THERMOS

Accelerating the development of low-carbon heating & cooling networks

Case study in Meylan, France

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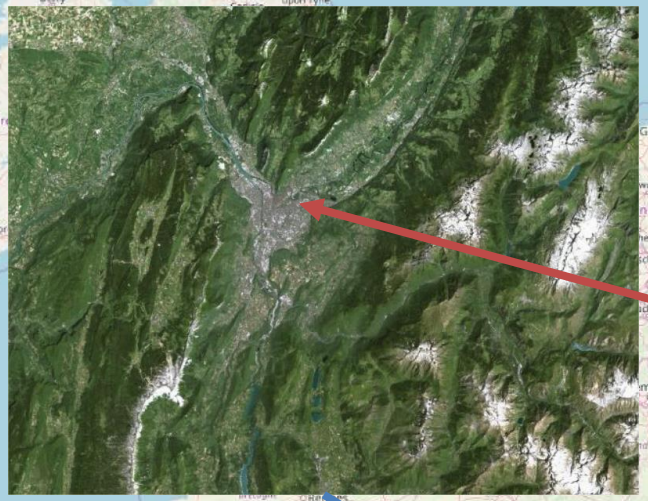
MANERGY

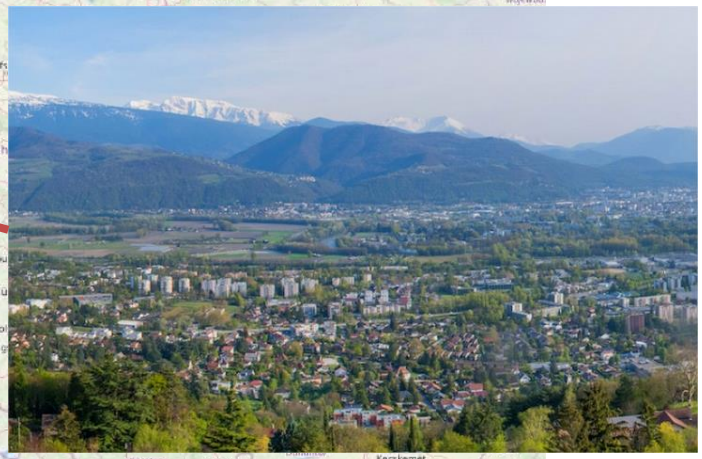
SERMET | ITHERM CONSEIL
SERMET | ÉTUDE DES FLUIDES
Sf2e | AGOTHERM Conseil et assistance en efficacité énergétique
PCI THERMIQUE | CIE DUPAQUIER

- Holding of local engineering consultancies
- 125 employees (mostly engineers)
- 15 M€ turnover
- 8 entites
- 40 years of experience

CHD, case studies, feasability studies, …

Meylan case study





Municipality wants to know if it is feasible to make a CDH network, the costs and the prices of the project

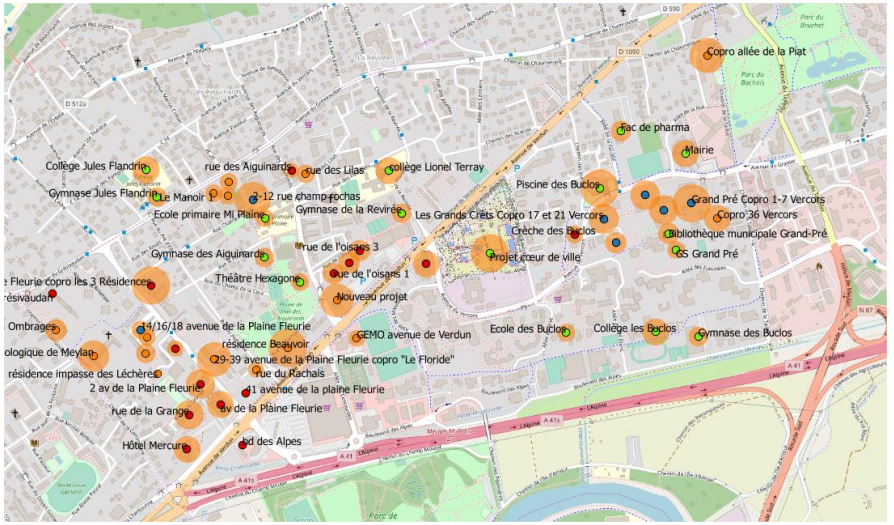
Meylan city, near Grenoble
Pop. 17,556
Heating Degree Days : 2606 (base 18°C)
Base temp : -11°C
Ski station : close

