

Agfa - Flexibility



18/06/2026

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My story @ Agfa

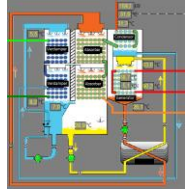
- Studies: Energy Engineering @ KU Leuven (2007-2012)
- Started at Agfa in 2023
- Department of Energy Operations & HVAC, linked to Engineering – Mechanical
- Goals:
 - Build an optimization routine to reduce energy costs
 - Maximize use of Demand Side Response on energy assets

Energy projects timeline at Agfa

WKK0 steam turbine
LT system on heat pumps and
residual heat
Study LM 6000



WKK2 7,8 MW
Gasturbine with
condensing flue gasses



Tri generation
heat pump

Project CO₂ reduction phase 1

2000

2011

2020

2024-2025



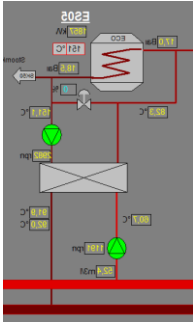
WKK1 8MW
Gas engines
Eff > 100%

2017

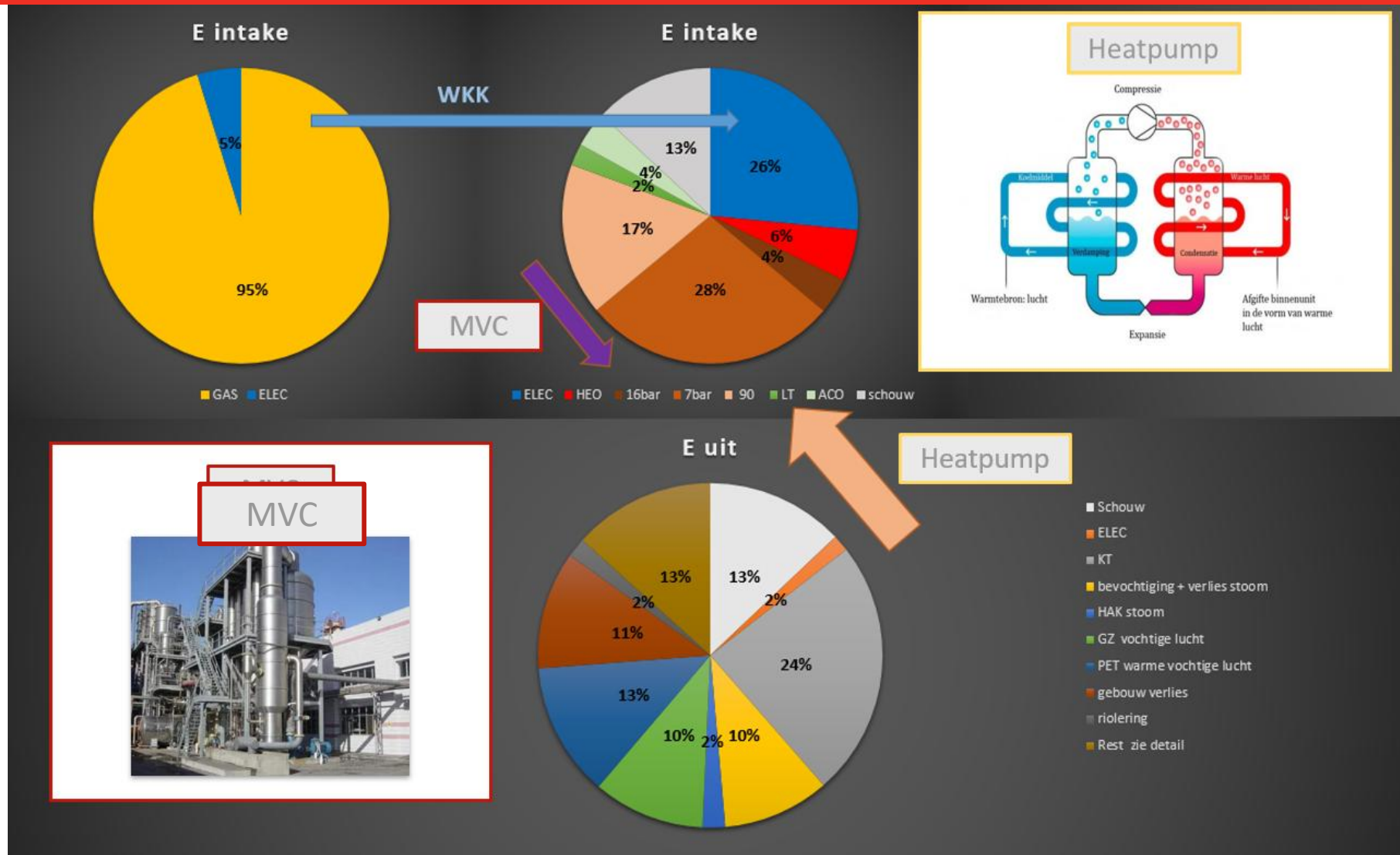
WKK1 9MW
new engines
Efficiency +1,5 %

2021

Heating network supplied with
oversupplied eco on WKK2



Transition to low CO₂ energy conversion

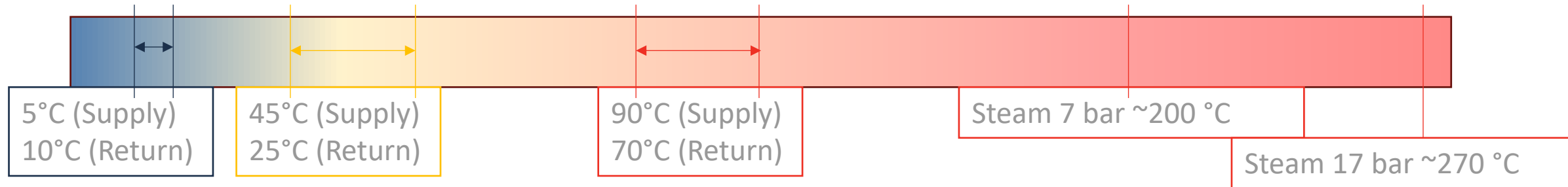


Flexibility analysis (2023)

- Consumption profile is complex:
 - PET production & Baselayer extrusion have 2 production cycles per year
 - Gietzalen have a weekly cycle
 - Electric, heat and cooling demands dependent on product & environment→ But no direct flexibility in production process
- CHP assets generating majority of heat & power consumed on site. CHP1 motors were manually controlled a.f.o. Belpex price (allow / stop injection). Missing heat demand filled with co-firing
- Gas requirement was predicted on monthly basis, and hedged. Any extra demand was bought @ average monthly spot price
- Elec import from grid was small, due to CHPs generating ~80% of consumption. CHPs were opportunities for Demand Side Response
- To further generate flexibility, Agfa can attempt to shift heat production strategy from “CHP driven” over “natural gas driven” to “electricity driven”

Energy levels & Energy Storage options

- Agfa uses following Energy levels:



