



Intelligent Energy – Europe Programme Project REFUND+

Results of modelling of direct tax measures for investments into RES heating systems in private households in Poland

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Data

National Census;

Statistical YearBooks;

Energy publications;

Experts opinion.

Final energy consumption in household sector, TJ

Fuel	2006	2007
Steam coal	247500	219300
Natural gas	138635	132622
Peat and wood	104500	95000
Geothermal energy	435	357
Coke and semi-coke	3220	1400
Liquefied petroleum gas (LPG)	21285	21758
Light fuel oil	19683	19687
Electricity	95282	94930
Heat	185000	180000

Size of similar houses

Houses	In Urban Areas	In Rural Areas
Big Houses (average 150m)	477562	433655
Average Houses (average 80m)	2599888	2803915

Houses in group of boilers

Houses	In Urban Areas	In Rural Areas
Hard Fuel boiler (Big Houses)	288635	357494
Hard fuel boiler (Average Houses)	1041873	1290429
Gas boiler (Big Houses)	188926	76161
Gas boiler (Average Houses)	498201	200837
Electricity (Average Houses)	44637	55285
Stoves (Average Houses)	1015176	1257362

Capacity of existing technologies [in kW]

Name	Big	Average
Hard fuel boilers	25	15
Gas boilers	25	15
Stoves	--	15
Electricity	--	6
Electric DHW heater	5	3
Gas DHW Heater	17	17

Parameters of existing technologies

Name	Fuel	Efficiency	Lifetime	Investment Cost EUR/kW	
				Big houses	Average houses
Hard fuel boilers	Wood	0,7	30	140	90
	Coal	0,7			
Gas boiler	Natural Gas	0,9	15	90	90
		0,9			
Stoves	Wood	0,7	15	--	117
	Coal	0,7			
Electricity	Electricity	0,99	15	--	120
Electric DHW heater	Electricity	0,95	15	67	85
Gas DHW Heater	Natural Gas	0,9	15	20	20

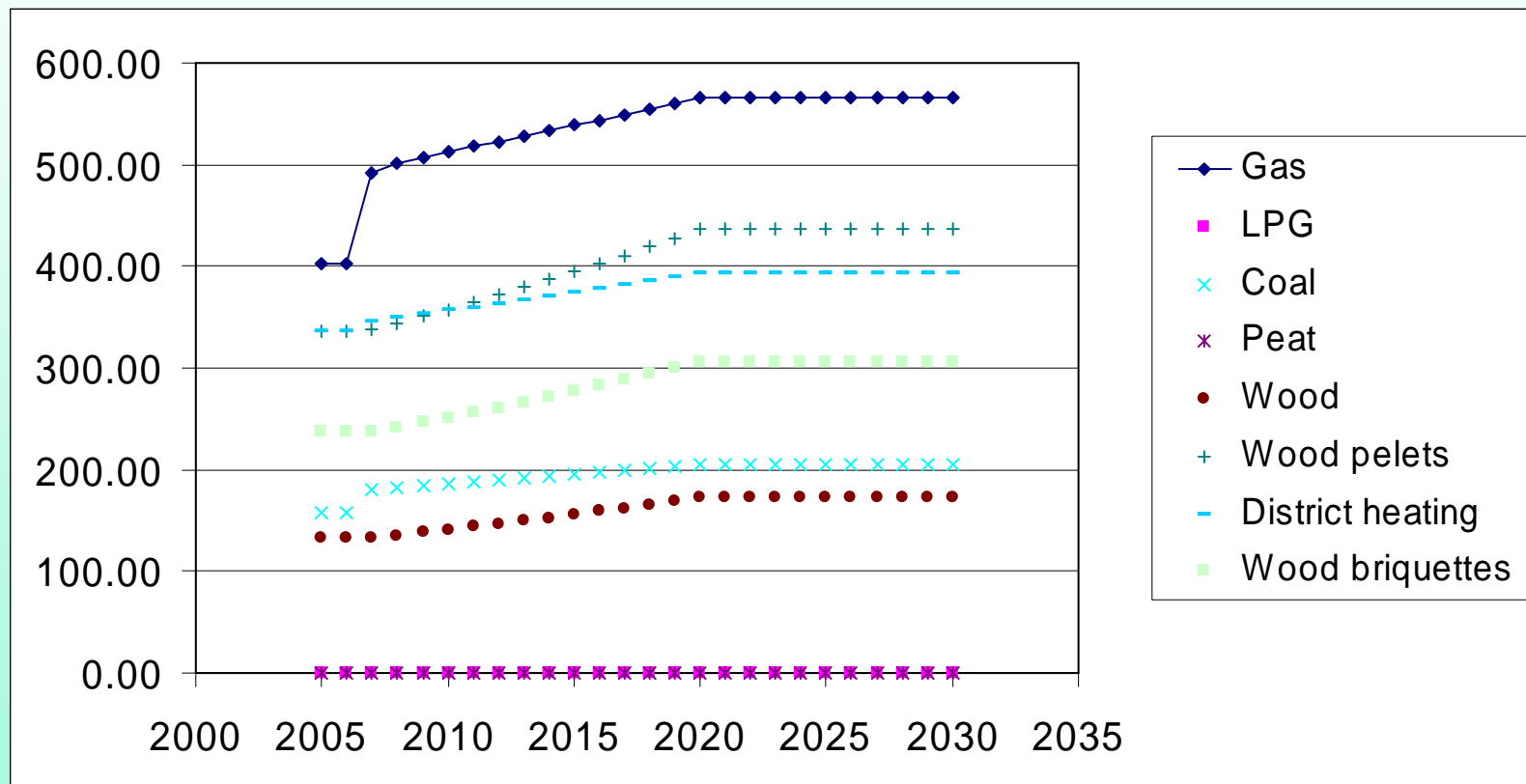
Capacity of new technologies [in kW]

Name	Big	Average
Solid 1 wood boiler	25	15
Solid 2 hybrid boiler	25	15
Solid 3 pellet boiler	25	15
Solid 4 wood boiler	25	15
Heatpump	15	8
Solar dhw heater	5	3
Electric DHW heater	5	3
Gas DHW Heater	17	17

Parameters of new technologies

Name	Fuel	Efficiency	Lifetime	Investment Cost EUR/kW	
				Big houses	Average houses
Solid 1 wood boiler	wood	0,75	20	136	176
Solid 2 hybrid boiler	Wood	0,75	20	50	60
	Coal	0,78			
	Pellets	0,78			
	Wood waste	0,75			
Solid 3 pellet boiler	Pellets	0,8	20	133	200
Solid 4 wood boiler	Wood	0,7	20	120	150
Heatpump	Electricity	3.2	20	668	1024
Solar dhw heater			20	600 (5kW)	833 (3kW)
Electric DHW heater	Electricity	0,95	15	67 (3kW)	85 (5kW)
Gas DHW Heater	Natural Gas	0,9	15	20 (17kW)	20 (17kW)

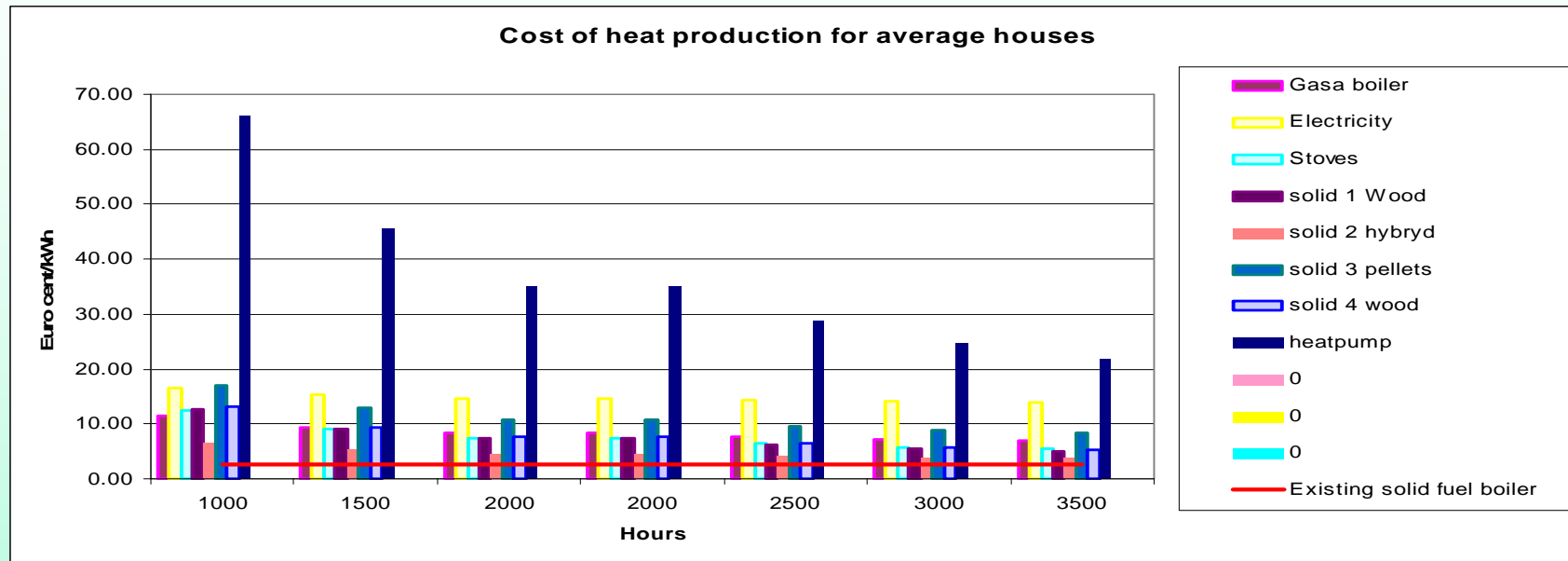
Fuel prices for household consumers in Poland EUR/kWyr



Information about solar collector

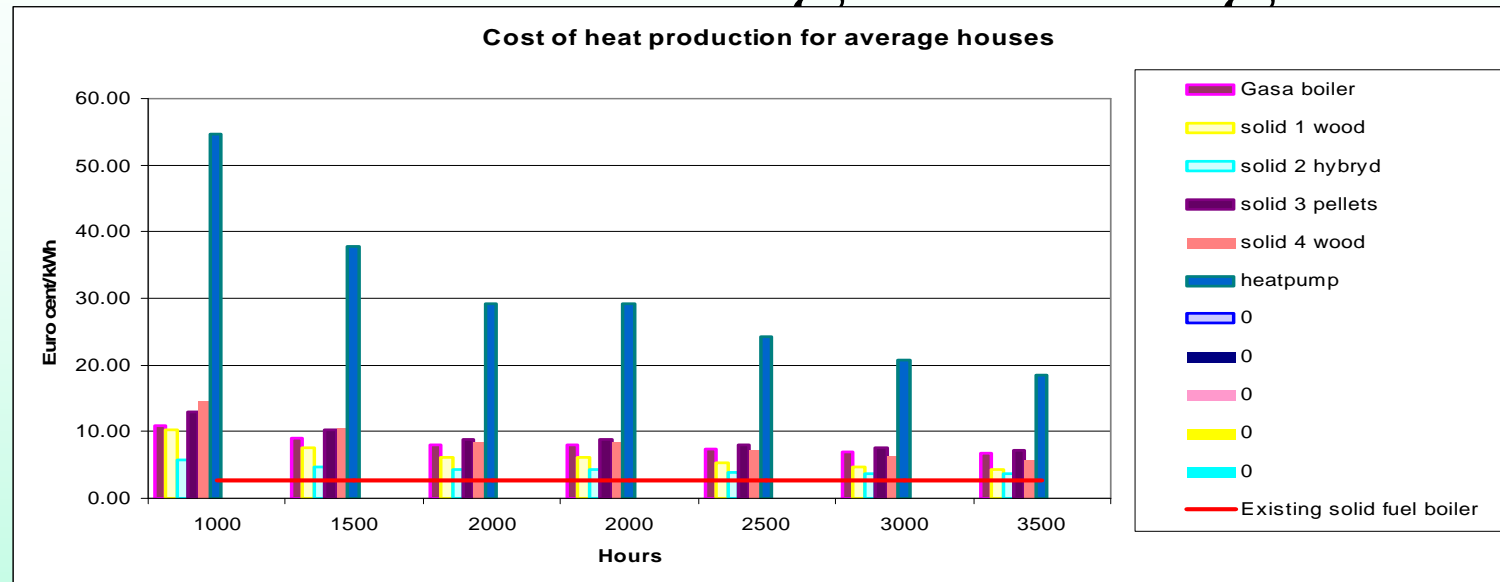
Location	Poland, Warsaw	
Area of solar collector	5.00	m ²
Capacity	3.5	kW
Heat production	2500	kWh