Case study : data

- Step 1 : collect data about the building consumption, then locate on a map (Qgis)

Thermos can make assumptions based on the height and surface of the building, but in this case we have access to more accurate data (public buildings consumption, gas supplier data, etc.) & many buildings are heated by electricity, hence not connectable

	ECS estimée Mwhu	Consommation de MWh u	Consommation Mwhu	Vérif fichier pro	Ecart (%)	Cause écart	Intermittence	P ch kW	P ECS kW
des Buclos	604	558	1162	1263	-8%	l ECS dans le fic	1	349	207
id Pré	0	174	174	215	-19%	ects", rendemen	0,7	156	0
ra Copro 19 et 23 Vercors	0	165	165	165	0%		0,7	147	0
nds Crêts Copro 17 et 21 Vercor	0	358	358	341	5%	ratio différent	0,9	249	0
2 Copro 13 et 15 Vercors	0	529	529	493	7%	ratio différent	0,9	368	0
1 Copro 9 et 11 Vercors	0	385	385	350	10%	ratio différent	0,9	267	0
ré Copro 1-7 Vercors	320	1083	1403	1733	-19%	ratio différent	0,9	753	110
6 Vercors	144	433	577	577	0%		0,9	301	49
des Buclos	0	90	90	90	0%		0,7	80	0
de la Musique	0	162	162	193	-16%	4 non pris en cor	0,7	145	0
de retraite chemin des Sétérées	0	144	144	192	-25%	ratio différent	0,9	100	0
Hexagone	0	303	303	298	2%		0,7	271	0
e des Aiguinards	0	163	163	163	0%		0,7	146	0
imaire Mi Plaine	0	296	296	331	-11%	endement différe	0,7	265	0
oir 1	40	198	238	238	0%		0,9	138	14
oir 2	40	233	273	273	0%		0,9	162	14
oir 3	40	209	249	249	0%		0,9	145	14
champ rochas	152	770	922	1009	-9%	années de ref diff	0,9	535	52
Grange	144	591	735	735	0%		0,9	410	49
la Grange	144	408	552	552	0%		0,9	284	49
ue Plaine Fleurie	56	136	192	192	0%		0,9	95	19
se Saint Jean	0	236	236	246	-4%	ratio différent	0,9	164	0
e les Léchères - 20 avenue de l	0	187	187	183	2%		0,9	130	0
avenue de la Plaine Fleurie	0	266	266	277	-4%	ratio différent	0,9	185	0
achais	42	108	150	144	4%	ratio différent	0,9	75	14
enue de la Plaine Fleurie	220	547	767	791	-3%	non relevée ds f	0,9	380	75
e Beauvoir	224	823	1047	1047	0%		0,9	572	77
projet	260	520	780	780	0%		0,9	361	89
rale 8 allée de la roseraie	84,4	274	359	465	-23%	s", conso connue	0,9	191	29
Ville Nord (inc B)	**621,429**	**1267**	**1888**	**1964**	**-4%**		**0,9**	**880**	**213**
Ville Sud	**434,793**	**834**	**1269**	**1391**	**-9%**		**0,9**	**579**	**149**



