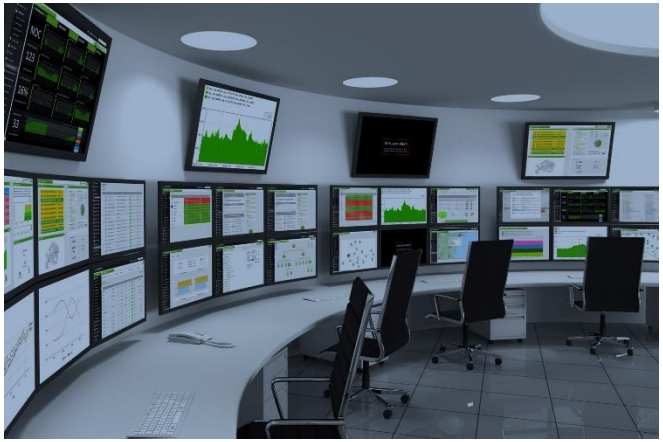
Regarding wood biomass, these working hours are distributed as shown in the picture:



Picture taken and elaborated from the Austrian Biomass Association ÖBV

NEXT STEPS

- Get pilot plants up and running;
- Monitoring of existing plants for deeper analysis (some need new installations);
- Requalification of existing plants and monitoring for before/after comparison;
- Implementation of other sources for grid complexity (solar thermal, industrial waste heat)



FLEXIBLE TOOL

A Quality Management System:

- Is NOT meant to make things more complicated;
- It should instead be FLEXIBLE for the different study cases.

Do not try to implement a full QM process from scratch, but adapt the principles to most possible cases and see how it evolves!

- Simplified versions for small plants, grid expansions, requalification;
- Smart pdf and Excel documents for planners, owners and operators (Checklists, KPI calculators, demand surveys etc.);
- Work with local authorities to define best QM funding schemes;

And spread the knowledge!

THANKS!

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