

**ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN
2010 FOR FINLAND**

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Primes Ver. 2 Energy Model**

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Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900
DECOMPOSITION OF CO2 EMISSIONS REDUCTION (ktn of CO2 avoided in target year)																	
Industrial Sectors - Metals																	
Total CO2 emissions reduction	0	-6	-18	-62	-125	-211	-465	-935	-1182	-1475	-1867	-2176	-2558	-2881	-3227	-3454	-3692
Structural change and behavioural effects	0	-2	-5	-11	-23	-58	-122	-223	-339	-457	-537	-546	-593	-668	-772	-842	-931
Technological improvement	0	-1	-1	-3	-7	-12	-26	-48	-85	-144	-269	-473	-712	-912	-1086	-1196	-1282
Energy saving in heat uses	0	0	0	-2	-2	-4	-8	-12	-17	-21	-28	-101	-108	-129	-145	-158	-171
Specific Industrial processes	0	0	-1	-1	-4	-6	-15	-32	-61	-116	-230	-356	-586	-761	-915	-1008	-1078
Electrical Equipment	0	0	0	-1	-1	-1	-3	-4	-6	-8	-12	-16	-18	-22	-26	-29	-33
Change of fuel mix	0	0	-1	-3	-5	-10	-16	-27	-34	-39	-46	-35	-54	-54	-56	-58	-61
Change of emission factor of electricity and steam (supply effect)	0	-2	-11	-44	-90	-131	-301	-638	-724	-834	-1016	-1122	-1199	-1248	-1314	-1358	-1418
Industrial Sectors - Chemicals																	
Total CO2 emissions reduction	0	-3	-16	-63	-121	-188	-413	-831	-956	-1113	-1357	-1532	-1705	-1822	-1940	-2031	-2129
Structural change and behavioural effects	0	0	-3	-7	-10	-14	-22	-42	-52	-65	-68	-80	-85	-86	-90	-114	-148
Technological improvement	0	-1	-1	-4	-9	-15	-30	-54	-80	-100	-136	-169	-275	-361	-407	-436	-464
Energy saving in heat uses	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1
Specific Industrial processes	0	-1	-1	-4	-8	-15	-31	-54	-81	-102	-136	-169	-275	-356	-402	-431	-458
Electrical Equipment	0	0	0	0	0	1	0	1	1	1	1	0	1	-3	-4	-4	-5
Change of fuel mix	0	0	0	-1	-1	-2	-4	-6	-7	-8	-9	-10	-10	-10	-10	-10	-10
Change of emission factor of electricity and steam (supply effect)	0	-2	-12	-51	-101	-156	-357	-730	-817	-939	-1144	-1274	-1336	-1366	-1434	-1471	-1508
Industrial Sectors - Materials																	
Total CO2 emissions reduction	0	-18	-87	-360	-704	-1104	-2456	-4920	-5553	-6404	-7781	-8723	-9318	-9712	-10263	-10673	-11197
Structural change and behavioural effects	0	-1	-6	-15	-24	-38	-65	-118	-167	-220	-273	-293	-323	-345	-356	-482	-468
Technological improvement	0	-2	-4	-14	-30	-52	-94	-148	-224	-275	-388	-548	-644	-784	-936	-998	-1336
Energy saving in heat uses	0	0	0	-1	-3	-5	-9	-16	-26	-34	-49	-63	-75	-96	-116	-128	-148
Specific Industrial processes	0	-1	-2	-7	-14	-23	-43	-66	-99	-122	-174	-284	-341	-428	-549	-588	-829
Electrical Equipment	0	-1	-2	-7	-13	-23	-42	-66	-99	-118	-165	-201	-228	-259	-271	-282	-360
Change of fuel mix	0	0	-1	-2	-5	-8	-15	-22	-29	-35	-40	-44	-47	-49	-50	-47	-52
Change of emission factor of electricity and steam (supply effect)	0	-14	-75	-328	-645	-1006	-2282	-4632	-5133	-5874	-7079	-7838	-8304	-8533	-8921	-9135	-9341
Industrial Sectors - Others																	
Total CO2 emissions reduction	0	-8	-29	-114	-224	-355	-774	-1519	-1750	-2040	-2500	-2830	-3089	-3275	-3549	-3731	-3902