Heat technologies in average houses



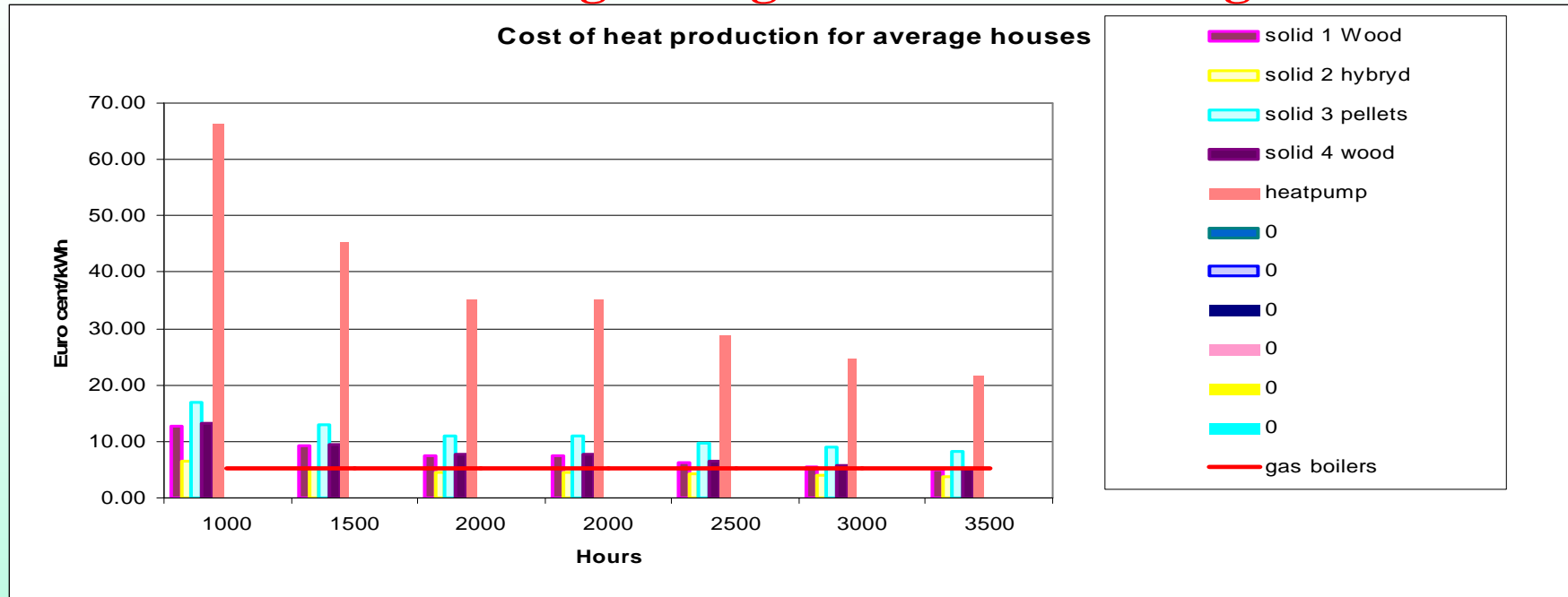
Existing solid fuel boiler	2.61	2.61	2.61	2.61	2.61	2.61	2.61
Gas boiler	11.51	9.38	8.31	8.31	7.67	7.24	6.94
Electricity	16.50	15.28	14.67	14.67	14.30	14.06	13.88
Stoves	12.38	9.13	7.50	7.50	6.52	5.87	5.40
solid 1 Wood	12.72	9.15	7.37	7.37	6.30	5.59	5.08
solid 2 hybrid	6.38	5.16	4.55	4.55	4.19	3.95	3.77
solid 3 pellets	16.96	12.91	10.88	10.88	9.67	8.86	8.28
solid 4 wood	13.10	9.46	7.64	7.64	6.54	5.82	5.29
heatpump	66.18	45.45	35.08	35.08	28.86	24.71	21.75

Heat technologies in big houses



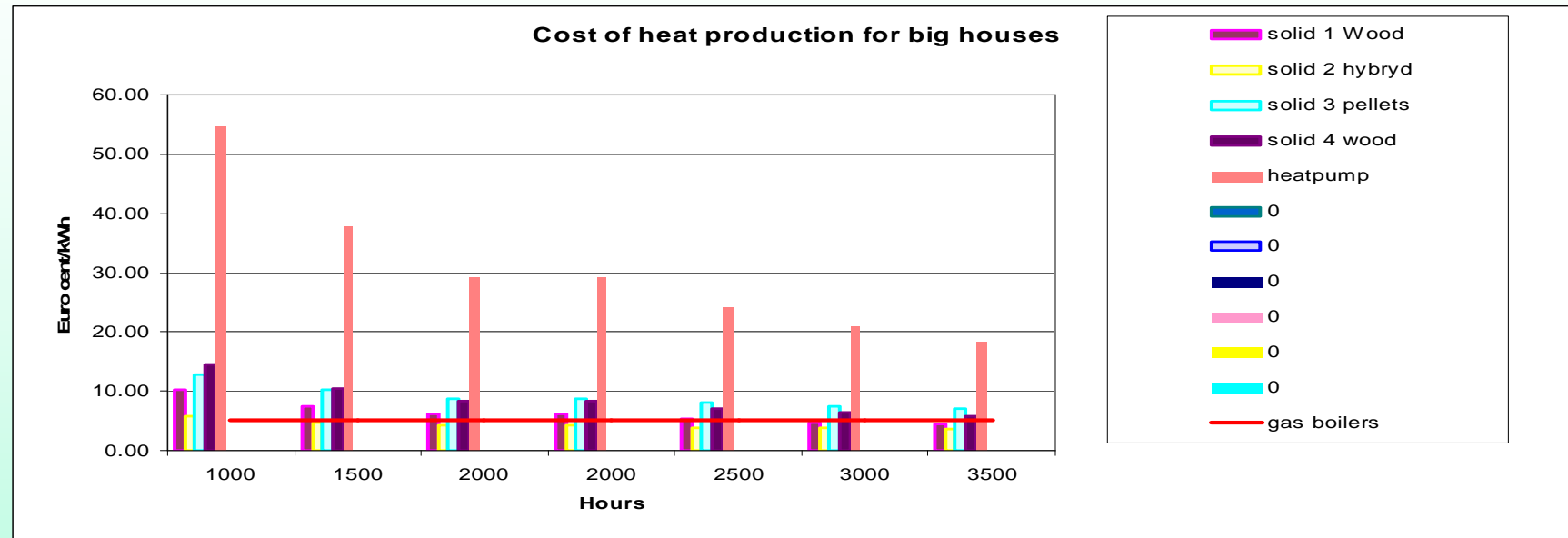
	1000	1500	2000	2000	2500	3000	3500
Existing solid fuel boiler	2.61	2.61	2.61	2.61	2.61	2.61	2.61
Gas boiler	10.87	8.95	7.99	7.99	7.41	7.03	6.76
solid 1 Wood	10.73	7.83	6.38	6.38	5.51	4.93	4.51
solid 2 hybrid	5.93	4.87	4.33	4.33	4.01	3.80	3.65
solid 3 pellets	12.89	10.20	8.85	8.85	8.04	7.50	7.12
solid 4 wood	14.56	10.43	8.37	8.37	7.13	6.30	5.71
heatpump	54.58	37.71	29.28	29.28	24.22	20.84	18.43

New technologies vs. gas boilers in average houses



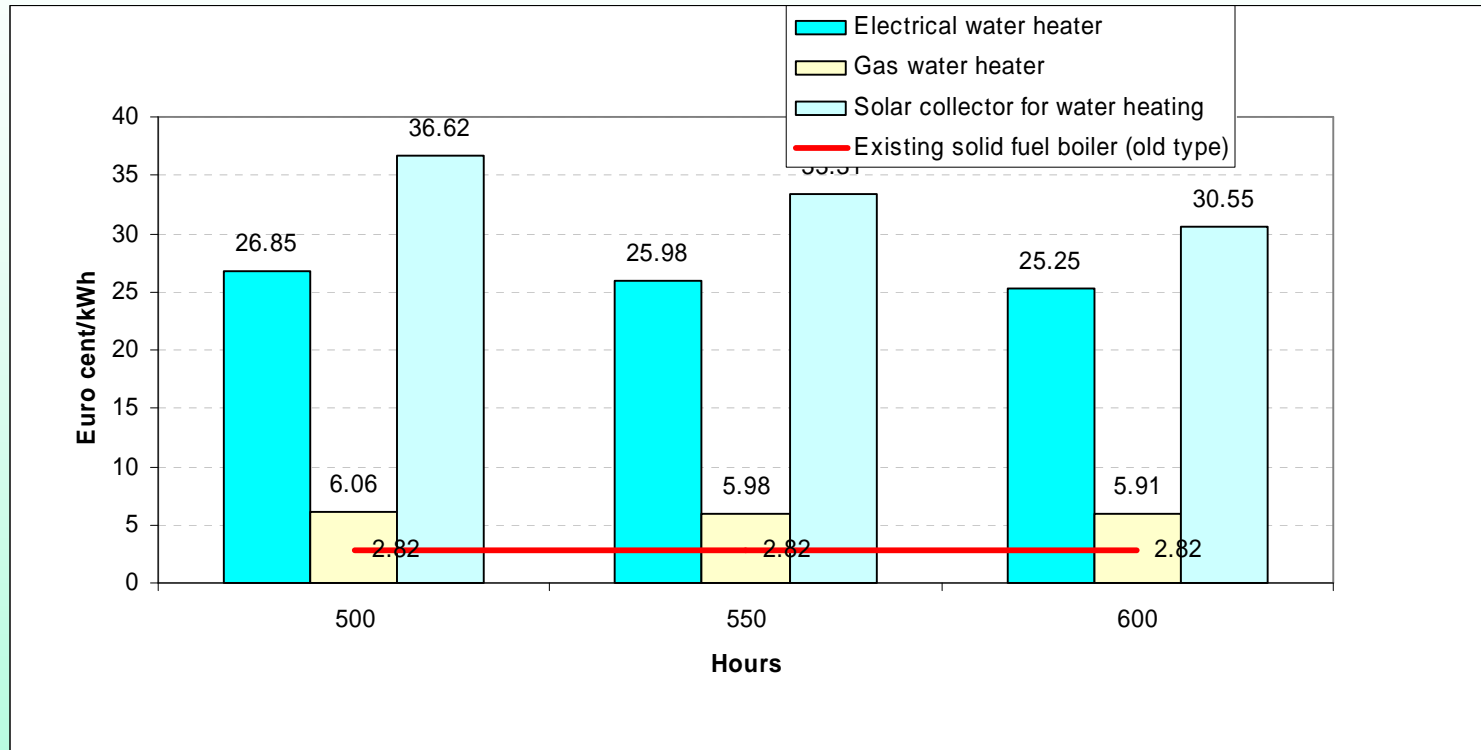
	1000	1500	2000	2000	2500	3000	3500
gas boilers	5.11	5.11	5.11	5.11	5.11	5.11	5.11
solid 1 Wood	12.72	9.15	7.37	7.37	6.30	5.59	5.08
solid 2 hybrid	6.38	5.16	4.55	4.55	4.19	3.95	3.77
solid 3 pellets	16.96	12.91	10.88	10.88	9.67	8.86	8.28
solid 4 wood	13.10	9.46	7.64	7.64	6.54	5.82	5.29
heatpump	66.18	45.45	35.08	35.08	28.86	24.71	21.75