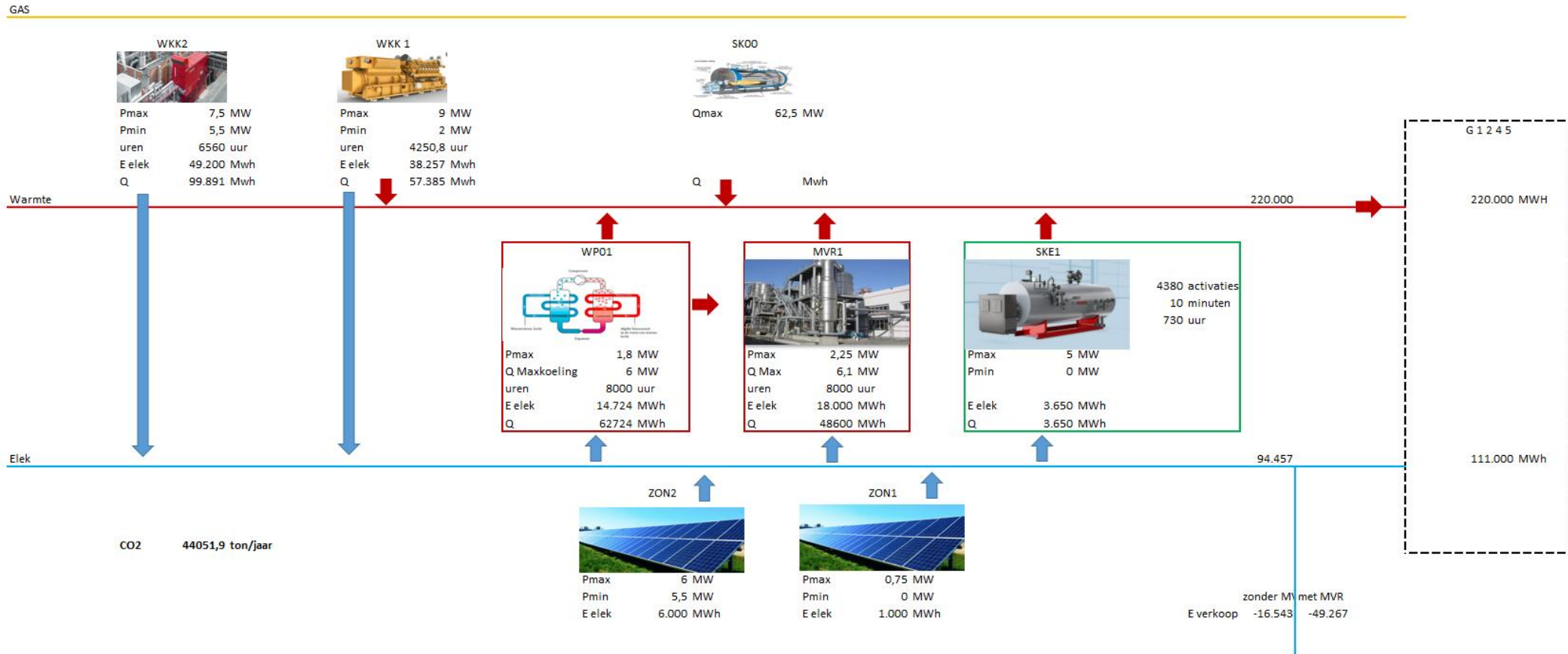
- Storage facilities:

- Large steam piping networks are a “bubble” that can store some energy by increasing the pressure and release again by decreasing the pressure
- 90°C water storage tank
- 45°C system has a flexible supply temperature
- 90°C-70°C systems have a ‘return dump’ to increase temperature of the return flow
- Absorption cooling machines can be used to dump 90°C heat into the 5°C cooling system

Agfa's current heat production assets & flexibility

Electricity producers	Electricity neutral	Electricity consumers
CHP1 – GS55 - 2.5 MWe aFRR + & - , mFRR	Gas boiler - SK54	Eboiler – SK51 – 5.2 MWe (2024) aFRR + & -
CHP1 – GS56 - 2.0 MWe aFRR + & - , mFRR	Gas boiler - SK59	Heat pump – WP51 – 1.4 MWe (2025) mFRR
CHP1 – GS57 - 2.5 MWe aFRR + & - , mFRR		MVC (2027) ?
CHP1 – GS58 - 2.0 MWe aFRR + & - , mFRR		
CHP2 – GS50 - 7.77 MWe aFRR + & -	Co-firing - SK50	