Structural change and behavioural effects	0	0	-1	-3	-5	-8	-14	-25	-37	-49	-63	-78	-91	-103	-113	-135	-160
Technological improvement	0	-2	-3	-10	-21	-37	-71	-114	-176	-233	-338	-449	-584	-699	-855	-954	-1020
Energy saving in heat uses	0	-1	-1	-4	-11	-22	-44	-65	-103	-140	-189	-238	-304	-386	-539	-614	-667
Specific Industrial processes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electrical Equipment	0	0	-2	-6	-11	-16	-27	-49	-73	-94	-149	-211	-280	-313	-317	-340	-354
Change of fuel mix	0	-1	-3	-7	-13	-23	-38	-53	-66	-76	-84	-89	-92	-95	-93	-94	-100
Change of emission factor of electricity and steam (supply effect)	0	-4	-22	-94	-186	-287	-652	-1327	-1471	-1681	-2016	-2214	-2321	-2377	-2486	-2547	-2622
Industrial Sectors - Total																	
Total CO2 emissions reduction	0	-35	-150	-599	-1174	-1858	-4109	-8205	-9442	-11031	-13505	-15261	-16670	-17689	-18979	-19889	-20919
Structural change and behavioural effects	0	-4	-15	-36	-62	-118	-223	-408	-595	-791	-940	-996	-1091	-1201	-1331	-1573	-1706
Technological improvement	0	-5	-11	-32	-67	-116	-221	-364	-565	-752	-1131	-1639	-2216	-2756	-3284	-3584	-4102
Energy saving in heat uses	0	-2	-2	-7	-16	-31	-62	-94	-147	-195	-266	-402	-488	-613	-801	-901	-987
Specific Industrial processes	0	-2	-4	-12	-26	-45	-89	-152	-241	-340	-540	-809	-1202	-1546	-1866	-2027	-2364
Electrical Equipment	0	-1	-4	-14	-25	-40	-70	-118	-177	-218	-325	-427	-525	-597	-617	-656	-751
Change of fuel mix	0	-2	-5	-13	-23	-44	-73	-108	-136	-159	-179	-178	-203	-208	-209	-209	-223
Change of emission factor of electricity and steam (supply effect)	0	-23	-119	-518	-1022	-1580	-3592	-7326	-8146	-9328	-11255	-12449	-13160	-13524	-14155	-14511	-14888

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900	
DECOMPOSITION OF CO2 EMISSIONS REDUCTION (ktn of CO2 avoided in target year)																		
Services																		
Total CO2 emissions reduction	0	-6	-31	-237	-420	-493	-1141	-2211	-2546	-3034	-3630	-4072	-4381	-4614	-4834	-5021	-5221	
Structural change and behavioural effects	0	-1	0	-29	-35	-56	-58	-128	-152	-230	-324	-386	-437	-465	-492	-552	-612	
Technological improvement	0	-1	-4	-83	-144	-43	-195	-324	-452	-601	-684	-741	-869	-1019	-1091	-1164	-1257	
Space heating and cooling	0	-3	-10	-19	-40	83	-59	-155	-269	-367	-396	-388	-445	-572	-644	-765	-745	
Other heat uses (water heating, cooking, etc.)	0	-1	-3	-13	-20	-27	-23	-50	-60	-85	-96	-106	-119	-130	-134	-143	-157	
Electric uses	0	3	9	-50	-84	-99	-112	-118	-123	-149	-191	-247	-305	-317	-313	-315	-356	
Change of fuel mix	0	0	1	0	1	2	5	3	4	4	1	-73	-75	-75	-78	-77	-74	
Change of emission factor of electricity and steam (supply effect)	0	-5	-28	-125	-241	-395	-893	-1761	-1946	-2208	-2623	-2873	-3000	-3055	-3173	-3227	-3278	
Agriculture																		
Total CO2 emissions reduction	0	-1	-3	-19	-34	-51	-96	-168	-195	-232	-281	-314	-338	-353	-372	-389	-411	
Structural change and behavioural effects	0	0	0	-3	-3	-5	-6	-12	-15	-23	-32	-39	-44	-49	-52	-58	-65	
Technological improvement	0	0	-1	-6	-10	-14	-22	-12	-4	-12	-16	-19	-22	-23	-23	-23	-26	
