

Low temperature district heating

- self-generated
- cooperative
- cheapest
- modular



Ramplaankwartier, Haarlem (NL)

2800 inhabitants

1150 dwellings

200 rental property

Mostly built in '30 & '50

mostly energylabel F & G

10 shops, 2 care centers,

1 school, 1 restaurant

Previous success:

1400 PV, for 200 househ.

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Energy label



Average energy use

Electricity use per house = 3111 kWh/yr
Natural gas = 1811 m³/yr



Starting points of residents



1. Feasible and affordable for everyone
2. Good for the environment
3. Comfort and added value
4. Unburdening: turnkey solution
5. Local ownership and control

Research starting points

- a. Cost-efficiency specs:
 - Insulation label 'C' = should be good enough
 - Future proof
- b. Energy specs:
 - Sun = best source; earth = best battery; water = best current
 - Max CO2 reduction
 - High COP, low heat loss
 - Cooling in the summer
- c. Spatial specs: little use of space; locally generated, incl. electricity-for-heating
- d. Socio-technical specs:
 - Triggering the Trias Energetica
 - Modular steps for implementation

SolarNet research (www.zonnewarmtenet.nl)

Research partners:



SPAARgas

 Gemeente Haarlem

Researched techniques

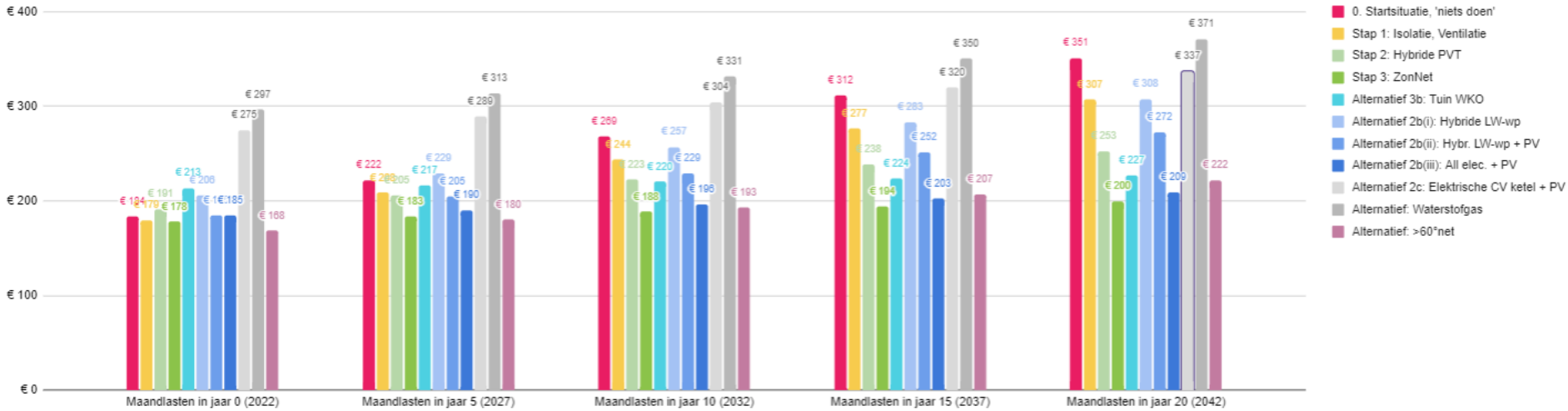
1. District:

- a. >60° heat network, with heat from:
 - residual heat (data centers, Tata, etc.)
 - asphalt, surface water, sewer, biomass
 - earth (deep geothermal)
- b. Hydrogen via current gas network
- c. **SolarNet**: 18° heat network with cooperative open TES

2. Building:

- a. Air heat pump via hybrid to all-electric (without and with PV panels)
- b. Electric central heating boiler (without and with PV panels)
- c. PVT heat pump, via hybrid to TES thermal heat storage
 - closed garden TES
 - open neighbourhood heat-cold-storage with 18° heat network = **SolarNet**

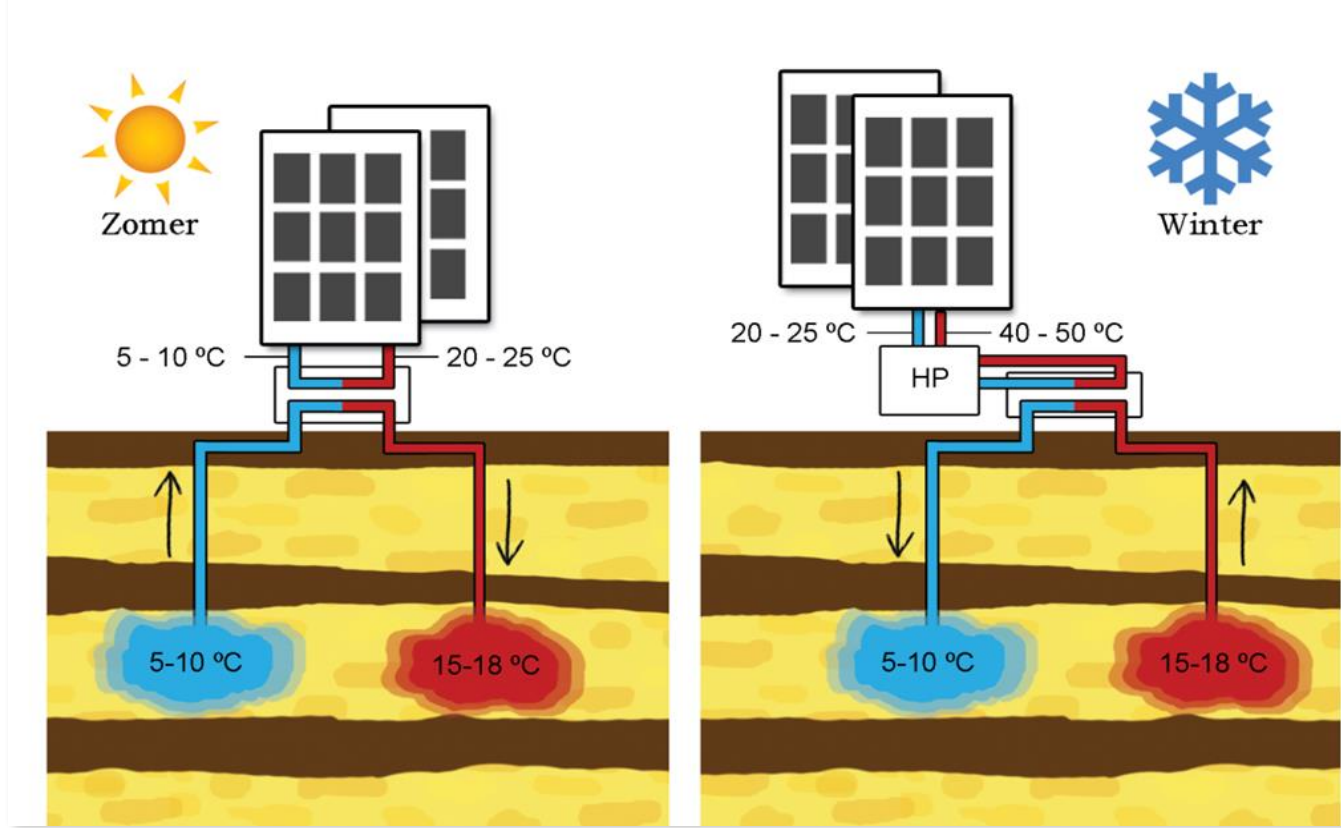
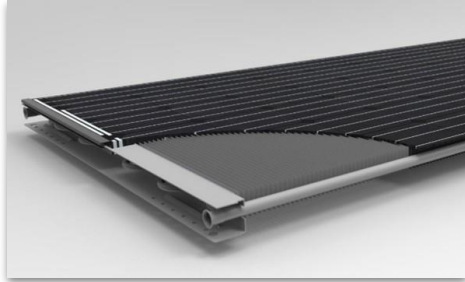
TCO and Conclusion



