

Heat Roadmap Europe: Large-Scale Electric Heat Pumps in District Heating Systems

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Country	Name (Location)	Source	Refrigerant	Output Capacity (MW)	Units	COP	Source Temp. (°C)	Supply temp. (°C)	Temp. range (°C)	Cooling	Est. year	Reference
Austria	Wörgl	Waste heat	R-134a	1.5	1	4.00	27	78	51	Yes	2015	[1]
		Waste heat	R-245fa	1.1	1	4.00	45	85	40	Yes	2015	[1]
Czech Republic	Děčín	Geothermal aquifer		6.4	1	3.40	55	72	17	No	2002	[2]
Denmark	Høje Taastrup	District cooling	NH ₃	3.2	1	2.85	0	73	73	No	2016	[3,4]
	Verdo Randers	Waste heat	NH ₃	1.0	1	6.34	30	60	30	Yes	2016	[5,6]
	Løgumkloster	Heat storage (solar)	NH ₃	1.3	1	4.50	17	85	68	Yes	2015	[7,8]
	Rye Kraftvarmeværk	Geothermal aquifer	NH ₃	2.0	1	4.00	9	75	66	No	2015	[9,10]
	Vejen	Flue gas	NH ₃	1.1	1	4.10	40	67	27	No	2013	[11,12]
	Bjerringbro	Waste heat	NH ₃	3.7	1	4.80	18	67	49	Yes	2012	[13,14]
	Brædstrup	Heat storage (solar)	NH ₃	1.2	1	3.20	25	80	55	No	2012	[15,16]
	Marstal	Heat storage (solar)	CO ₂	1.5	1	3.10	10–35	78	43–68	No	2012	[15,17]
	Skjern	Waste heat	NH ₃	3.9	3	4.60	38	72	34	No	2012	[18,19]
	Skjern	Waste heat	NH ₃	1.3	1	3.90	33	70	37	No	2015	[20]
Finland	Suomenoja (Espoo)	Sewage water		40.0	2					No	2015	[21]
	Kakola (Turku)	Sewage water	R-134a	21.0	2	3.30	10	78	68	Yes	2009	[22,23]
	Katri Vala (Helsinki)	Sewage water	R-134a	90.0	5	3.50	10	88	78	Yes	2006	[22,24,25]
	Mäntsälä	Waste heat	R-134a	3.6	1	4.00	36	85	49	No		[26,27]
France	Créteil	Geothermal aquifer	R-134a	4.0	2	4.00	55	88	33	No	2014	[28,29]
	Paris (La Défence)	Waste heat	R-134a	12.0	1	4.50	12	90	78	Yes	2014	[30,29]
	Le Plessis-Robinson	Geothermal aquifer	R-134a	1.5	1	4.80	39	85	46	No	2013	[31,29]

Italy	Cherbourg (Divette)	Sea water	R-134a	2.2	2	3.00	11	63	52	No	2013	[29]	
	Blagnac	Geothermal aquifer	R-134a	3.2	4	6.00	46	70	24	No	2012	[29]	
	Famagosta (Milano)	Geothermal aquifer	R-134a	15.0	3	2.65	15	90	75	Yes	2011	[32]	
	Morbegno	Waste heat		3.7	1	4.47	46	84	38	No	2010	[22]	
	Canevese (Milano)	Geothermal aquifer	R-134a	15.0	3	2.65	15	90	75	Yes	2010	[32]	
	Riva del Garda	Waste heat & geothermal		1.3	1	3.48					Yes	2008	[33,32]
Netherlands	Bagno di Romagna	Geothermal aquifer		1.6	1		37	80	43	No	1987	[32,34]	
	Delft	Waste heat		1.2	1		15	70	55	No		[35,36]	
	Horten	Sea water	NH ₃	2.4	2	3.00	5	68	63	Yes	2012	[37]	
Norway	Drammen	Sea water	NH ₃	13.2	3	3.05	8	90	82	No	2010	[38,39]	
	Skøyen Vest (Oslo)	Sewage water (raw)	R-134a	18.4	1	2.80	10	90	80	No	2008	[40]	
		Sewage water (raw)	R-134a	9.2	1	2.90	10	75	65	No	2005	[40]	
	Lillestrøm	Sewage water	R-134a	4.3	1			80	80	Yes	2003	[41]	
	Fornebu (Oslo)	Sea water	R-134a	6.9	1	3.06	5	75	70	Yes	2006	[40,42]	
		Sea water	R-134a	6.8	1	3.06	5	75	70	Yes	2001	[40,42]	
	Lysaker (Oslo)	Sea water	R-134a	4.6	1	2.80		75	75	Yes	2012	[40]	
		Sea water	R-134a	4.5	1	2.80		75	75	Yes	1999	[40]	
Sandvika (Oslo)	Sewage water	R-134a	13.0	2	3.10	10	78	68	Yes	1989	[43]		
Slovakia	Trondheim	Sea Water	R-134a	1.2	1	4.03	11	55	44	Yes		[44]	
	Sereď	Geothermal aquifer		1.8	1			65	65	No		[45]	
	Brista 2 (Stockholm)	Flue gas	NH ₃	6.4	2	6.50	40	60	20	No	2013	[46,47]	
Sweden	Sysav (Malmö)	Flue gas	R-134a	19.0	2	5.40	34	70	36	No	2002	[48,40]	
	Umeå	Flue gas	R-134a	13.0	2	4.50	38	70	32	No	2001	[49,50]	
		Waste heat	R-134a	34.0	2	4.00	10–16	80	64–70	No	1985	[49]	
	Jönköping	Sewage water	R-134a	7.0	1					No	1999	[49]	
	Lund	District cooling	R-134a	27.0	3	2.90					No	1999	[49,51]
		Geothermal aquifer	R-134a	26.0	1	3.40	23	81	58	No	1986	[49,52,53,54]	
		Geothermal aquifer	R-134a	20.0	1	3.40	23	81	58	No	1985	[49,52,53,54]	
	Hammarby (Stockholm)	Sewage water	R-134a	13.0	1	3.20	8–16	80	64–72	No	1983	[49,54]	
Sewage water		R-134a	80.0	2	3.50	19	90	71	Yes	1997	[49,55,56,57]		
Sewage water		R-134a	26.0	1					No	1991	[49,55,56,57]		