Case study : network

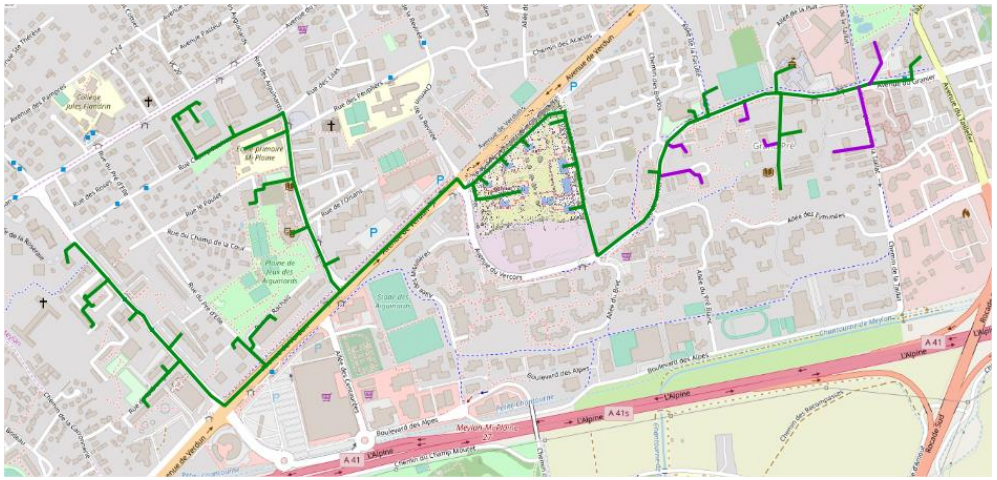
- Step 2 : guess where a network can pass

⇒ *Which buildings should I keep or not? Based on which criteria?*

⇒ *How can I optimize the route? (easy for a simple network; can be very complicated)*

Before Thermos : make assumptions, draw a network by hand, optimize it step by step

…I don't know the pipes diameter



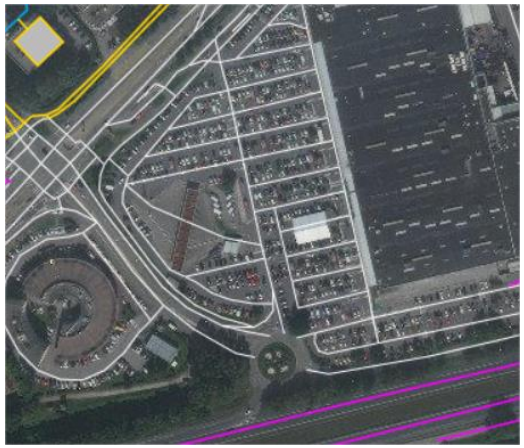
Case study : network

- With Thermos :
- Import Qgis data on Thermos, with peak power and consumption data (about 1hr of work from a full Excel spreadsheet)
- For the simulation, I kept OSM streets data

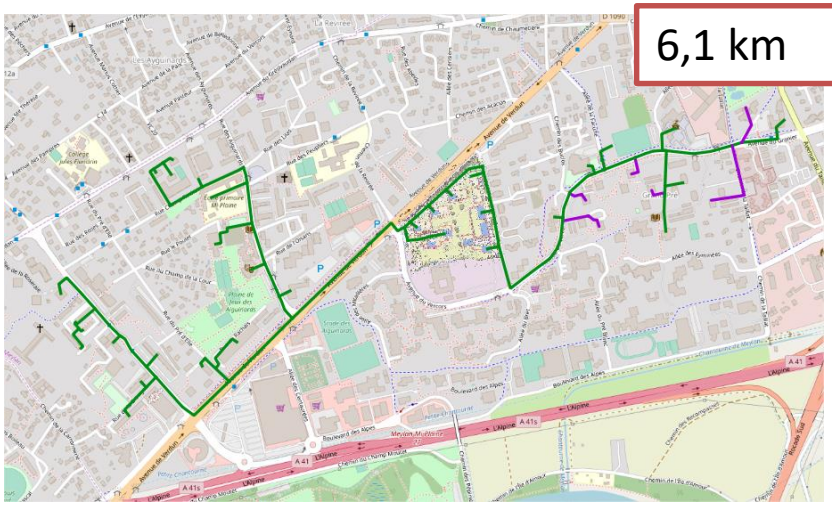
! OSM has very complete data, simplify it before running the simulation (it takes time but it saves much more):