New technologies vs. gas boilers in big houses



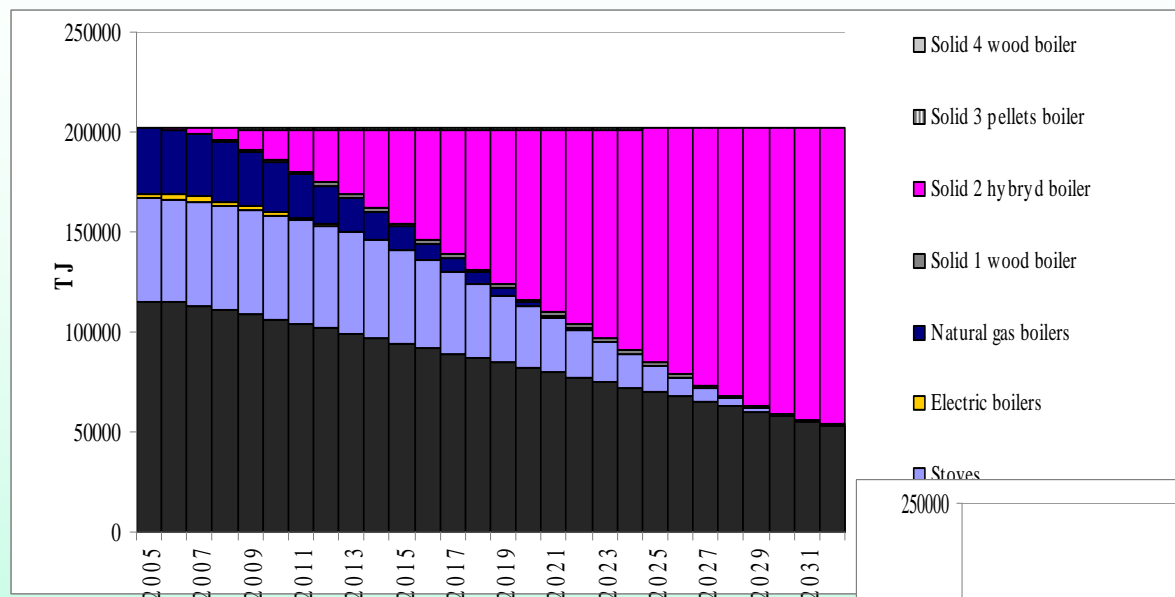
	1000	1500	2000	2000	2500	3000	3500
gas boilers	5.11	5.11	5.11	5.11	5.11	5.11	5.11
solid 1 Wood	10.29	7.53	6.16	6.16	5.33	4.78	4.38
solid 2 hybrid	5.77	4.76	4.25	4.25	3.95	3.74	3.60
solid 3 pellets	12.89	10.20	8.85	8.85	8.04	7.50	7.12
solid 4 wood	14.56	10.43	8.37	8.37	7.13	6.30	5.71
heatpump	54.57	37.71	29.27	29.27	24.21	20.84	18.43

Solar collector for water heating vs. other options

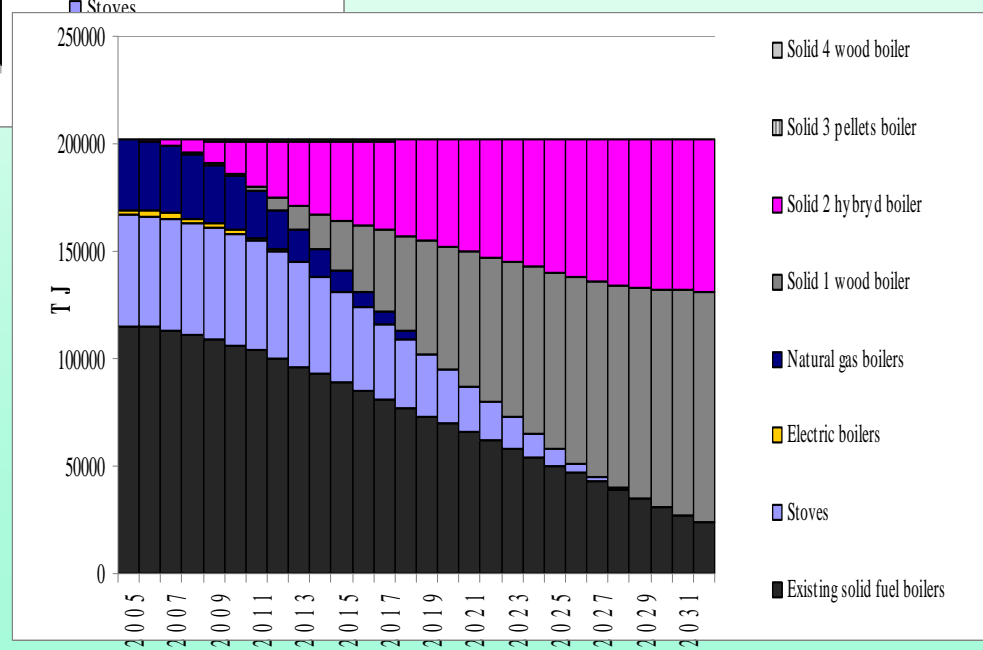


	500	550	600
Existing solid fuel boiler (old type)	2.82	2.82	2.82
Electrical water heater	26.85	25.98	25.25
Gas water heater	6.06	5.98	5.91
Solar collector for water heating	36.62	33.31	30.55

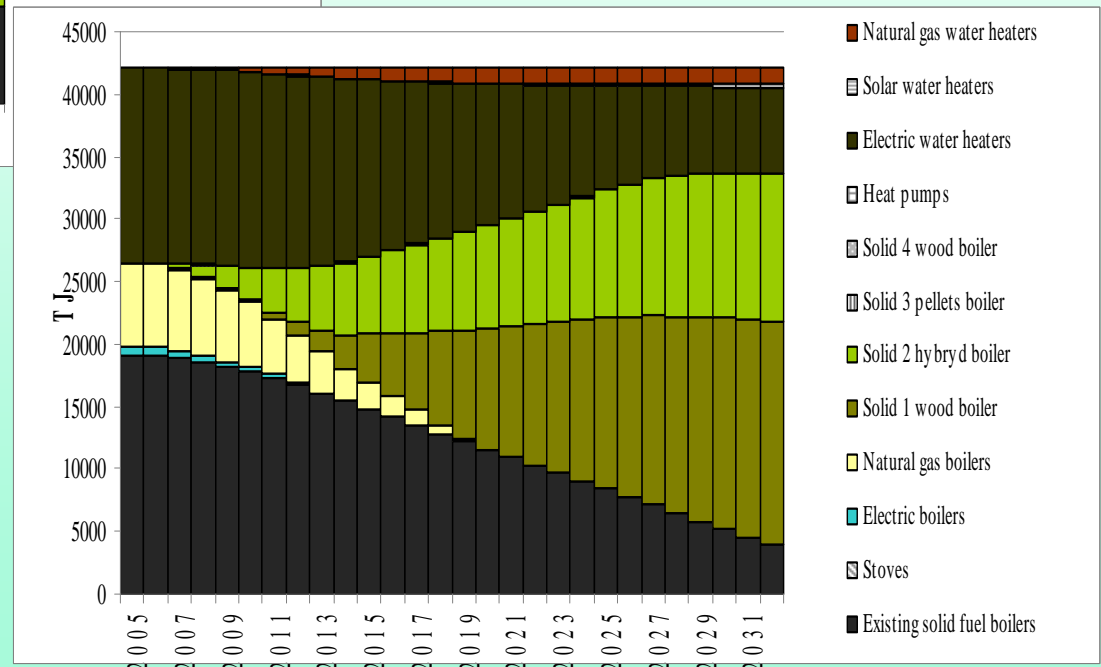
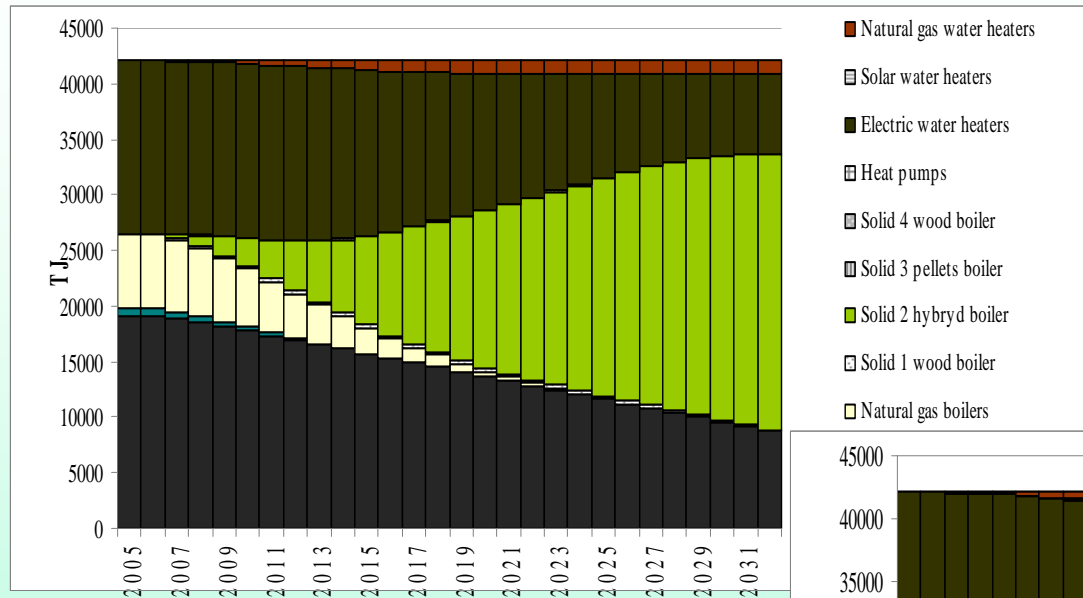
Total heat production in individual houses



With support

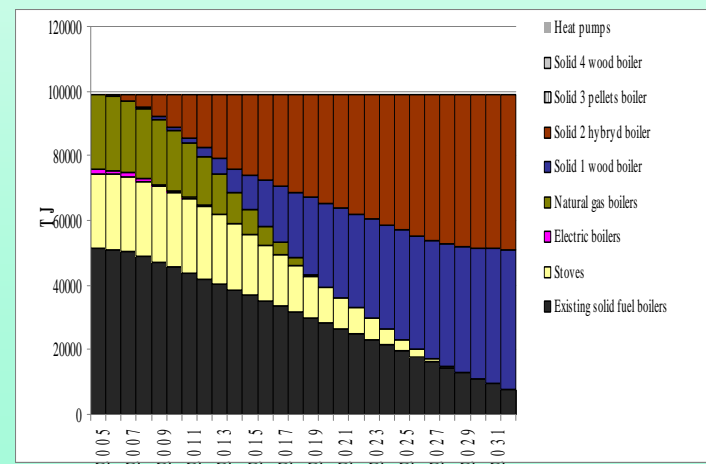
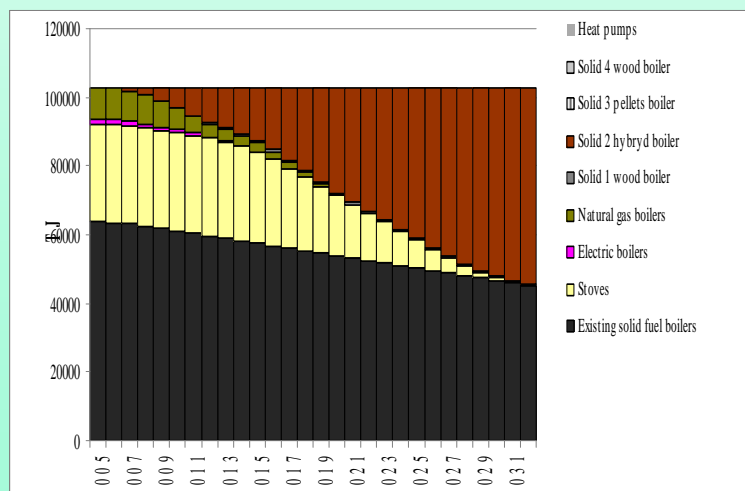
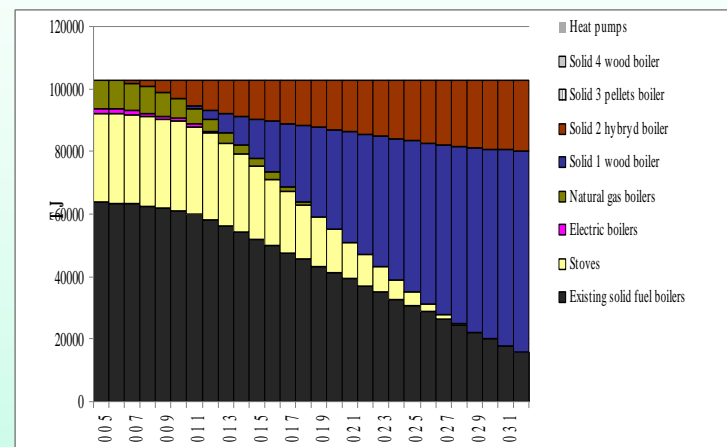
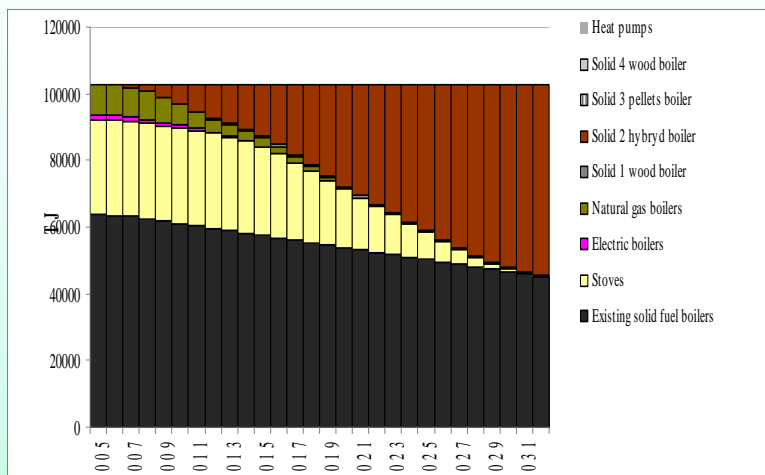