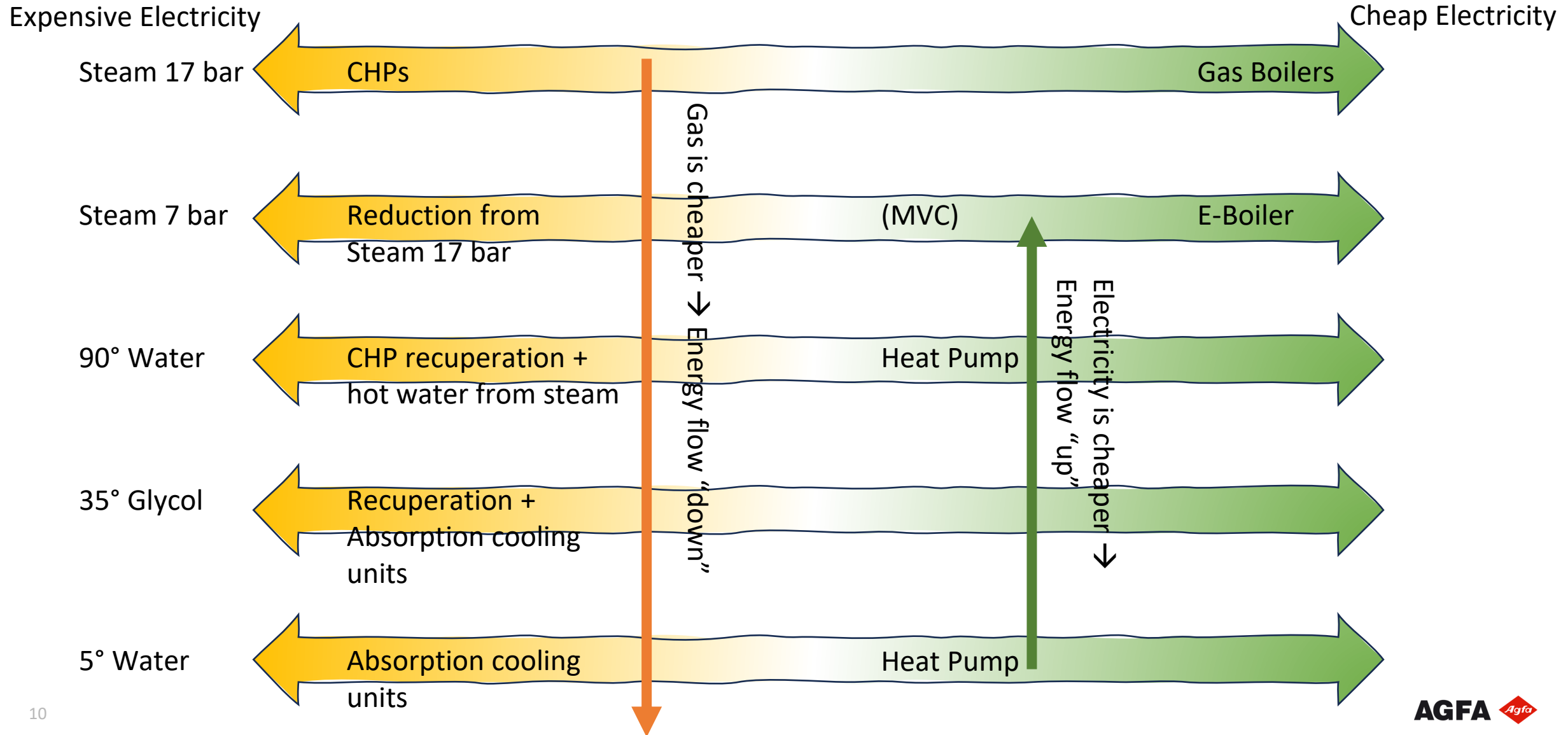
Energy conversion Agfa: symbiosis CHP & Heat Pump technology