* no grids / multiple parallel lanes

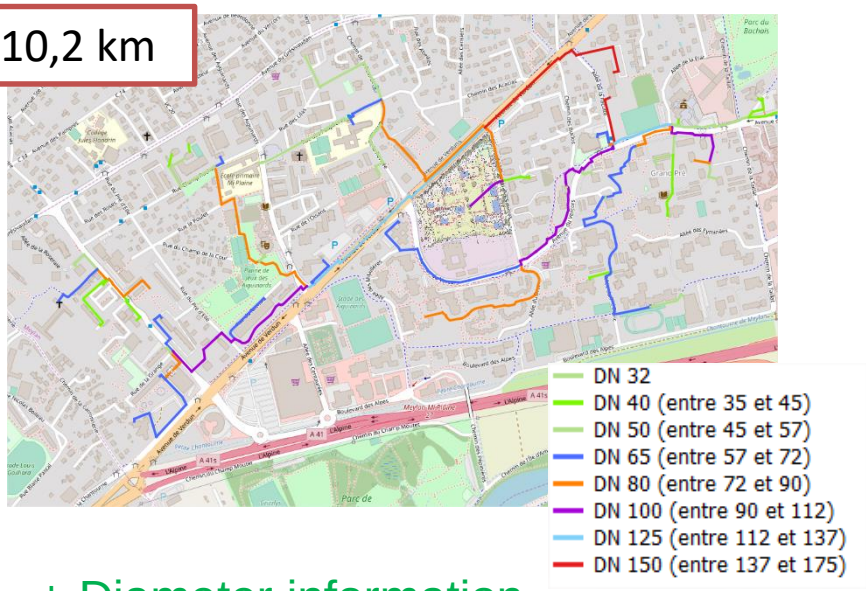
* no footpaths / no private roads (if needed)



Network result



No diameter information
Fully done by hand



+ Diameter information
(! Continuous diameter)
- Some bugs on the network (can be fixed by hand, but it needs double checking – this network is not yet optimized)

+ Automatic calculations, can easily be re-run

Economic result

Working hypothesis :

- Discount future values : 0%
- Calculations over 24 years (standard time for contracts in France)
- Loan at 1,5% over 24 years
- Maximize network NPV (no individual systems) => all the buildings are considered in the network (it's a choice of scenario, which can be easily modified in Thermos)
- Supply plant investment : 3,8 M€ (13 MW) – fixed cost
- 0 operating costs as input
- Supply cost : 3c/kWh (biomass)

- The energy price is calculated separately to balance the economy of the contract over 24 years and test Thermos

Economic result

Cost summary

Item	Capital cost	Operating cost	Operating revenue	NPV
Pipework	6,523 M			-6,523 M
Heat supply	4,511 M	17,134 M		-21,645 M
Demands	0		38,232 M	38,232 M
Emissions		0		0
Network	*11,034 M*	*17,134 M*	*38,232 M*	*10,064 M*
Emissions		0		0
Individual systems		*0*		*0*
Insulation				

= theoretically, resulting operating costs

Operating costs simulated separately : 9,1 M€
=> needs to be adjusted, but very promising !

(heat demands = investment costs + heat supply costs + operating costs)

Other possibiliy : with given operating costs, calculate the balanced energy price

Limits of Thermos

- Maps : some bugs (in OSM data or Thermos), which can be fixed manually

- About the investment : possibility to add subsidies? (in France, subsidies are related to :
  * the length of the network
  * the energy demand of the network (from renewable sources)

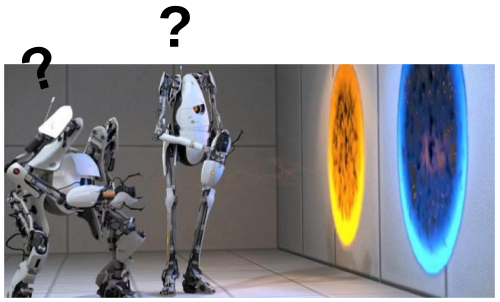
- Calculation time can be long

Thank you for your attention !

Merci de votre attention!

Example of bug

Example of bug



Solution : set inclusion « forbidden » for these paths

THERMOS

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