Total hot water production in individual houses

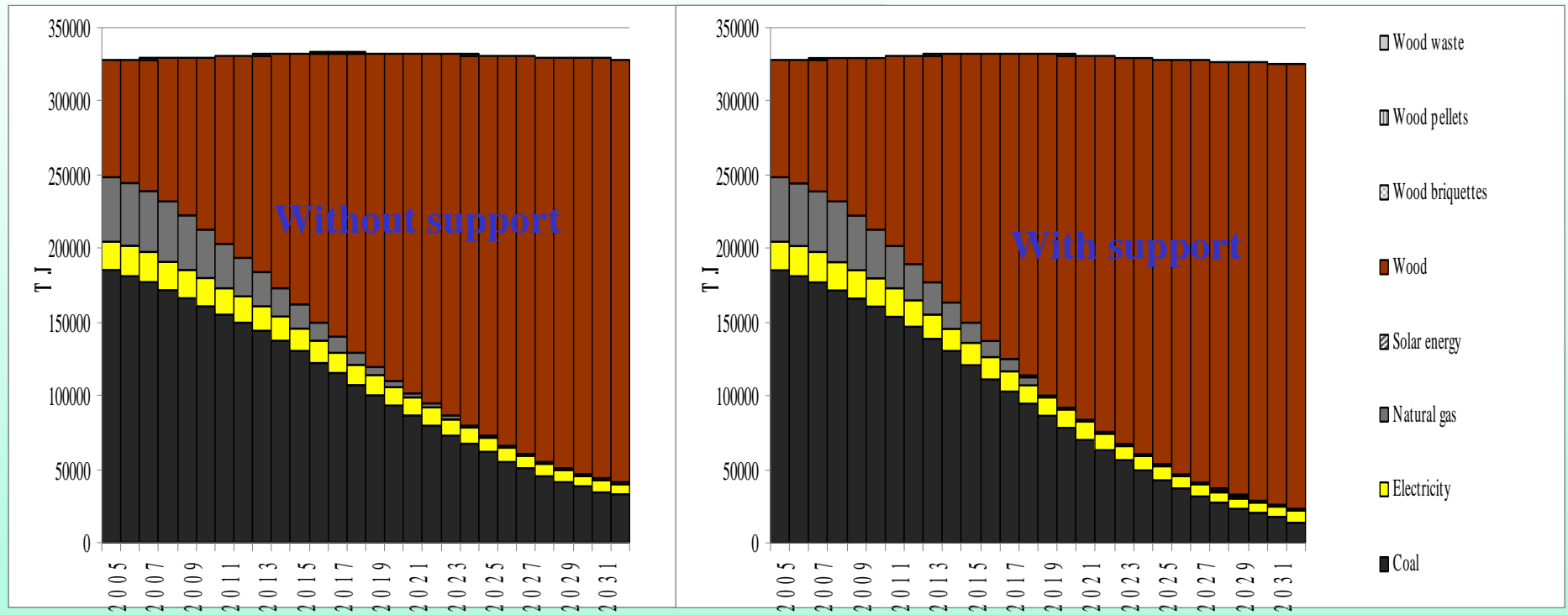


Heat production in rural and urban areas

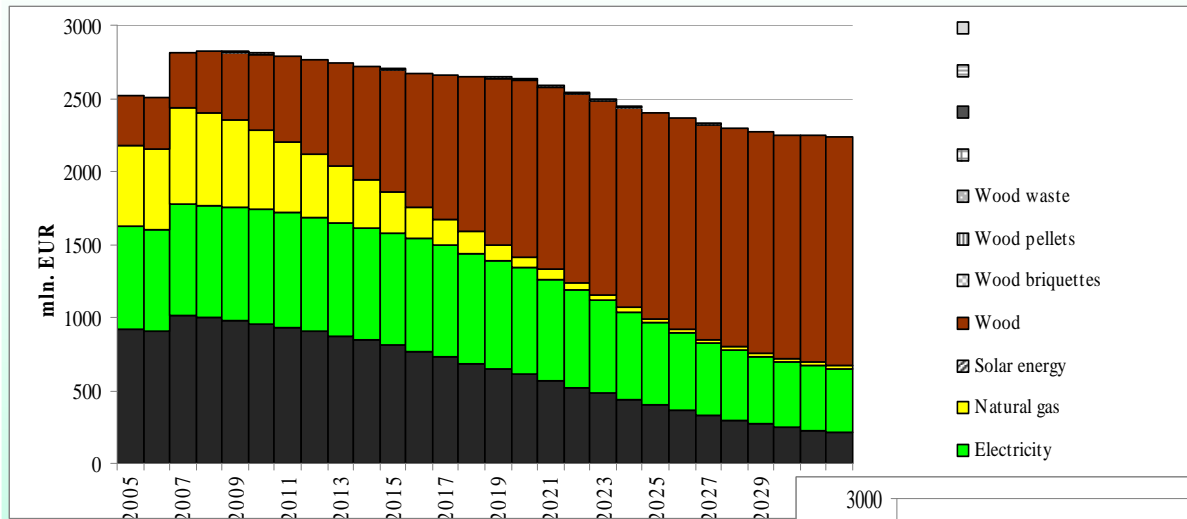
Without support



Total fuel consumption in individual houses

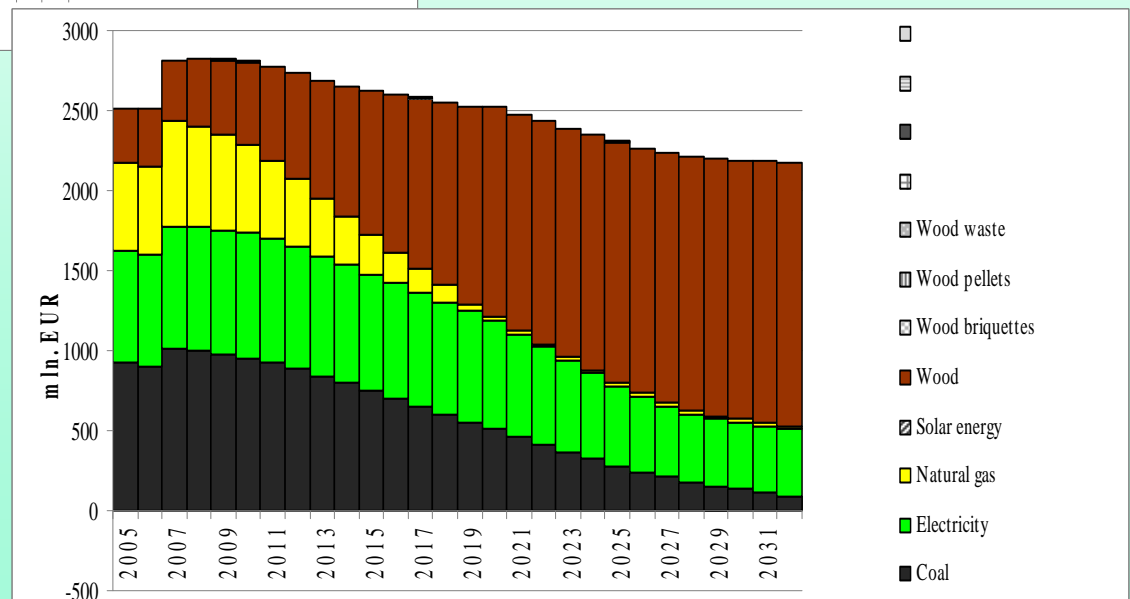


Total fuel cost in individual houses

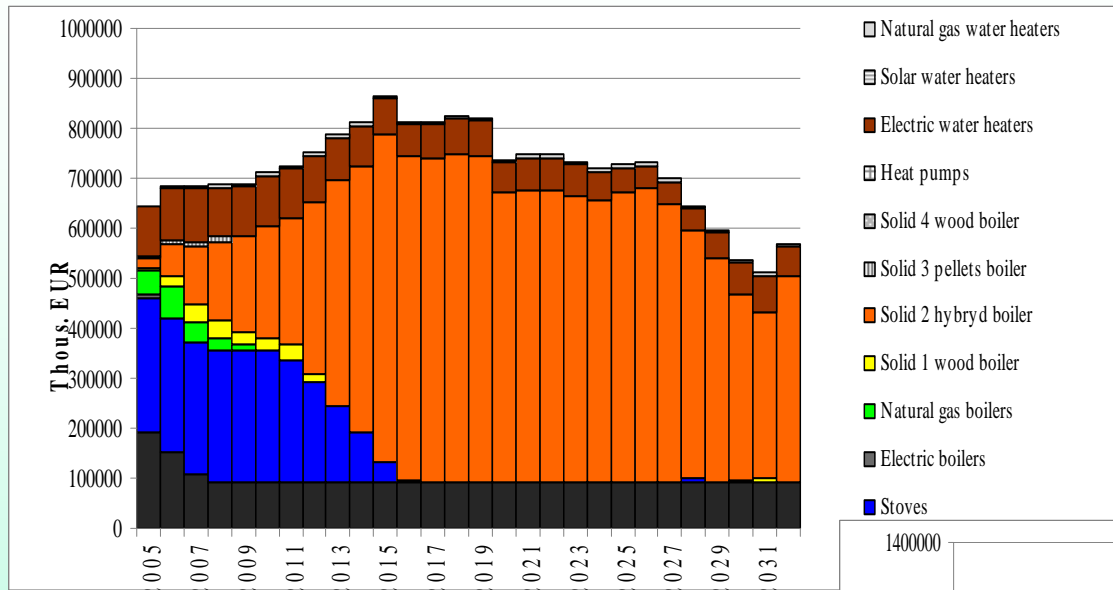


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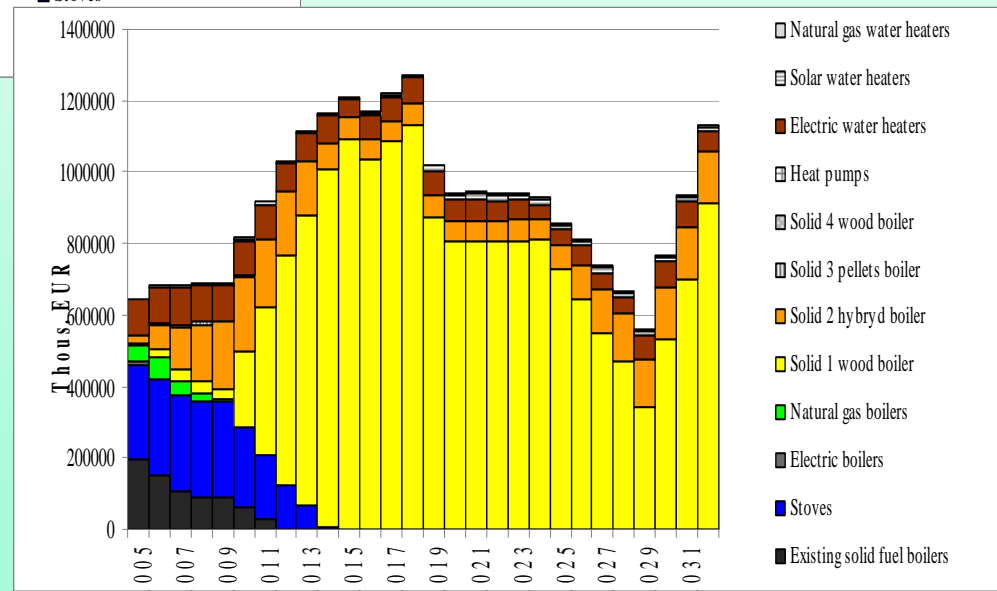
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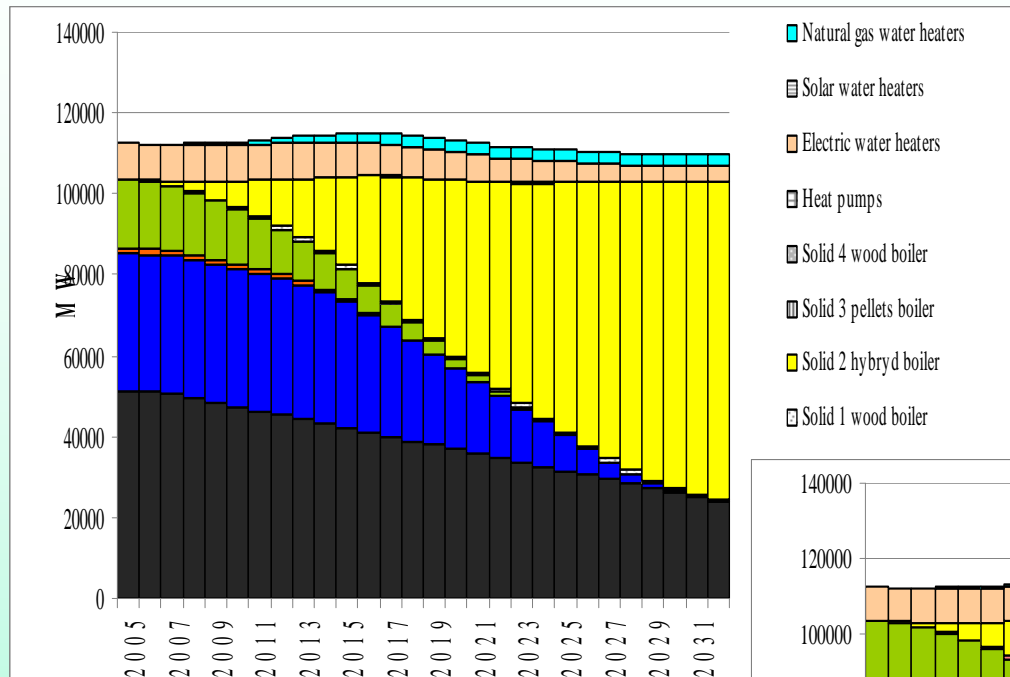
Annual investment cost by technologies