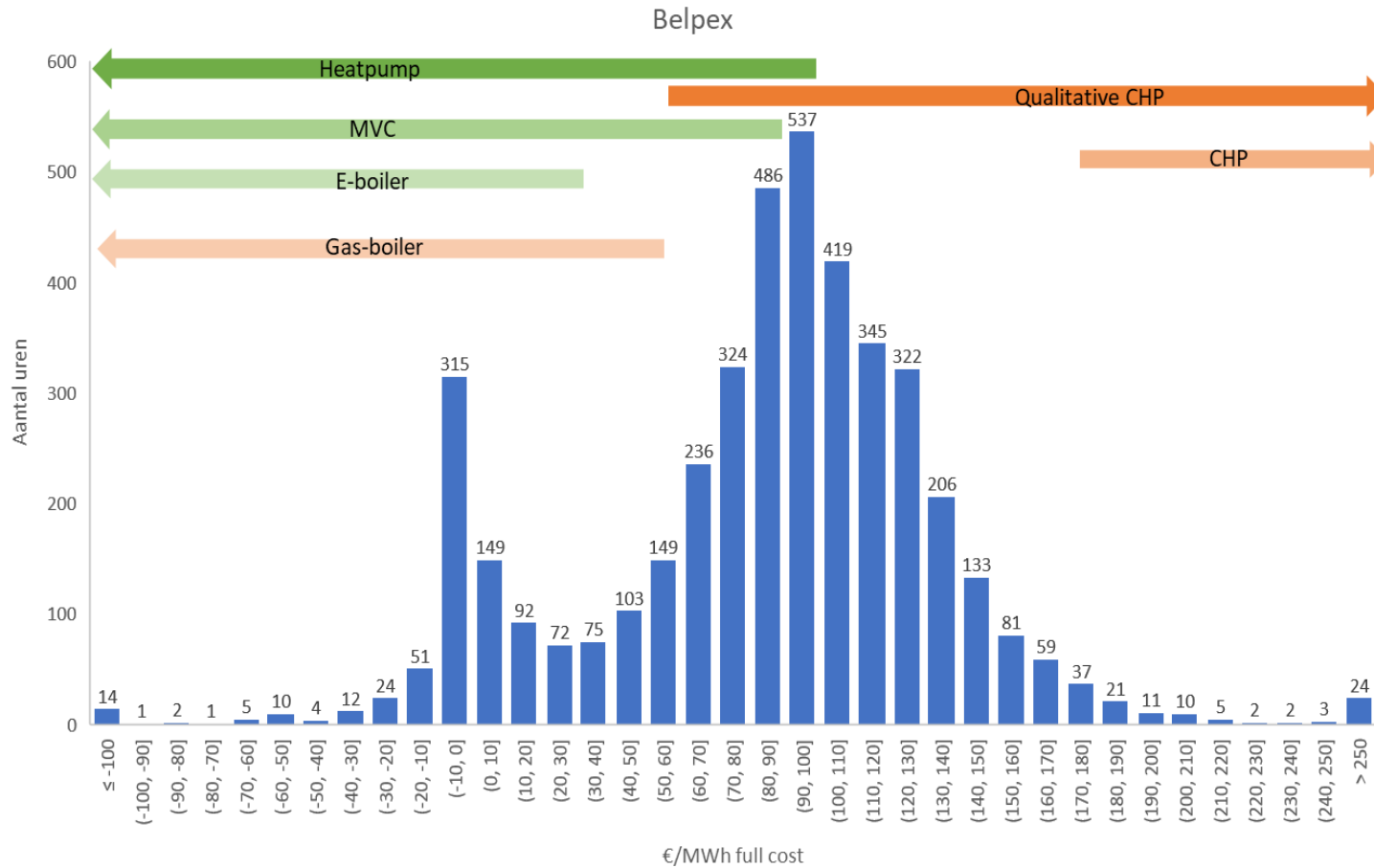
Agfa's steps towards increasing flexibility

- Build a heat demand forecast & Belpex forecast → necessary for CHP1 aFRR bids (at least 2 days ahead)
 - 2024
- Flexibilize CHP2 (55-100% power output range), allowing for CHP2 aFRR bids
 - 2024
- Belpex exposure
 - 2025
- Heat production strategy based on Belpex price
 - 2025
- Eboiler integration - with external party control for aFRR
 - 2025
- Heat pump integration
 - 2026