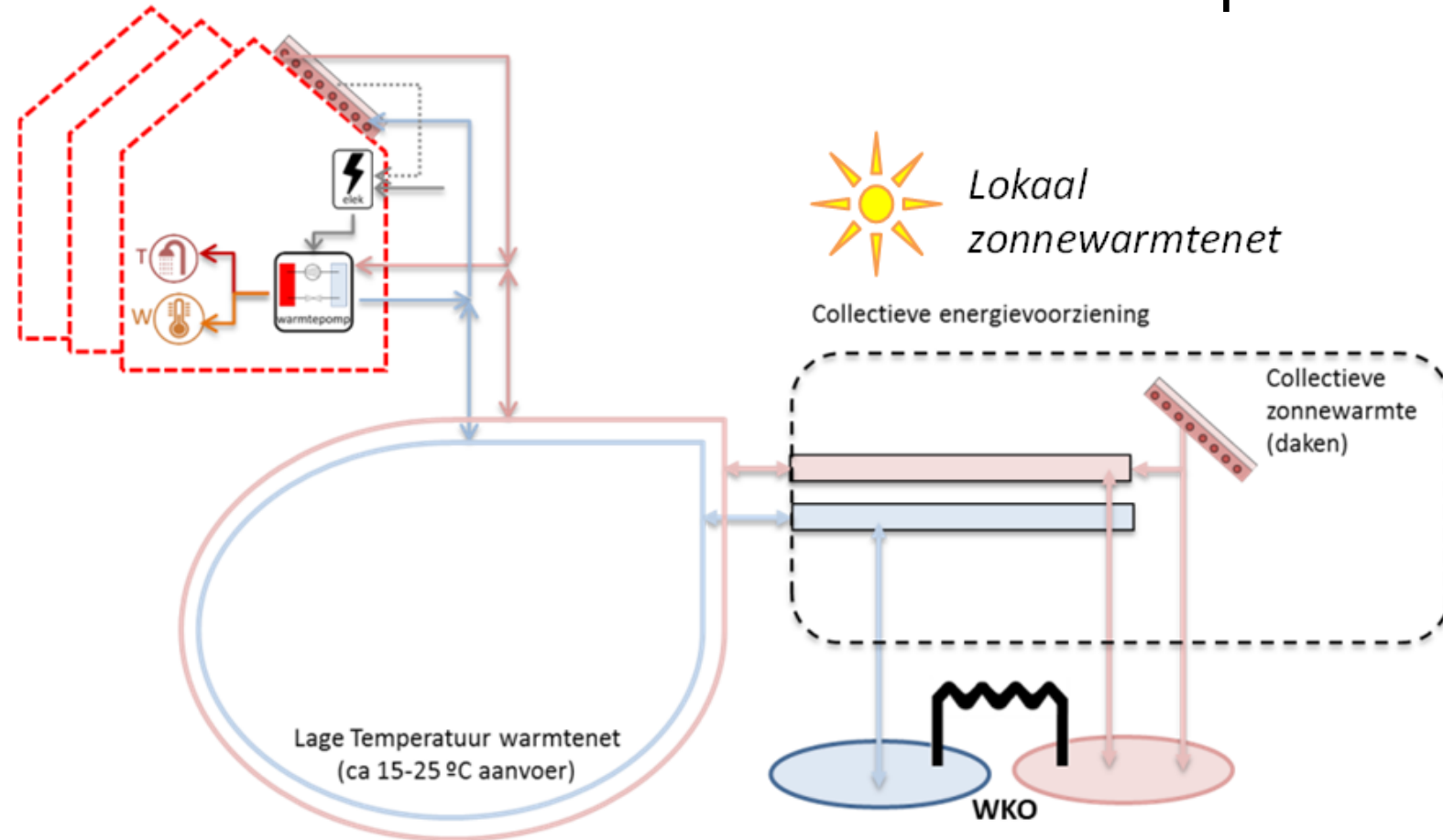
Conclusion: SolarNet is the winner

lowest cost - lowest space - lowest CO2 - modular - applicable for all types of dwellings