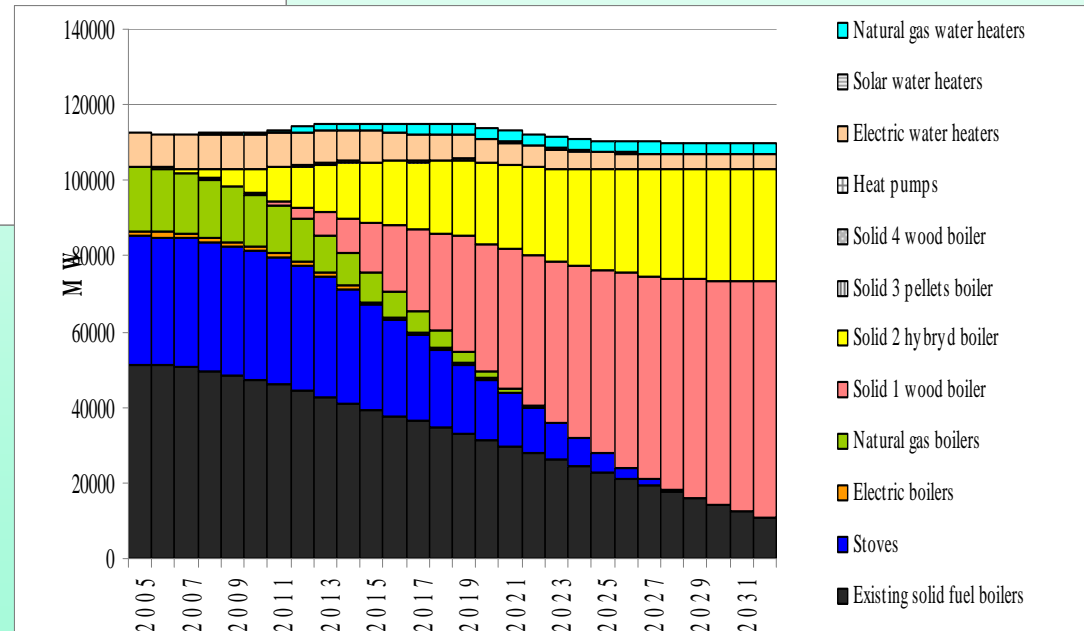
With support



Total installed capacity of heating appliances

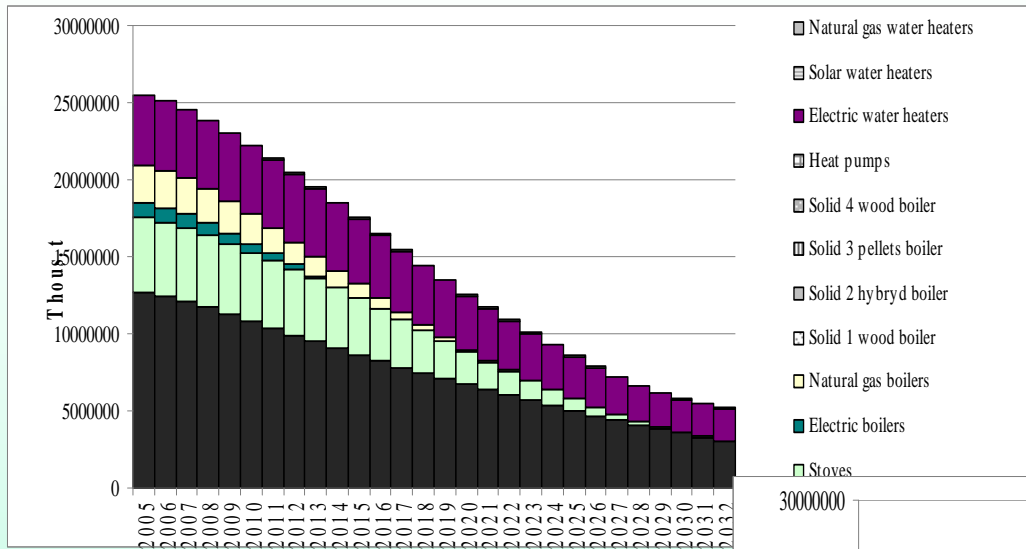


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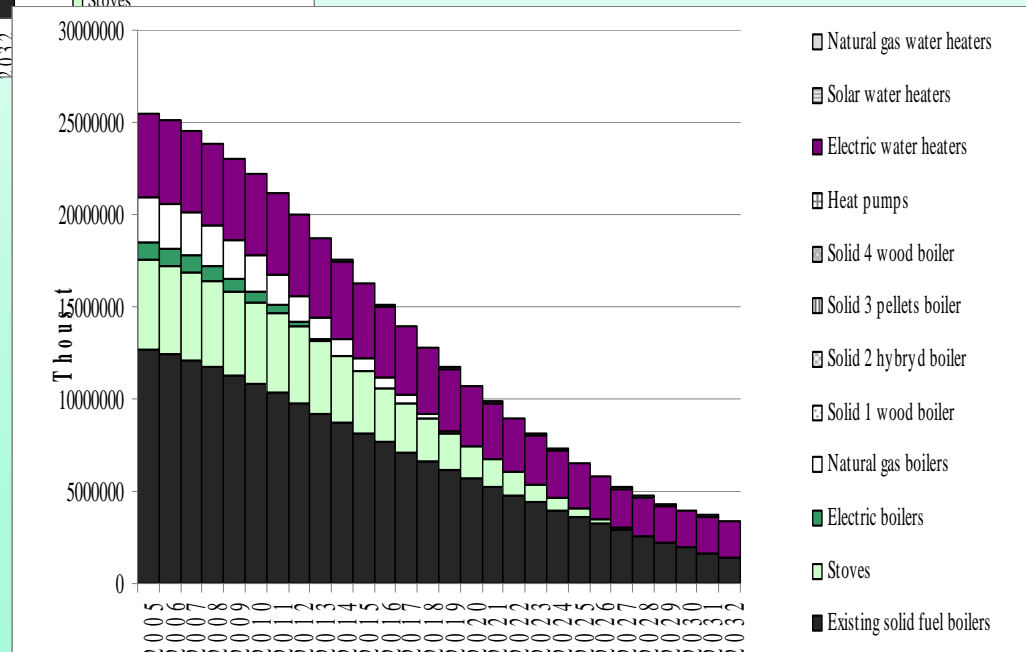
With support

Total CO2 emissions

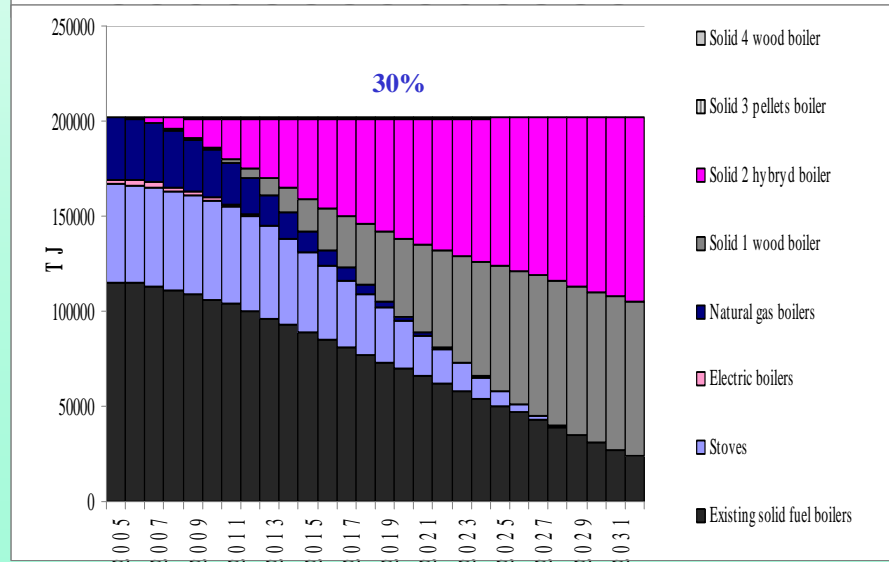
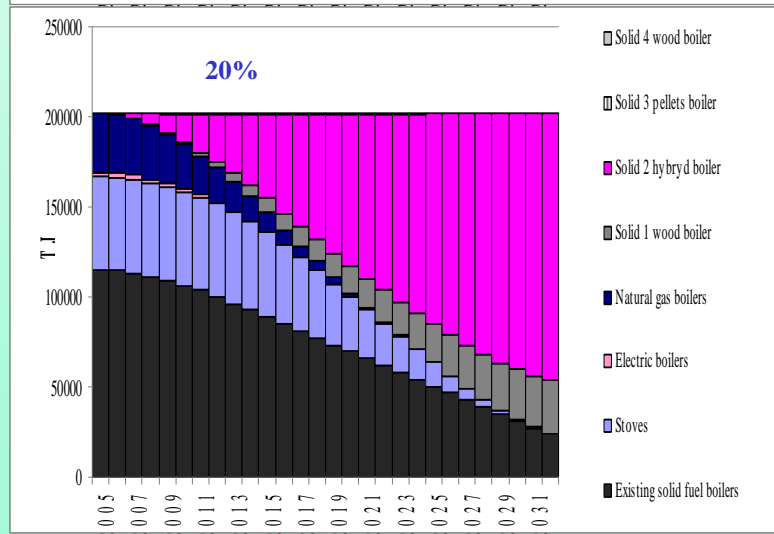
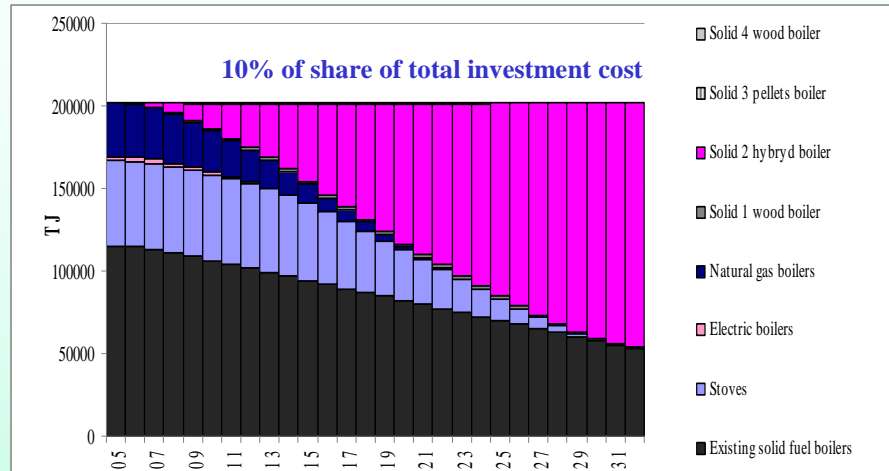
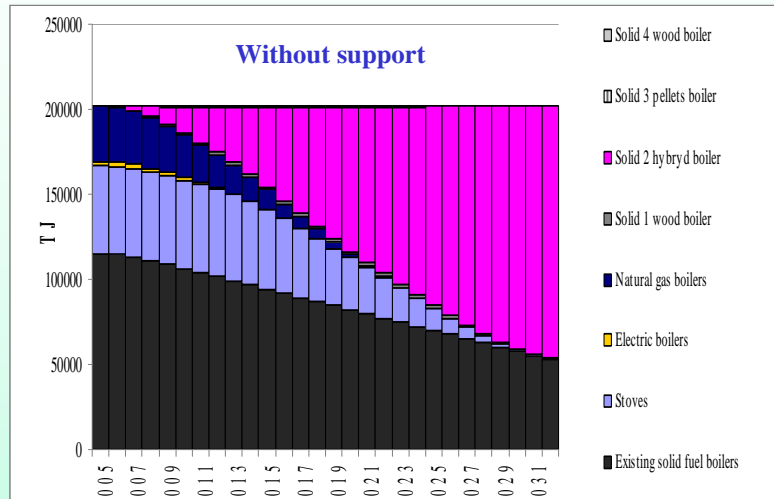