Space heating and cooling	0	0	-1	-4	-6	-10	-16	-5	3	-4	-6	-7	-7	-7	-7	-7	-6	
Other heat uses (water heating, cooking, etc.)	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-4	
Electric uses	0	0	0	-2	-3	-4	-5	-6	-6	-8	-9	-12	-14	-14	-14	-14	-16	
Change of fuel mix	0	0	0	-1	-1	-2	-4	-7	-26	-29	-32	-36	-40	-45	-49	-55	-62	
Change of emission factor of electricity and steam (supply effect)	0	0	-2	-10	-20	-29	-65	-138	-151	-168	-201	-220	-231	-237	-248	-253	-258	
Households																		
Total CO2 emissions reduction	0	-19	-70	-267	-509	-857	-1886	-3732	-4342	-5240	-6649	-7583	-8468	-9155	-10147	-10700	-11299	
Structural change and behavioural effects	0	-6	-14	-33	-64	-123	-237	-421	-624	-876	-1131	-1418	-1649	-1873	-2045	-2388	-2769	
Technological improvement	0	-4	-7	-15	-26	-41	-83	-238	-337	-493	-688	-1029	-1407	-1633	-2296	-2461	-2519	
Space heating	0	-2	-4	-8	-14	-22	-46	-102	-151	-219	-329	-529	-832	-1171	-991	-1053	-1087	
Other heat uses (water heating, cooking, air conditioning)	0	-1	-2	-5	-8	-15	-29	-112	-150	-184	-226	-261	-279	-198	-215	-311	-327	
Electric appliances	0	-1	-1	-2	-4	-4	-8	-24	-36	-90	-114	-168	-197	-264	-1090	-1096	-1105	
Change of fuel mix	0	-1	-2	-3	-6	-11	-20	-31	-41	-50	-60	-68	-76	-198	-537	-423	-422	
Change of emission factor of electricity and steam (supply effect)	0	-8	-47	-215	-413	-682	-1546	-3042	-3341	-3820	-4590	-5068	-5335	-5450	-5269	-5427	-5588	
Passenger Transport																		
Total CO2 emissions reduction	0	-4	-8	-22	-45	-83	-168	-298	-421	-690	-950	-1192	-1462	-1769	-2148	-2957	-3783	
Structural change and behavioural effects	0	-1	-2	-4	-9	-18	-36	-63	-99	-148	-249	-332	-417	-500	-574	-685	-546	
Technological improvement	0	-3	-5	-12	-25	-49	-96	-160	-237	-446	-582	-728	-909	-1128	-1424	-2147	-3097	
Train transports	0	0	0	-1	-2	-5	-8	-11	-19	-35	-42	-56	-60	-62	-53	-46		
Aviation / Navigation	0	-2	-4	-10	-19	-38	-74	-120	-171	-334	-412	-477	-532	-577	-614	-449	-604	
Road transports	0	0	-1	-2	-4	-8	-17	-32	-55	-93	-136	-208	-321	-490	-747	-1646	-2448	
Change of fuel mix	0	0	0	0	0	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-191	-4	
Change of emission factor of electricity and steam (supply effect)	0	0	-1	-5	-11	-16	-35	-74	-83	-95	-116	-130	-134	-137	-146	-133	-136	
Goods Transport																		
Total CO2 emissions reduction	0	-3	-7	-20	-40	-74	-234	-361	-486	-650	-807	-970	-1042	-1149	-1270	-1822	-2072	
Structural change and behavioural effects	0	-2	-4	-11	-23	-45	-151	-220	-302	-378	-439	-465	-555	-630	-715	-822	-983	
Technological improvement	0	-1	-1	-3	-6	-13	-46	-65	-99	-183	-260	-390	-571	-903	-1005	-1479	-1664	
Train transports	0	0	-1	-1	-3	-5	-30	-32	-38	-64	-63	-71	-66	-67	-67	-69	-72	
Aviation / Navigation	0	0	0	0	0	0	0	-1	-1	-2	-3	-4	-4	-6	-8	-18	-23	
Road transports	0	0	-1	-2	-4	-8	-16	-32	-60	-118	-194	-316	-701	-830	-930	-1392	-1569	
Change of fuel mix	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Change of emission factor of electricity and steam (supply effect)	0	0	-1	-6	-11	-17	-36	-76	-85	-89	-107	-115	-116	-116	-120	-121	-123	
Final Energy Demand Sectors - Total																		