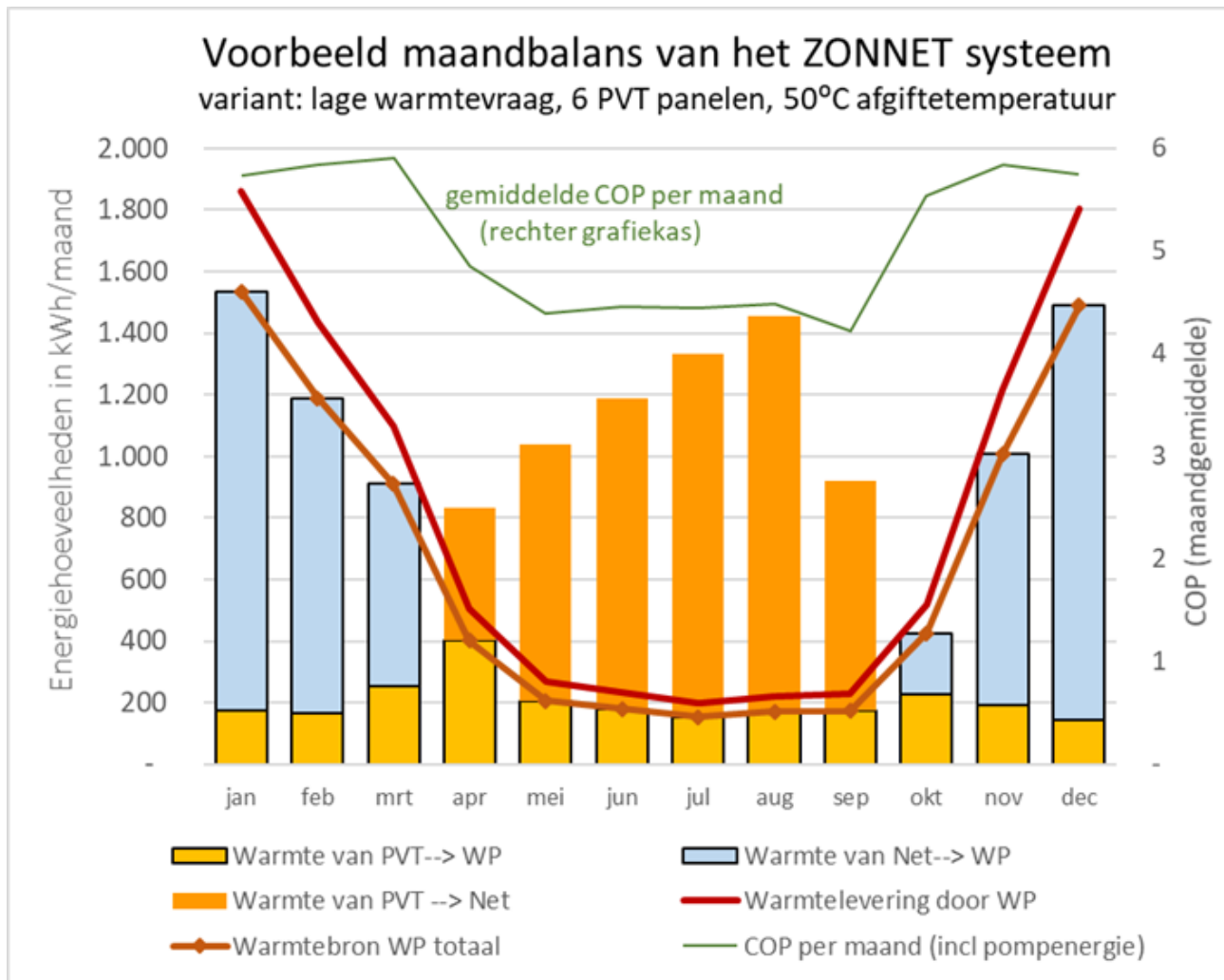
SolarNet



SolarNet: 15-20° heatnet + open TES + PVT

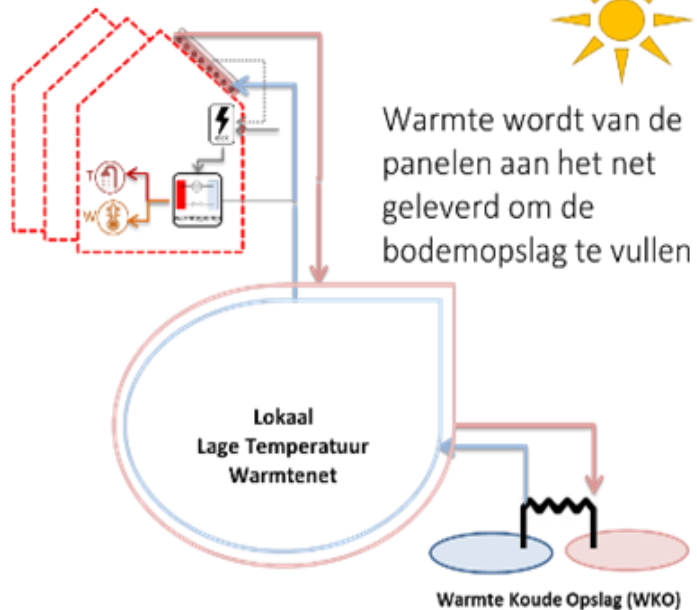


SolarNet: energy- balance

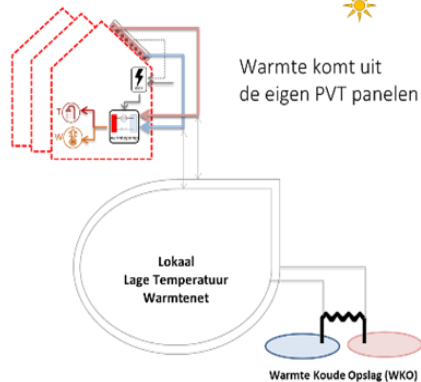


SolarNet: Use of heatnet, per season

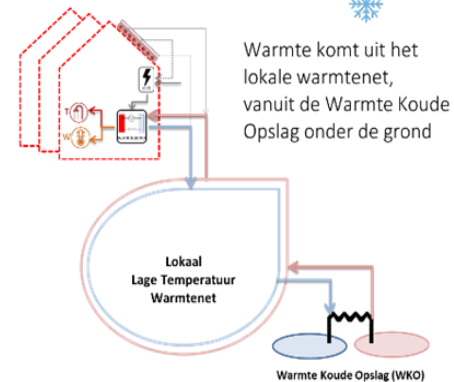
ZonneWarmteNet - Zomer



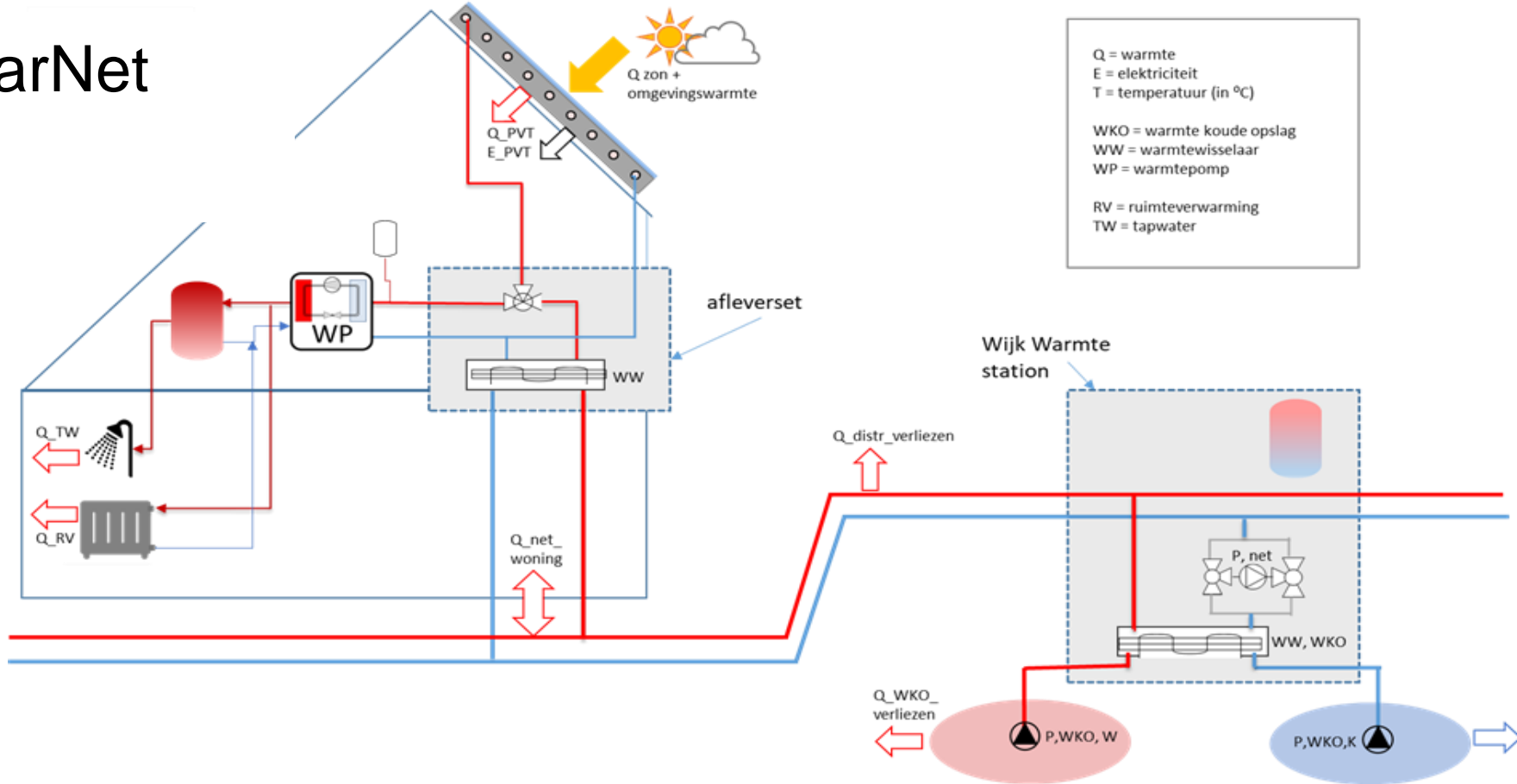
ZonneWarmteNet - Tussenseizoen



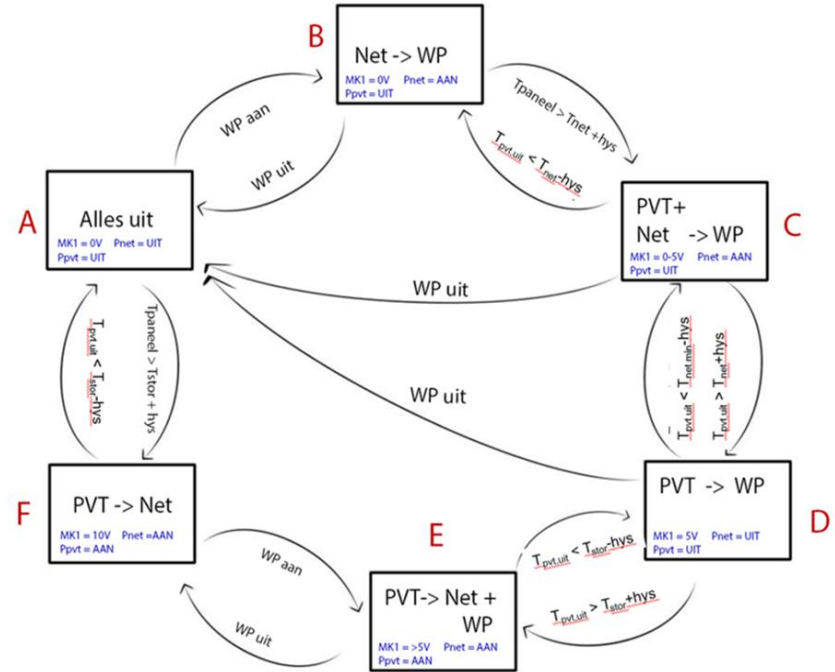
ZonneWarmteNet - Wintersituatie



SolarNet



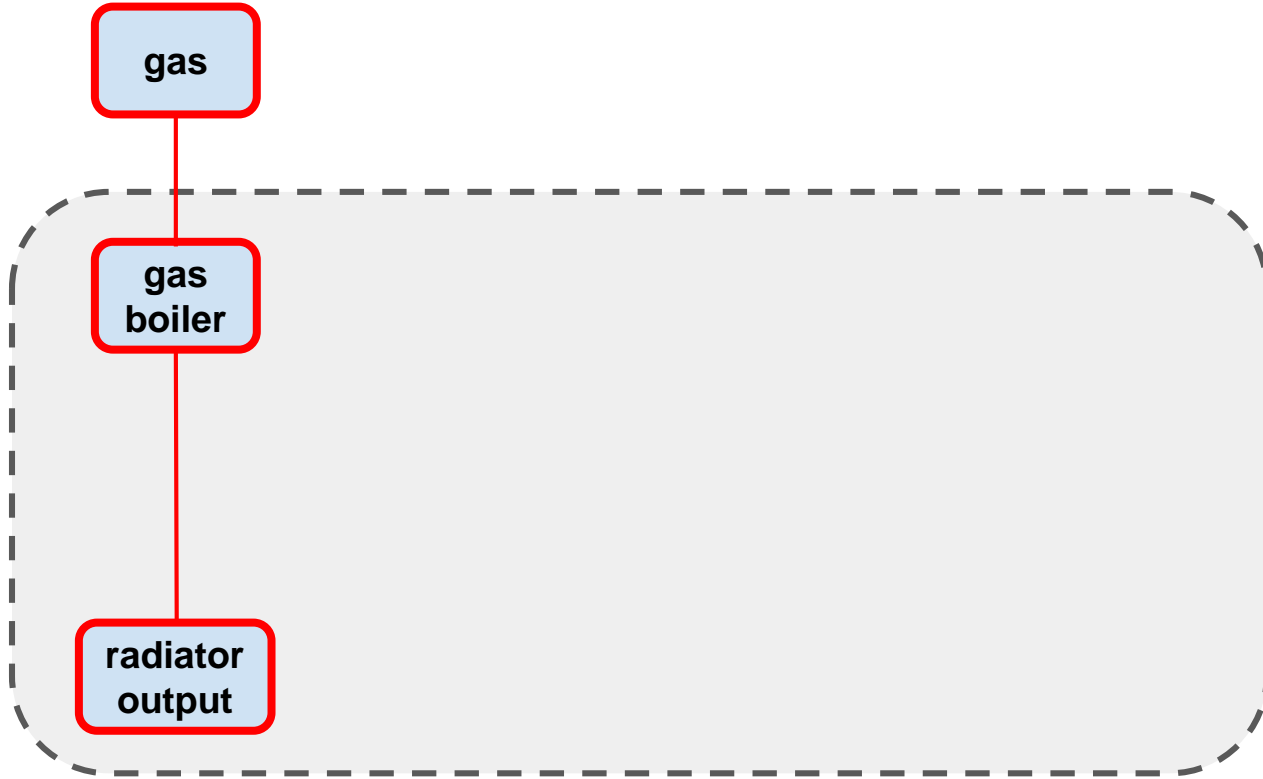
Deliveryset (Green Village - Delft)



Modular steps for houses

- Step 1. Savings-calculator + tailor-made technical & financial **offer**