Without support

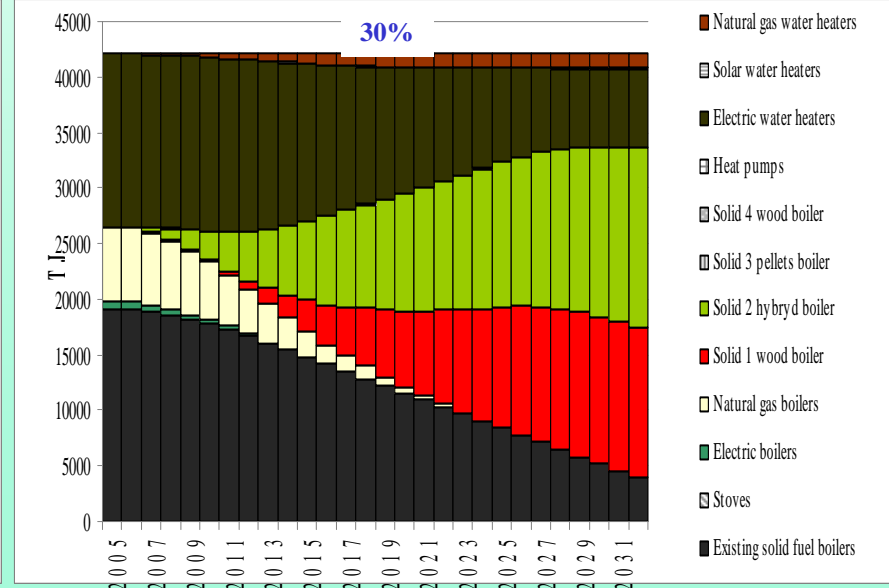
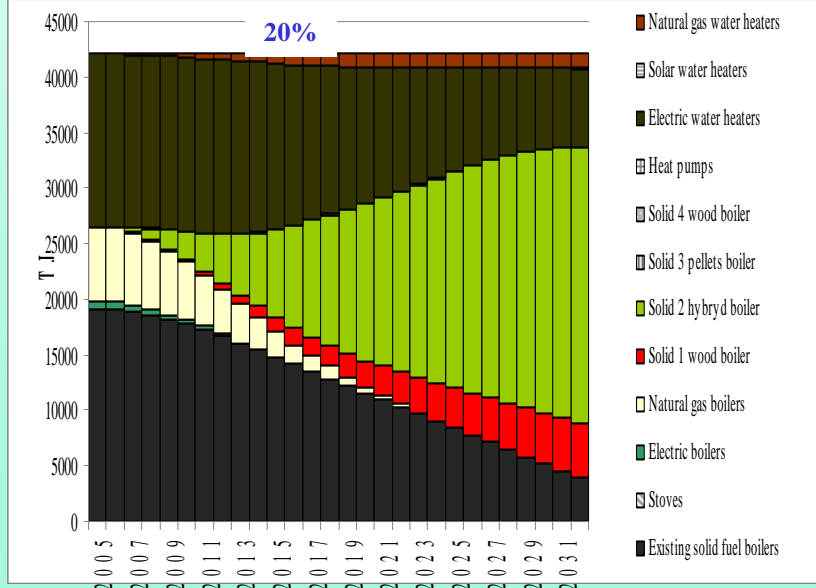
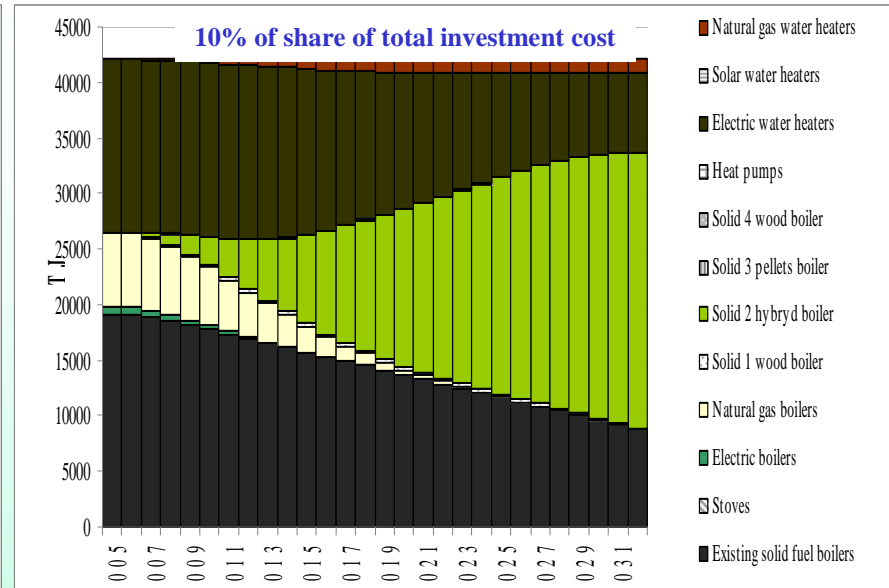
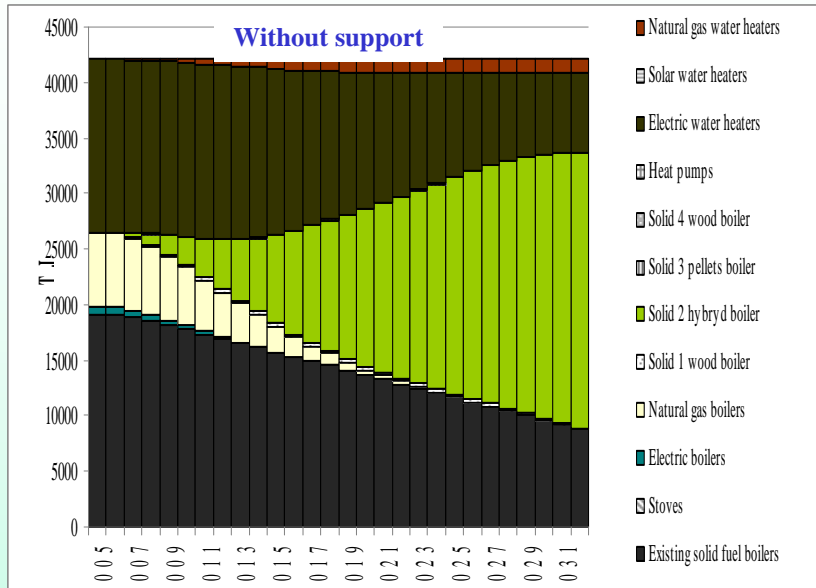
With support



Penetration of RES space heating technologies (dr 17.5%)

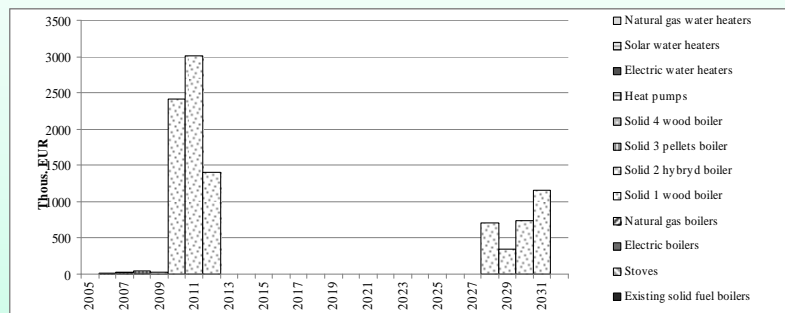


Penetration of RES water heating technologies (dr 17.5%)