Total CO2 emissions reduction	0	-68	-269	-1165	-2223	-3415	-7633	-14975	-17431	-20877	-25821	-29393	-32362	-34730	-37750	-40779	-43705	
Structural change and behavioural effects	0	-14	-35	-117	-197	-365	-711	-1252	-1786	-2445	-3115	-3635	-3793	-4219	-4640	-5280	-5983	
Technological improvement	0	-14	-29	-152	-278	-276	-662	-1163	-1694	-2488	-3542	-4546	-6195	-7462	-9122	-10858	-12666	
Change of fuel mix	0	-3	-7	-17	-30	-55	-92	-144	-200	-236	-272	-357	-398	-529	-877	-957	-786	
Change of emission factor of electricity and steam (supply effect)	0	-37	-199	-879	-1718	-2718	-6169	-12417	-13751	-15708	-18893	-20854	-21976	-22520	-23111	-23672	-24270	

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900	
DECOMPOSITION OF CO2 EMISSIONS REDUCTION (ktn of CO2 avoided in target year)																		
Electricity production																		
Total CO2 emissions reduction	0	-42	-221	-996	-1911	-2583	-5831	-12287	-13891	-16003	-19454	-21719	-23263	-24106	-25627	-26471	-27414	
Change of demand	0	0	-17	-177	-248	-153	-275	-609	-797	-1150	-1553	-2013	-2093	-2405	-3168	-3424	-3716	
Production from non fossil fuels	0	104	152	-33	-300	-494	-437	-3098	-4373	-4732	-5098	-6005	-6316	-7144	-8762	-9796	-11003	
Large hydro	0	30	44	-10	-87	-142	-126	-829	-1164	-1272	-1390	-1619	-1681	-1881	-2291	-2530	-2804	
Small renewables	0	6	8	-2	-17	-33	-30	-225	-359	-404	-447	-550	-577	-657	-800	-882	-987	
Biomass and waste	0	16	23	-5	-46	-74	-63	-604	-883	-929	-972	-1172	-1320	-1544	-1940	-2270	-2652	
Nuclear energy	0	52	77	-17	-151	-246	-219	-1440	-1968	-2127	-2288	-2665	-2737	-3062	-3731	-4114	-4560	
Change of fossil fuel mix	0	15	-172	-428	-863	-1393	-4068	-8667	-8904	-10241	-12850	-13875	-4370	-4180	-3915	-3771	-3482	
Technological improvement of fossil fuel plants	0	-160	-184	-358	-499	-543	-1050	87	183	120	46	174	-10484	-10377	-9782	-9480	-9213	
Steam production																		
Total CO2 emissions reduction	0	4	-2	-62	-51	-284	-597	-762	-666	-873	-1045	-1222	-1271	-1370	-1361	-1427	-1502	
Change of demand	0	-1	-5	-16	-19	-25	-35	-103	-121	-160	-220	-279	-328	-367	-404	-459	-525	
Production from non fossil fuels	0	-208	-218	-372	-394	-555	-749	-1432	-1493	-1555	-1556	-1401	-1319	-1326	-1304	-1273	-1259	
Technological improvement of fossil fuel plants and change of fuel mix	0	212	221	326	362	296	187	773	948	841	730	458	376	323	346	305	282	
Other Supply Sectors production																		
Total CO2 emissions reduction	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	7	9	
Statistical Difference																		
	0	-1	-1	-3	-6	-18	-43	-77	-72	-151	-175	-189	-246	-360	-477	-519	-563	
Avoided CO2 Emissions - As in Final Report																		
Total CO2 emissions reduction	0	-69	-270	-1168	-2229	-3433	-7676	-15053	-17504	-21027	-25995	-29581	-32607	-35088	-38225	-41290	-44259	
In Final Energy Demand	0	-31	-47	-109	-266	-563	-1240	-1990	-2976	-4144	-5506	-6666	-8092	-9554	-11061	-13231	-15185	
In Electricity and Steam Generation	0	-38	-222	-1058	-1962	-2869	-6436	-13062	-14528	-16884	-20489	-22915	-24516	-25535	-27166	-28066	-29083	