- Step 2. LT-ready **basic-insulation** + ventilation + radiator output
- Step 3. LT-ready **heat generation**: PVT solar panels, water-water heatpump
- Step 4. Collaborative **heat storage**: district network, TES, delivery set
- Step 5. **Gas**(-boiler) **out** + induction-cooking

Current situation



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Step 1:

Offer

gas

gas
boiler

radiator
output

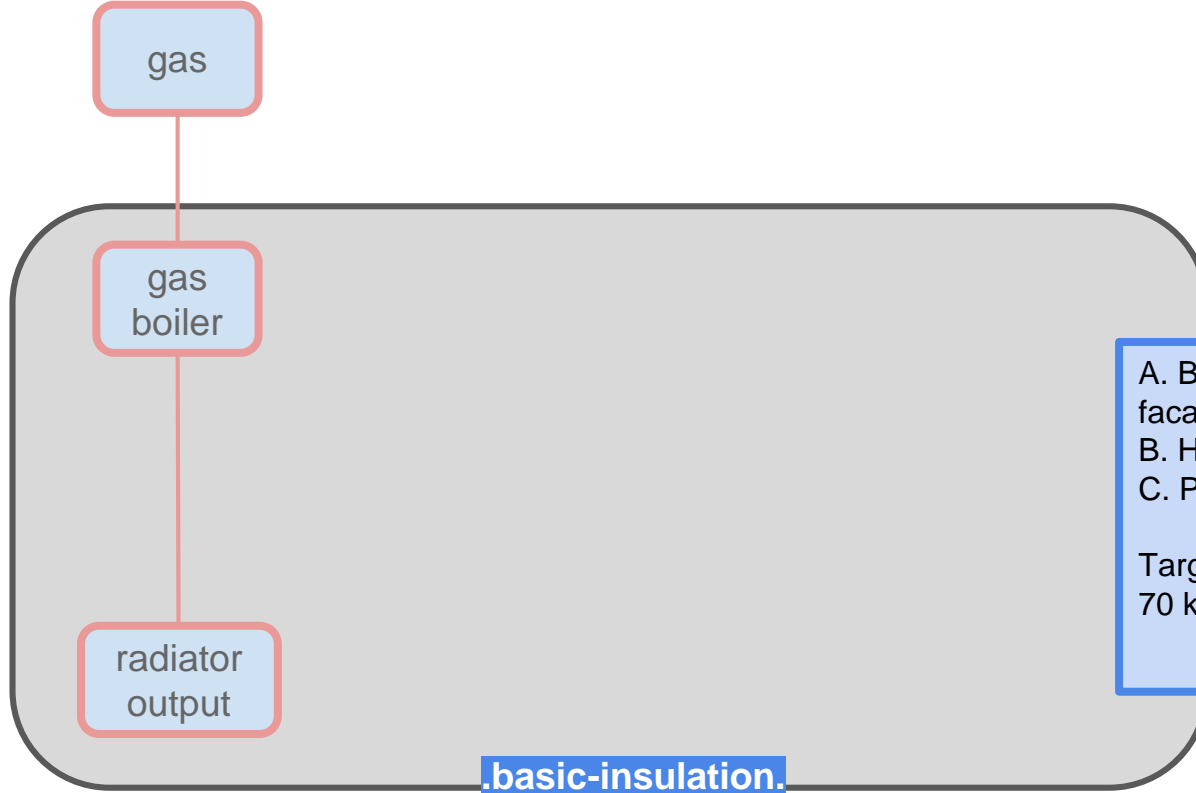
Concept-offer - for everyone

- online house file: request help from your street coach
- savings calculator: every extra step is an extra saving