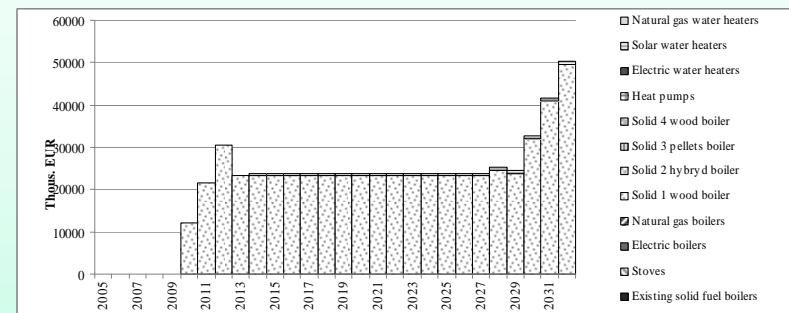


Budget cost

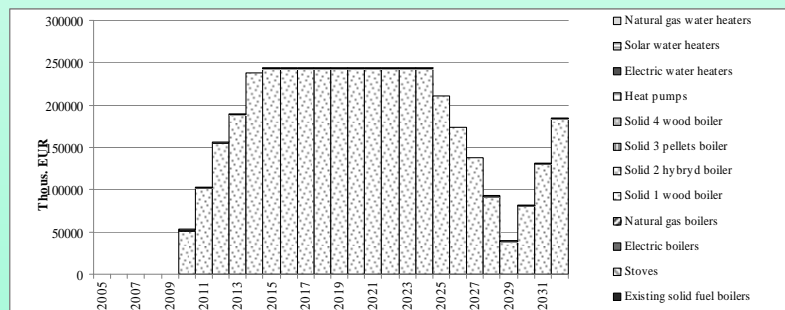
10%



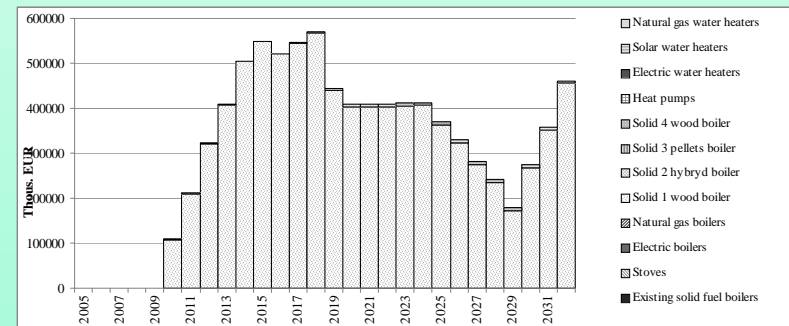
20%



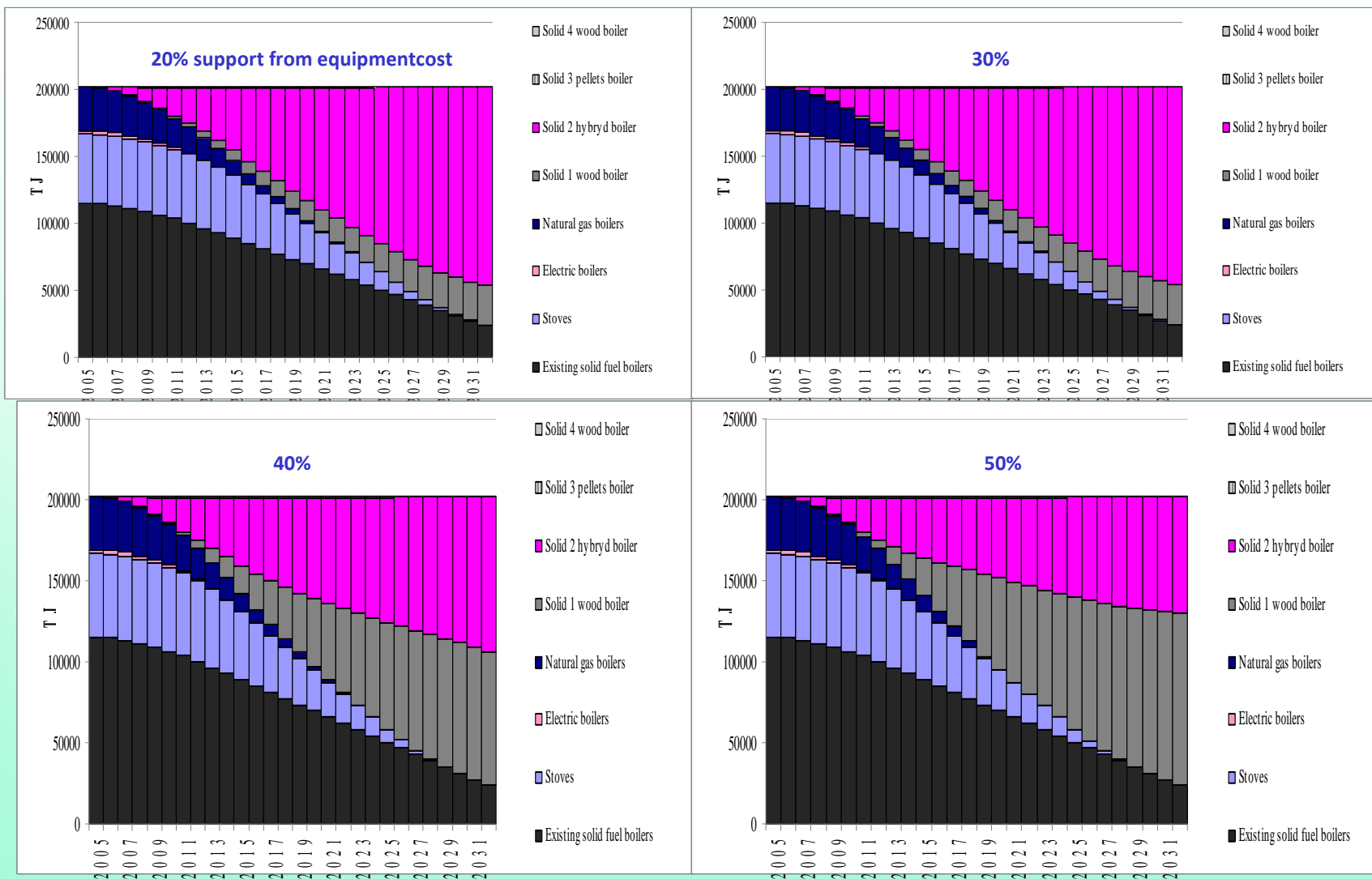
30%



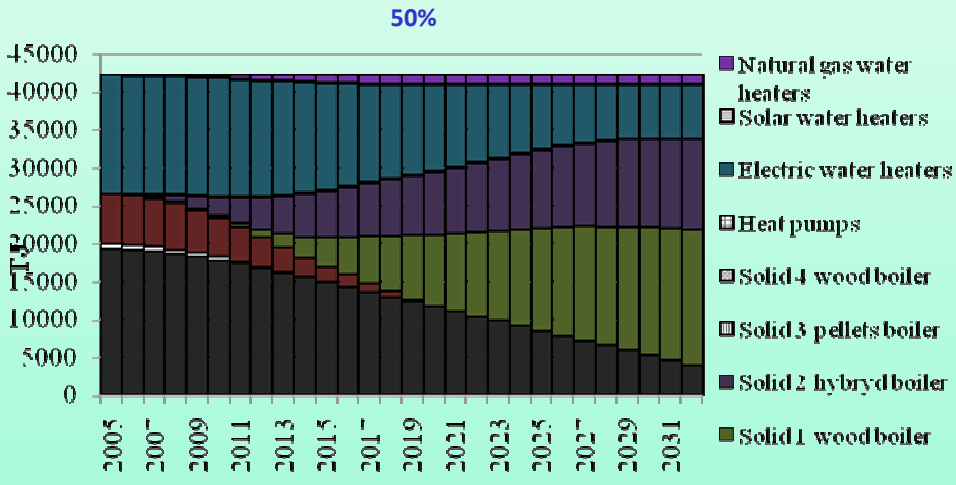
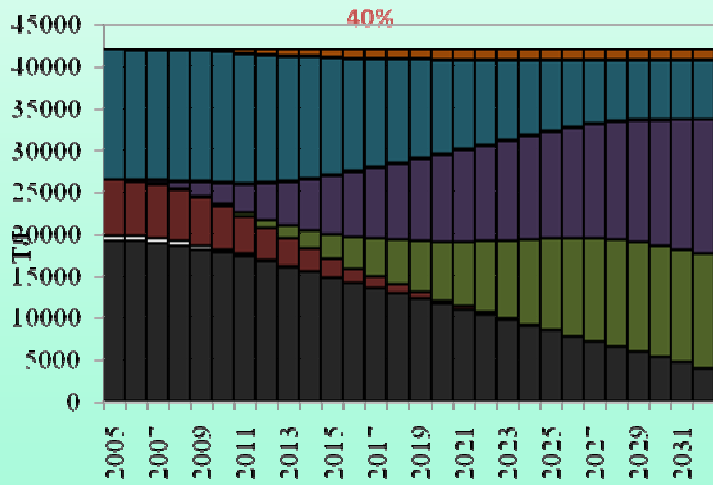
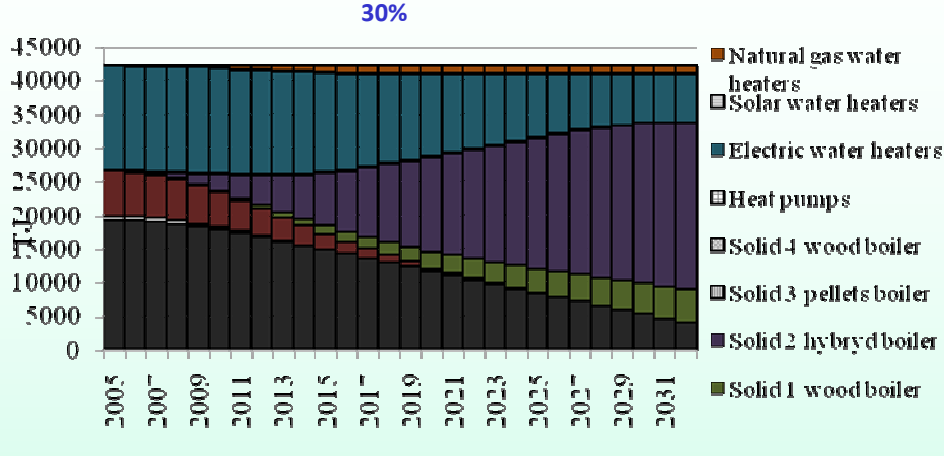
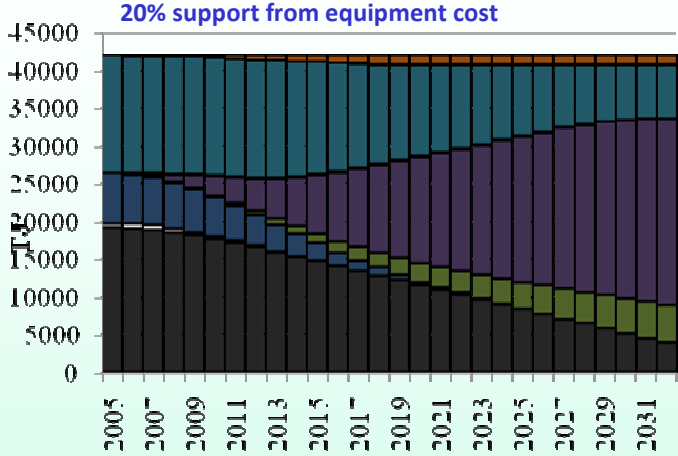
50%



Penetration of RES space heating technologies (dr 17.5%)

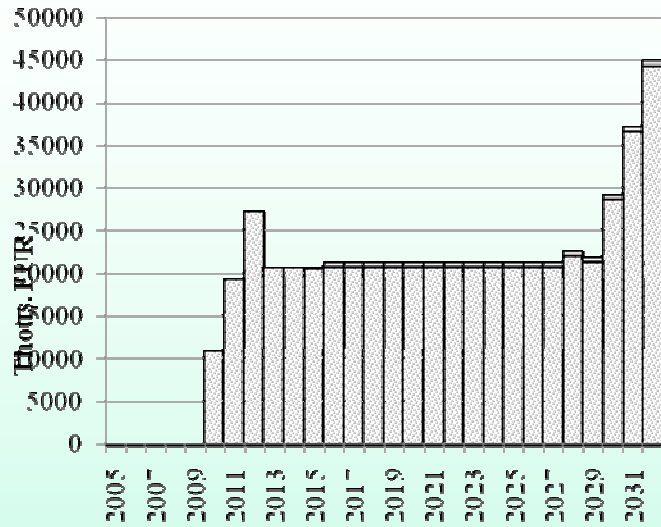


Penetration of RES water heating technologies (dr 17.5%)