	Sewage water	R-134a	80.0	3					No	1986	[49,55,56,57]
	Sewage water	R-134a	25.0	1					No	1986	[49,55,56,57]
Brunna-Kungsängen	Waste heat	R-134a	4.0	1					No	1997	[49]
Helsingborg	Sewage water	R-134a	27.0	1	3.00				Yes	1996	[49,58]
Västerås	Sewage water & district cooling	R-134a	4.0	1	3.50	8–12			No	1993	[49]
Sollentuna	Waste heat	R-134a	5.0	1		21			No	1992	[49]
Nora	Lake water	R-152a	4.0	2					No	1989	[49]
Jönköping	Sewage water	R-134a	7.0	1					No	1999	[49]
	Sewage water	R-134a	25.0	1					No	1988	[49]
Eslöv	Sewage water	R-134a	8.0	1					No	1986	[49]
	Sewage water	R-134a	100.0	2	3.30	12	80	68	No	1986	[49,54,59,60,61]
Gothenburg	Sewage water	R-134a	30.0	1	3.30	12	80	68	No	1984	[49,54,59,60,61]
	Sewage water	R-134a	30.0	1	3.30	12	80	68	No	1983	[49,54,59,60,61]
Järfälla	Lake water	R-134a	50.0	2	3.00	1.5–10	85		No	1986	[49]
Ropsten 3 (Stockholm)	Sea water	R-134a	100.0	4	3.00	3	80	77	Yes	1986	[49,54,62]
Ropsten 2 (Stockholm)	Sea water	R-134a	75.0	3	3.00	3	80	77	Yes	1986	[49,54,62]
Ropsten 1 (Stockholm)	Sea water	R-134a	75.0	3		3	80	77	Yes	1985	[49,54,62]
Vallentuna	Lake water	R-134a	7.0	1					No	1986	[49]
Borås	Sewage water	R-134a	10.0	1	3.00				No	1985	[49]
	Sewage water	R-134a	50.0	2	3.50	16	72	56	Yes	1985	[49,63,64]
Sundbyberg - Solna	Sewage water & district cooling	R-134a	60.0	2	3.20	7–18	83	65–76	Yes	1985	[49,63,64]
Åkersberga	Sea water	R-134a	6.0	1					No	1985	[49]
Örebro	Sewage water	R-134a	40.0	2	3.50				No	1985	[49]
Örkelljunga	Waste heat	R-134a	2.0	2		17			No	1985	[49]
Hofors	Waste heat	R-134a	5.2	2		25			No	1984	[49]
Klippan	River water	R-134a	2.0	1					No	1984	[49]
Kungsbacka	Sewage water	R-134a	5.1	3					No	1984	[49]
Oskarshamn	Sewage water	R-134a	2.4	1					No	1984	[49]

Switzerland	Borlänge	Waste heat	R-134a	12.0	1	3.10	35	80	45	No	1985	[49,65]
		Waste heat	R-134a	24.0	2	3.10	35	80	45	No	1983	[49,65]
	Visby	Sea/sewage water	R-134a	11.5	1					No	1983	[49]
	Loudden (Stockholm)	Sewage water	R-134a	5.4	2					No	1982	[49]
	Uppsala	Sewage water	R-134a	36.0	3	3.20	9 - 18	70	52-61	No	1982	[49]
	Västerås	Sewage water & district cooling	R-134a	13.0	1	3.50	9-20	70	50-61	No	1982	[49]
	Sala-Heby	Sewage water	R-134a	3.2	1	2.80				No	1981	[49]
	Plan-les-Ouates (Geneva)	Waste heat		4.5	1		14	55	41	No	2015	[66,67]
	Rheinfelden 2	Waste heat	NH ₃	2.0	2	4.00	25	81	56	No	2014	[68,69]
	Rheinfelden	Sewage water	NH ₃	2.5	2	4.10		67	67	No	2009	[69,70]
	Schlossmatte (Münsingen)	Sewage water	R-134a	1.1	1	3.44	10	62	52	No	2007	[71]
	Walche (Zürich)	River water	R-134a	13.4	2	3.39	15	70	55	No	1988	[72]
	Lausanne	Lake water	NH ₃	4.5	2	4.80	7	65	58	Yes	1986	[54,73]
	Zürich	Waste heat	NH ₃	2.0	1	4.70	24	67	43	No		[54,74]
Dietikon (Zürich)	Sewage water	NH ₃	4.0	1	5.50	15	43	28	No		[75]	
Total				1 580.0	149							

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