Final offer - for members

- subsidy scan: for which subsidies are you eligible?
- professional energy advice: which insulation, how much PVT, etc.
- unburdening financing: arranging subsidies and loans
- unburdening: collective purchasing, construction, maintenance, warranty

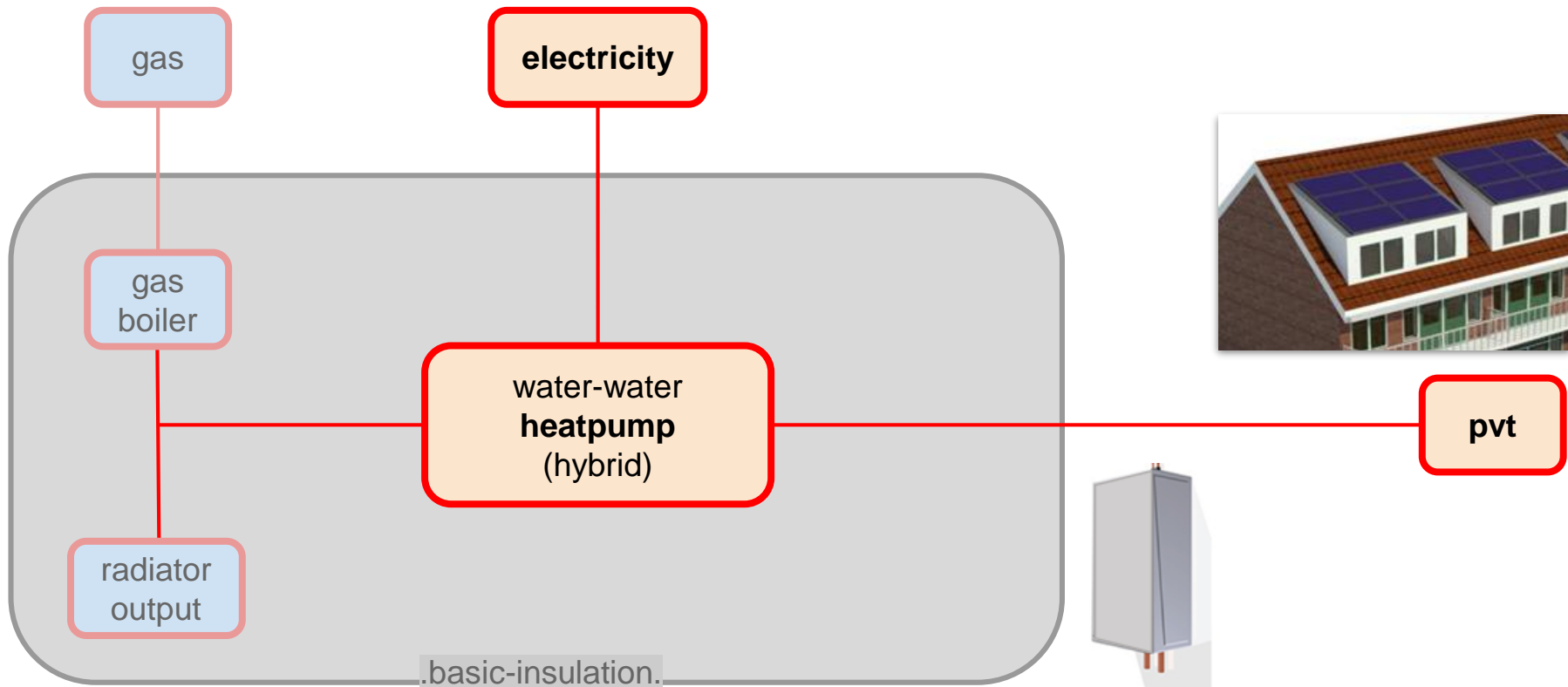
Step 2. LT-ready basic-insulation + ventilation + radiator output



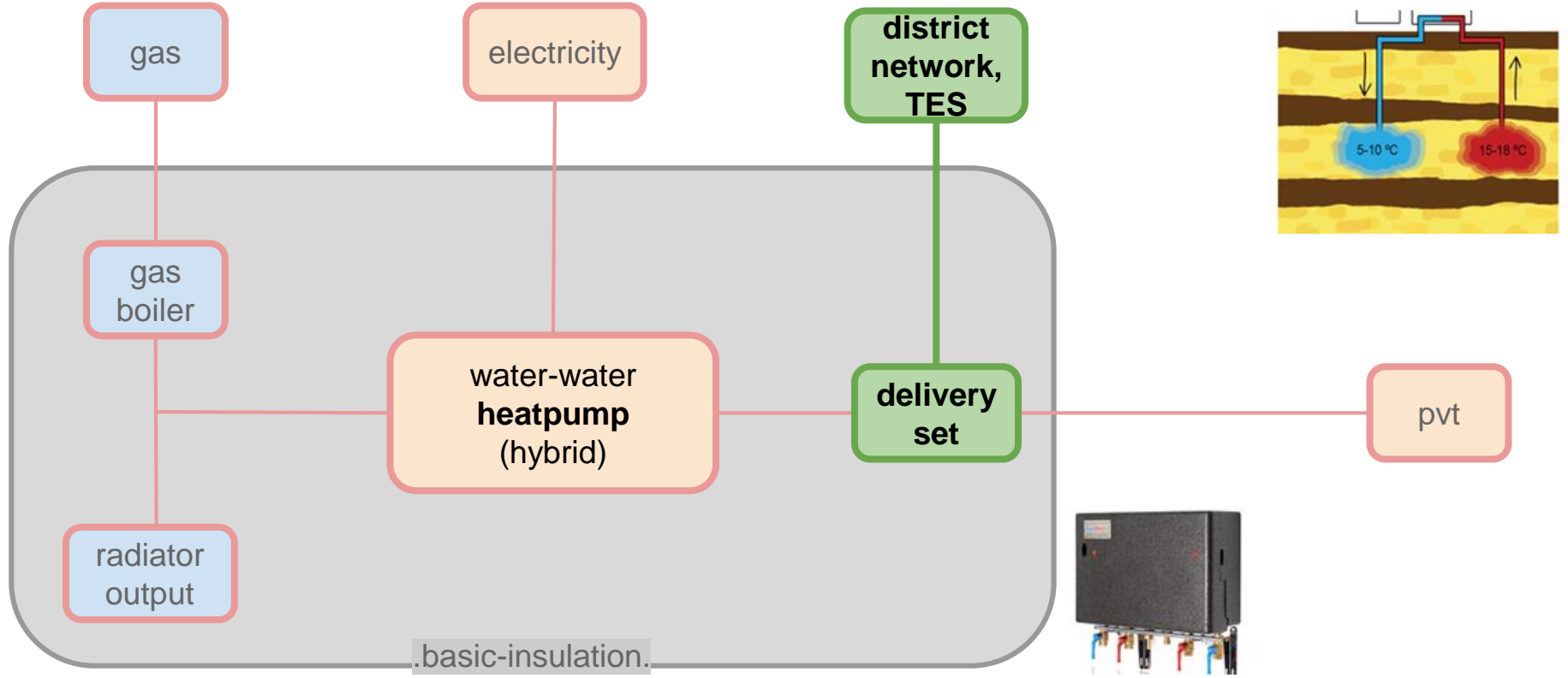
A. Basic Insulation: Windows, facade, floor or roof, crack seal
B. Heat recovery ventilation
C. Possibly bigger radiator