Heat production strategy



Heat Production strategy



EPEX prijzen 2023

UUR	jan	feb	mrt	apr	mei	jun	jul	aug	sep	okt	nov	dec
0:00	€ 98	€ 125	€ 99	€ 105	€ 94	€ 104	€ 93	€ 97	€ 91	€ 79	€ 72	€ 56
1:00	€ 87	€ 120	€ 92	€ 96	€ 86	€ 96	€ 81	€ 91	€ 85	€ 70	€ 66	€ 52
2:00	€ 83	€ 115	€ 90	€ 95	€ 83	€ 91	€ 73	€ 88	€ 83	€ 62	€ 63	€ 48
3:00	€ 76	€ 112	€ 87	€ 92	€ 80	€ 90	€ 68	€ 84	€ 81	€ 58	€ 58	€ 45
4:00	€ 76	€ 110	€ 87	€ 91	€ 81	€ 88	€ 67	€ 84	€ 79	€ 57	€ 59	€ 45
5:00	€ 83	€ 114	€ 91	€ 99	€ 88	€ 93	€ 72	€ 88	€ 86	€ 63	€ 65	€ 49
6:00	€ 108	€ 131	€ 109	€ 114	€ 96	€ 102	€ 79	€ 104	€ 109	€ 84	€ 84	€ 58
7:00	€ 132	€ 153	€ 127	€ 129	€ 104	€ 112	€ 87	€ 114	€ 134	€ 107	€ 104	€ 71
8:00	€ 158	€ 166	€ 132	€ 132	€ 99	€ 109	€ 90	€ 107	€ 123	€ 122	€ 115	€ 87
9:00	€ 163	€ 154	€ 118	€ 113	€ 84	€ 92	€ 77	€ 94	€ 103	€ 112	€ 109	€ 92
10:00	€ 148	€ 135	€ 102	€ 94	€ 69	€ 77	€ 62	€ 80	€ 81	€ 95	€ 99	€ 87
11:00	€ 139	€ 122	€ 93	€ 76	€ 54	€ 67	€ 44	€ 68	€ 72	€ 79	€ 95	€ 83
12:00	€ 132	€ 117	€ 82	€ 60	€ 37	€ 57	€ 25	€ 56	€ 61	€ 69	€ 90	€ 74
13:00	€ 128	€ 112	€ 77	€ 48	€ 22	€ 46	€ 15	€ 47	€ 53	€ 63	€ 91	€ 72
14:00	€ 132	€ 116	€ 77	€ 48	€ 14	€ 49	€ 12	€ 44	€ 55	€ 62	€ 98	€ 78
15:00	€ 139	€ 125	€ 80	€ 56	€ 23	€ 56	€ 19	€ 54	€ 66	€ 70	€ 109	€ 86
16:00	€ 146	€ 136	€ 90	€ 71	€ 49	€ 68	€ 41	€ 67	€ 80	€ 89	€ 119	€ 91
17:00	€ 167	€ 160	€ 118	€ 94	€ 72	€ 86	€ 63	€ 87	€ 108	€ 118	€ 137	€ 104
18:00	€ 169	€ 180	€ 139	€ 117	€ 92	€ 105	€ 84	€ 108	€ 145	€ 141	€ 136	€ 102
19:00	€ 154	€ 168	€ 148	€ 136	€ 110	€ 121	€ 108	€ 134	€ 190	€ 153	€ 121	€ 94
20:00	€ 144	€ 154	€ 133	€ 140	€ 119	€ 136	€ 122	€ 144	€ 160	€ 127	€ 107	€ 84
21:00	€ 131	€ 145	€ 121	€ 132	€ 113	€ 133	€ 123	€ 132	€ 122	€ 102	€ 96	€ 73
22:00	€ 123	€ 139	€ 113	€ 121	€ 105	€ 121	€ 115	€ 118	€ 107	€ 97	€ 92	€ 68
23:00	€ 108	€ 127	€ 104	€ 110	€ 96	€ 108	€ 103	€ 102	€ 95	€ 87	€ 80	€ 57

Bron: ENTSO-E

The way forward for Agfa?

- MVC integration
- Emergency Diesel generators - mFRR response
- Integrated electric car charging

- BESS system versus molecule (H₂, ...) energy storage ?
- Imbalance exposure ?
- Biogas adoption ?

- Markets still changing → Need to remain flexible