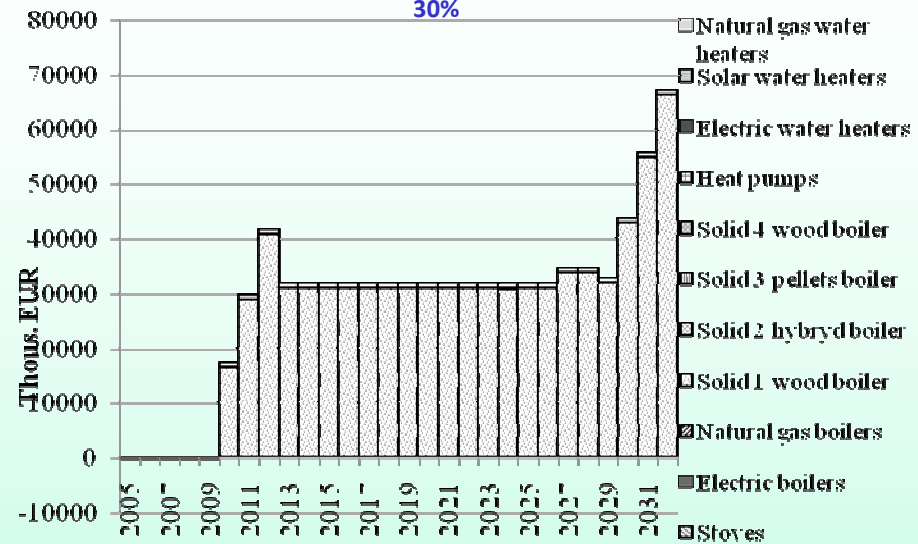


Budget cost

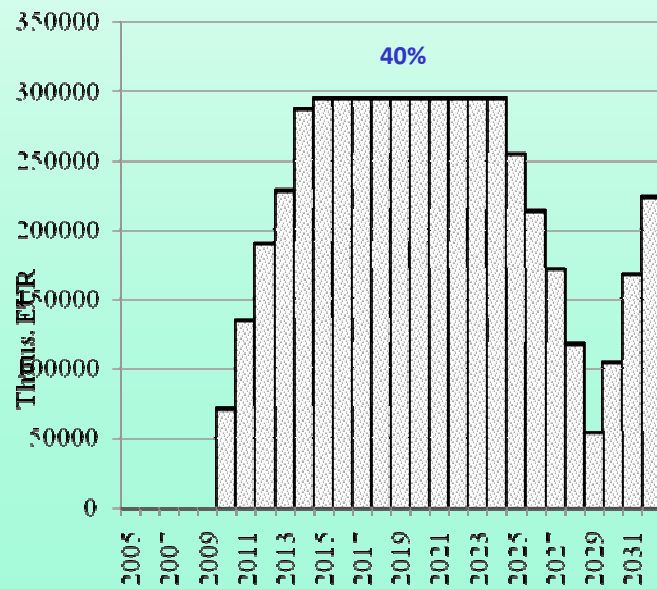
20% support from equipment cost



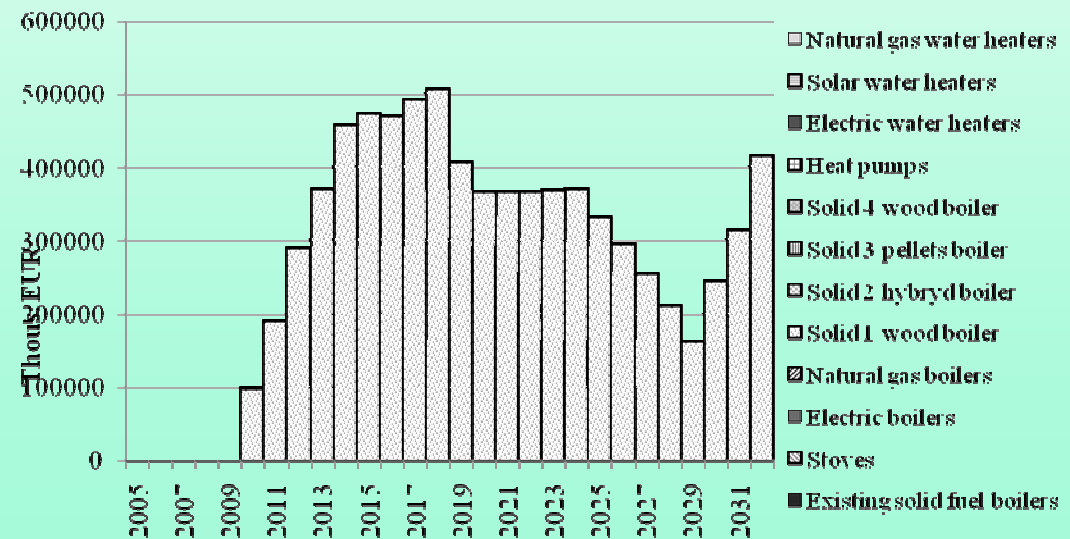
30%



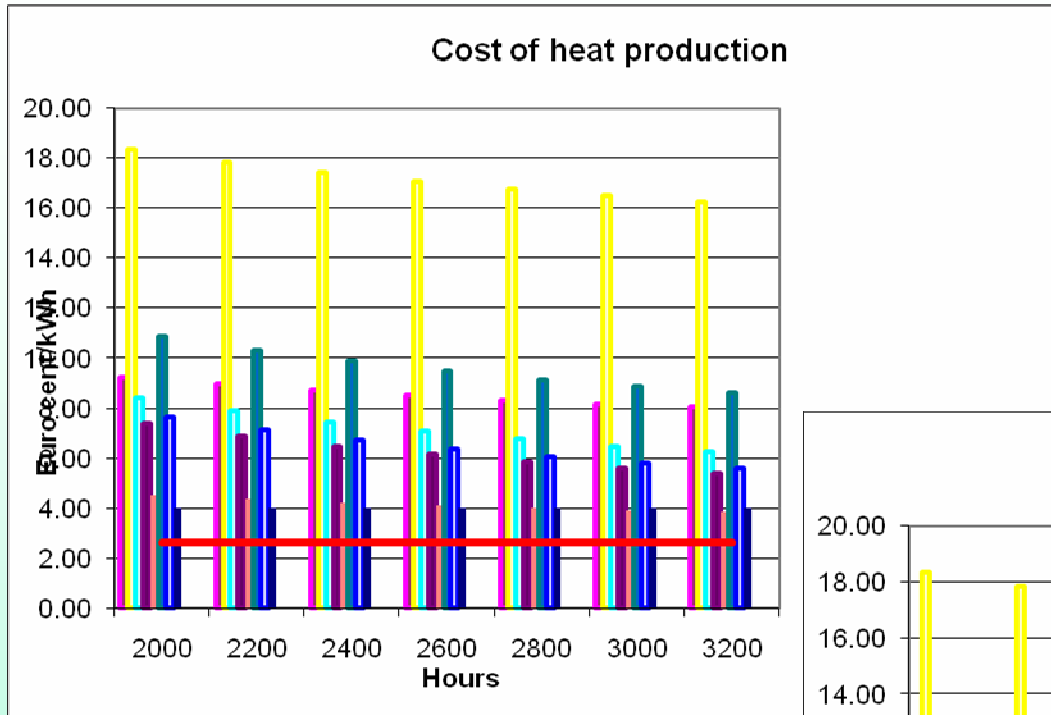
40%



50%

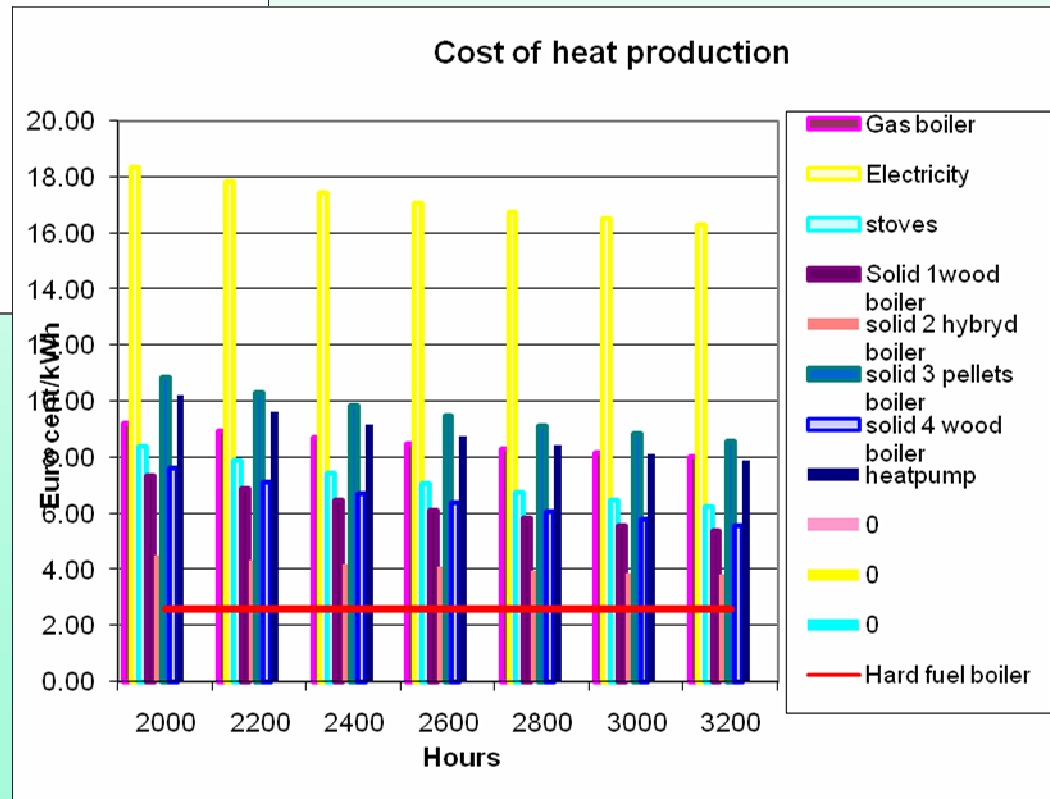


Economic attractiveness of heat pumps

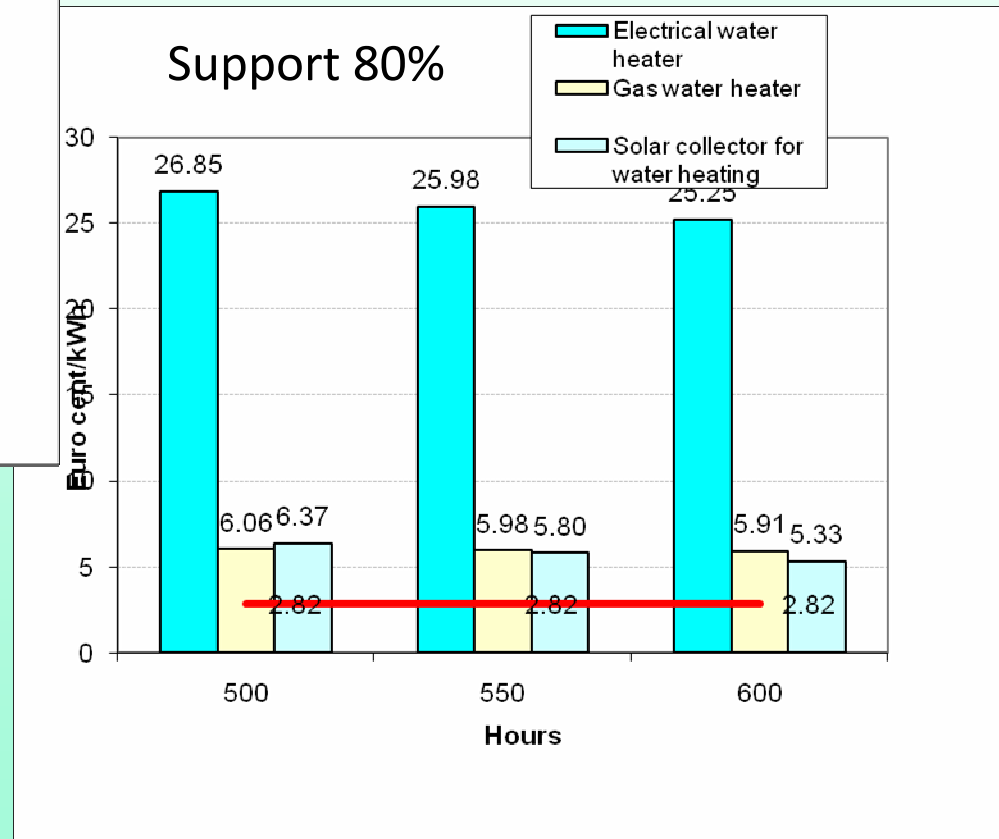
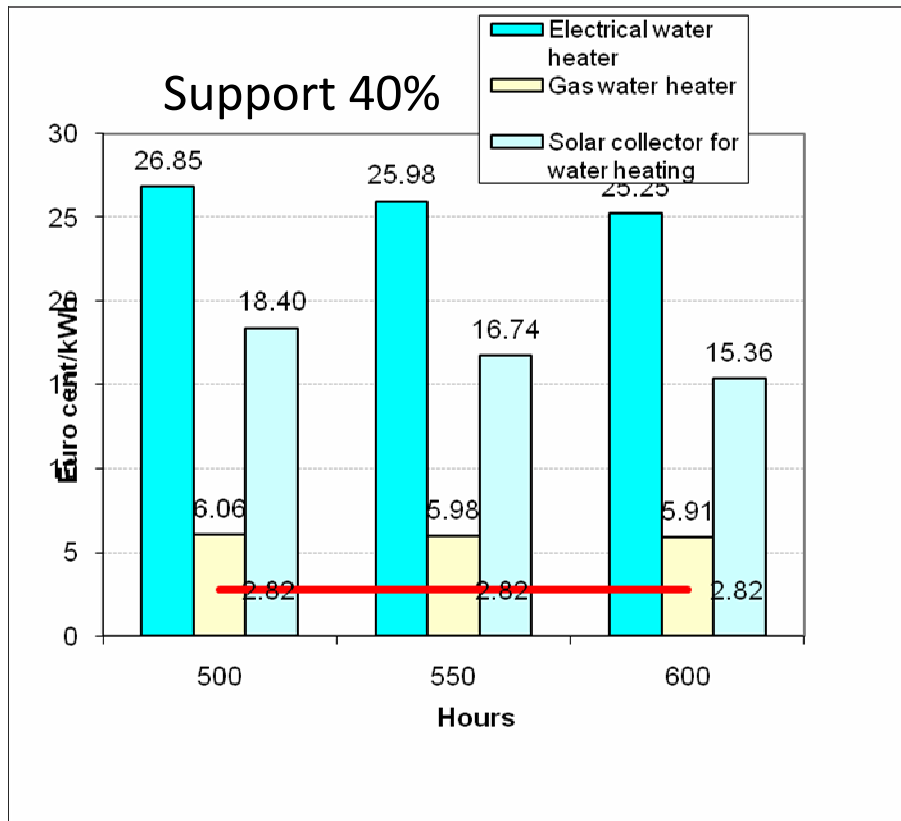


40% support on investment

80% support on investment



Economic attractiveness of solar collectors



Conclusions

Looking to the RES penetration rate rational support is about:
30%> from total installation cost or
50% from equipment cost;

Possible increase of wood consumption does not exceed 5,5%;

Decrease of CO2 emission will not be big. For example: In case of 50% investment support, decrease will be from 5.232.262 to 3.405.152 t in 2034. Budged expenses in this situation will be on level of 9.264.350.000 during 29 years

Conclusions

Investment support for solar collectors should be on level of 80%.
In this case solar collectors will be attractive for consumers;

Investment support for heat pumps should be on level almost
100%. In other case this technology shouldn't be attractive;

Thank you for your attention.

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