Target: reduce heat demand to
70 kWh / m² / yr

Step 3. LT-ready heat generation: PVT panels, ww heatpump

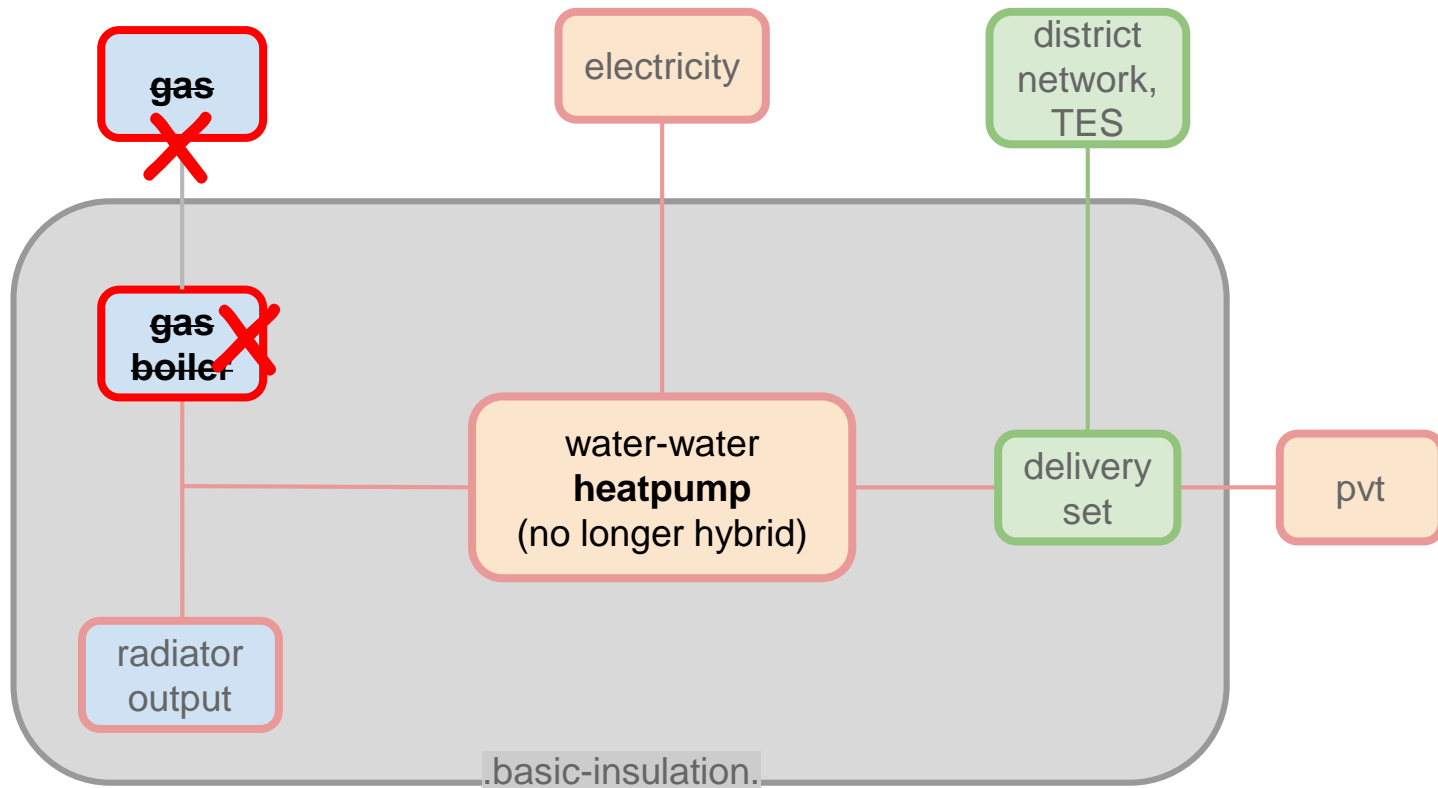


Step 4. Heat storage: district network, TES, delivery set



Step 5.

Gas(-boiler) out

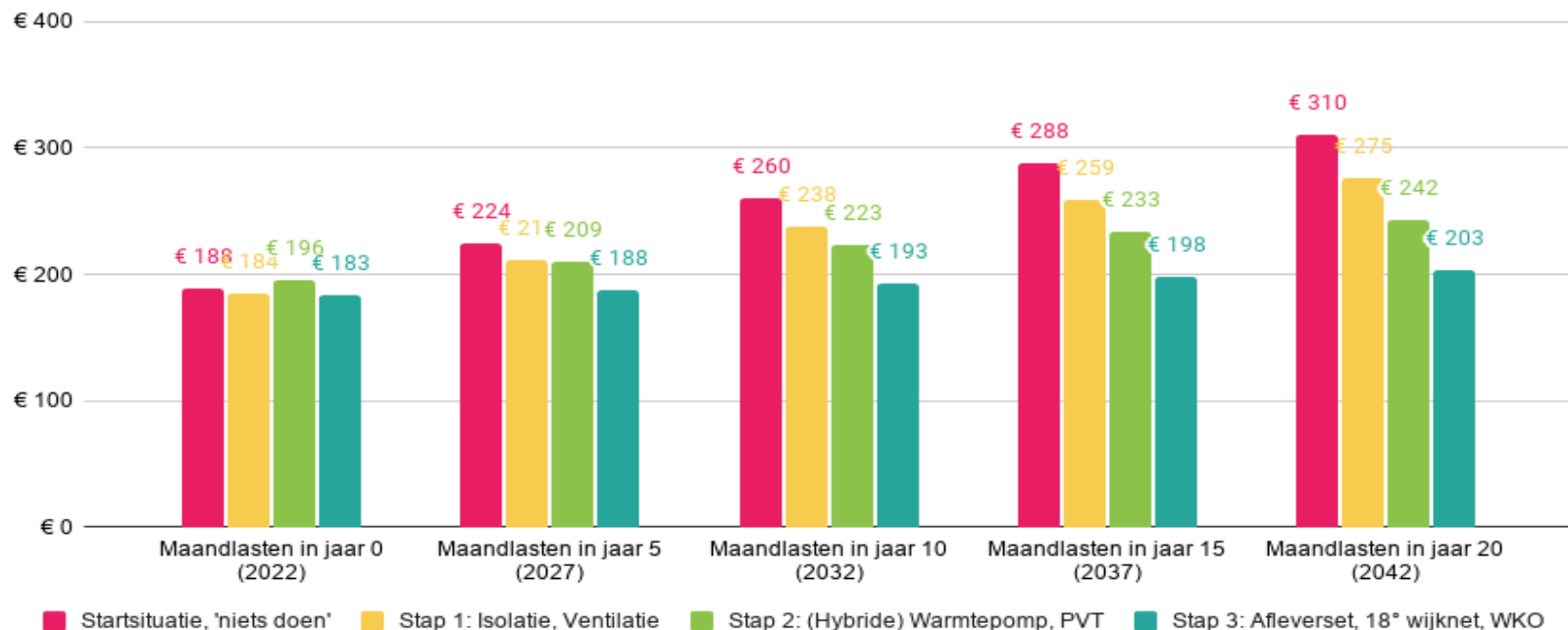


Savings-calculator

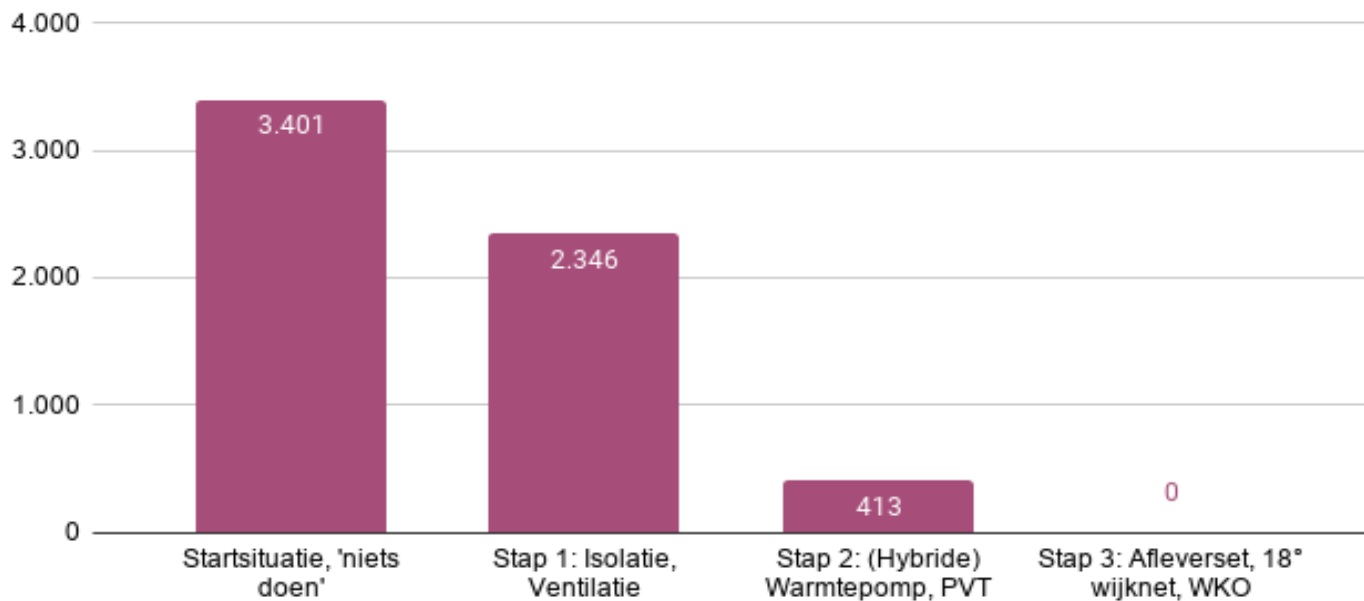
Uw situatie			Uw startsituatie:		
Uw huidige aardgasverbruik	1840	m3	Netto verwarmde ruimte	110	m2 vloeroppervlak
Uw maandlasten (2022)	€ 184		Aantal bewoners	3	
			Beschikbaar dak	12,0	m2 dakoppervlak
			U kookt op aardgas		
Stap 1: Isolatie					
U financiert met een duurzaamheidslening*	€ 7.000				
U ontvangt aan subsidie**	€ 1.750				
Uw isolatiebudget	€ 8.750				
Uw maandlasten (2022)	€ 179		Kostenfactor schilisolatie	1,99	€ / kwh / m2 / jr
Stap 2: PVT Hybride			Uw beoogde installatie***:		
U financiert met een duurzaamheidslening*	€ 15.751		Geluidsarme water-water warmtepomp:	7	KW
U ontvangt aan subsidie	€ 2.800				
Uw maandlasten (2022)	€ 191		Aantal PVT panelen	12,0	m2 panelen
			Boilervat	180	liter
Stap 3: Aardgasvrij					
Uw maandlasten (2022)	€ 178				

Savings calculator

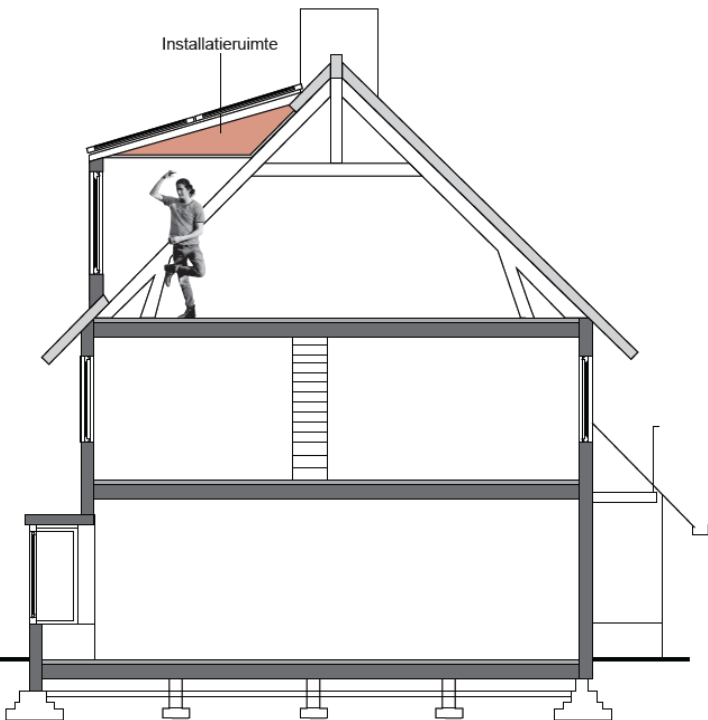
In drie stappen naar aardgasvrij - PVT hybride route



CO2 uitstoot (kilogram CO2 / woning / jaar)

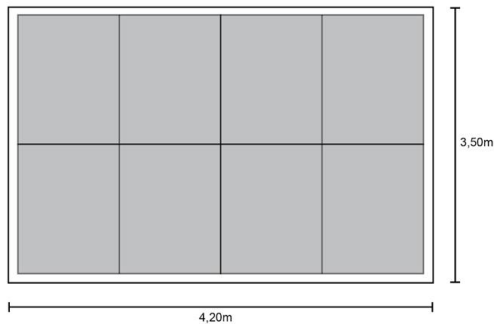


ZonKapel



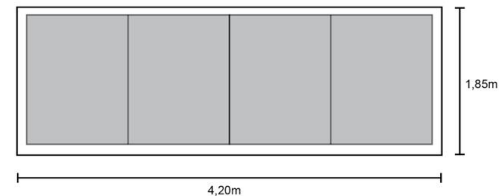
Optie 1: schuine kapel, 8 panelen

Afmetingen dakkapelloppervlak: ongeveer 4,20m x 3,5m
Uitgaande van standaard zonnepaneel van 1,65x1m passen er 8 panelen op



Optie 3: schuine kapel, 4 panelen

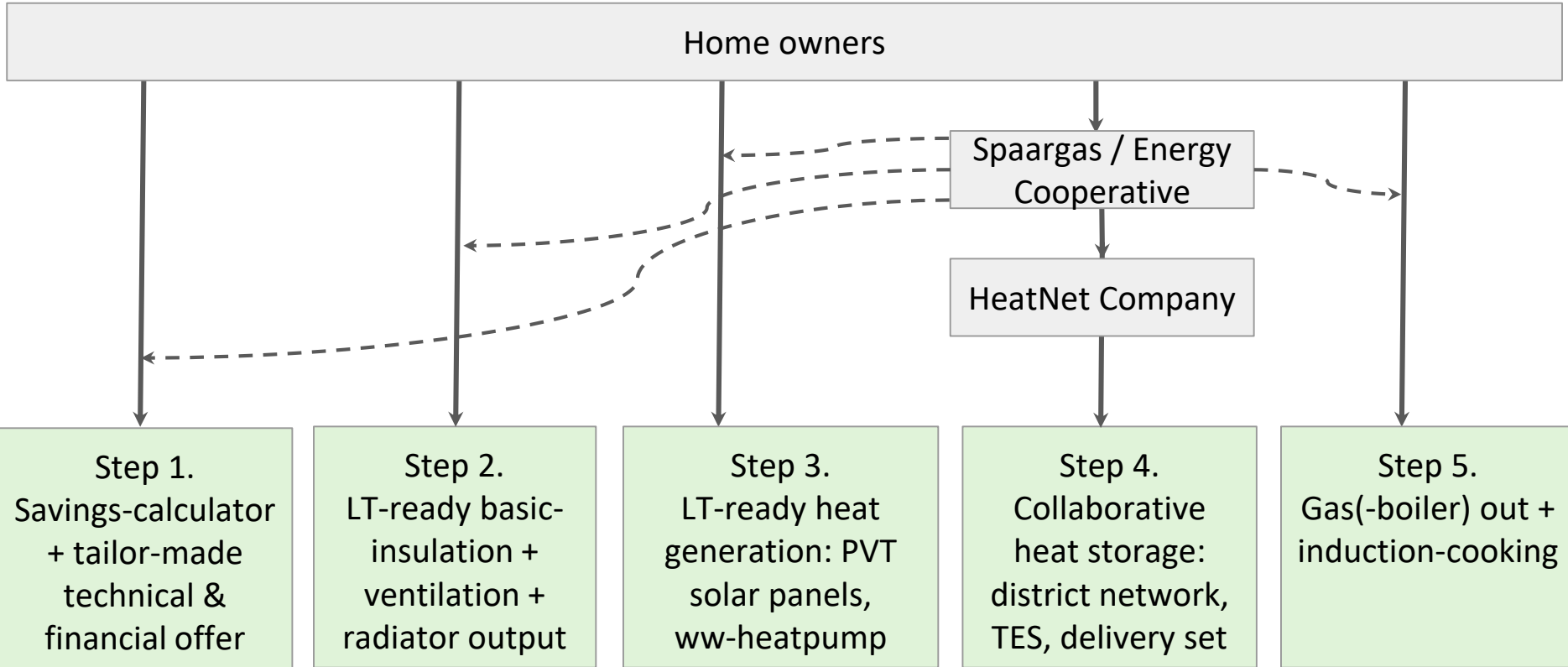
Afmetingen dakoppervlak: ongeveer 4,20m x 1,85m
Uitgaande van standaard zonnepaneel van 1,65x1m passen er 4 panelen op



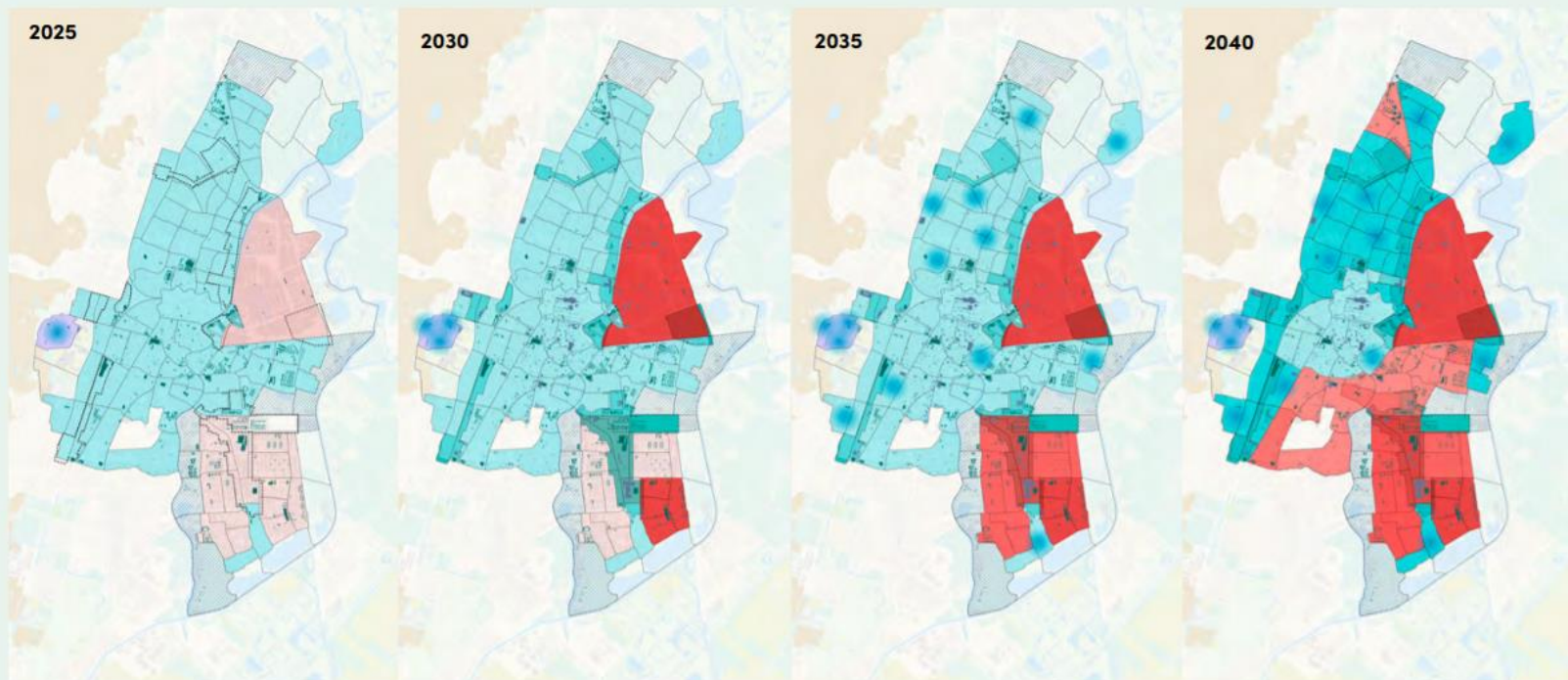
Governance

-----> Service

-----> Ownership



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Figuur 5. Weergave van de groei van warmtenetten en individuele oplossingen in 2025, 2030, 2035 en 2040.

Collectieve warmtetechnieken:

- Warmtenet-MT (in gebruik voor 2030)
- Warmtenet-MT (in gebruik voor 2035)
- Warmtenet-MT (in gebruik voor 2040, onderzoeksgebied)
- Warmtenet-MT met verhoogde kans (onderzoeksgebied)
- ZonneWarmteNet
- Warmtenet-MT (in gebruik voor 2035, onderzoeksgebied)

Individuele warmtetechnieken:

- Elektrische warmtepomp
- Hybride warmtepomp

Meerdere warmtetechnieken mogelijk:

- Elektrische warmtepomp, ZonneWarmteNet of Warmtenet-MT (onderzoeksgebied)
- PVT warmtepomp mogelijk, neem contact op met SpaarGas

Gebieden met nieuwbouwwoningen die voor 2030 aardgasvrij zullen zijn:

- Ontwikkeldergebieden

Gebouwtypes die voor 2035 aardgasvrij kunnen zijn:

- Woningen gebouwd na 1995
- Kantoren voor 2030 met een A label of hoger

Collaboration : neighbourhood and municipality

Residents:

1. Know the neighbourhood and the neighbors
2. Can bring their neighbors along in the transition
3. Have their own knowledge and network

Municipality

1. Access to financing via, for example, BNG
2. Knowledge about tender
3. Work in public space
4. Solution scalable for the rest of the city



Support



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Questions?

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