In Other Energy Conversion Sectors	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	7	9	

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900	
DECOMPOSITION OF CO2 EMISSIONS REDUCTION (% contribution to avoid CO2 emissions in target year)																		
Industrial Sectors - Metals																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	42.5	25.5	18.4	18.6	27.3	26.2	23.8	28.7	31.0	28.7	25.1	23.2	23.2	23.9	24.4	25.2	
Technological improvement	0	12.2	7.0	5.5	5.8	5.6	5.6	5.1	7.2	9.8	14.4	21.7	27.8	31.7	33.6	34.6	34.7	
Energy saving in heat uses	0	3.5	2.5	2.4	1.8	2.0	1.7	1.3	1.5	1.4	1.5	4.6	4.2	4.5	4.5	4.6	4.6	
Specific Industrial processes	0	8.0	3.5	2.2	3.2	2.8	3.3	3.4	5.2	7.9	12.3	16.4	22.9	26.4	28.4	29.2	29.2	
Electrical Equipment	0	0.6	1.0	0.9	0.7	0.7	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.8	0.8	0.9	0.9	
Change of fuel mix	0	5.9	7.2	5.1	4.0	4.8	3.4	2.9	2.9	2.7	2.5	1.6	2.1	1.9	1.7	1.7	1.7	
Change of emission factor of electricity and steam (supply effect)	0	39.5	60.3	71.1	71.7	62.3	64.8	68.2	61.2	56.6	54.4	51.6	46.9	43.3	40.7	39.3	38.4	
Industrial Sectors - Chemicals																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	13.6	17.8	10.8	8.3	7.7	5.4	5.0	5.4	5.8	5.0	5.2	5.0	4.7	4.6	5.6	6.9	
Technological improvement	0	15.2	8.5	7.0	7.1	7.9	7.3	6.5	8.4	9.0	10.0	11.0	16.1	19.8	21.0	21.5	21.8	
Energy saving in heat uses	0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	
Specific Industrial processes	0	18.2	7.8	6.5	6.9	8.2	7.6	6.5	8.5	9.1	10.0	11.0	16.1	19.6	20.7	21.2	21.5	
Electrical Equipment	0	-3.0	0.6	0.5	0.1	-0.3	-0.3	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.2	0.2	0.2	0.2	
Change of fuel mix	0	3.9	1.6	1.0	1.0	1.2	0.9	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	
Change of emission factor of electricity and steam (supply effect)	0	67.3	72.2	81.1	83.7	83.2	86.4	87.8	85.5	84.4	84.3	83.2	78.3	75.0	73.9	72.4	70.8	
Industrial Sectors - Materials																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	
Structural change and behavioural effects	0	7.3	7.0	4.2	3.5	3.4	2.6	2.4	3.0	3.4	3.5	3.4	3.5	3.5	3.5	4.5	4.2	
Technological improvement	0	13.0	5.2	4.0	4.2	4.7	3.8	3.0	4.0	4.3	5.0	6.3	6.9	8.1	9.1	9.3	11.9	
Energy saving in heat uses	0	1.3	0.5	0.4	0.4	0.4	0.4	0.3	0.5	0.5	0.6	0.7	0.8	1.0	1.1	1.2	1.3	
Specific Industrial processes	0	6.1	2.4	1.8	1.9	2.1	1.7	1.3	1.8	1.9	2.2	3.3	3.7	4.4	5.3	5.5	7.4	
Electrical Equipment	0	5.6	2.3	1.8	1.9	2.1	1.7	1.3	1.8	1.8	2.1	2.3	2.4	2.7	2.6	2.6	3.2	
Change of fuel mix	0	2.6	1.1	0.6	0.6	0.8	0.6	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.5	
Change of emission factor of electricity and steam (supply effect)	0	77.1	86.7	91.2	91.7	91.1	92.9	94.1	92.4	91.7	91.0	89.9	89.1	87.9	86.9	85.6	83.4	
Industrial Sectors - Others																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	3.9	4.1	2.6	2.2	2.3	1.8	1.7	2.1	2.4	2.5	2.7	2.9	3.2	3.2	3.6	4.1	
Technological improvement	0	24.5	11.7	8.9	9.4	10.5	9.1	7.5	10.1	11.4	13.5	15.9	18.9	21.4	24.1	25.6	26.1	
Energy saving in heat uses	0	19.1	4.2	3.3	4.7	6.1	5.7	4.3	5.9	6.8	7.6	8.4	9.8	11.8	15.2	16.5	17.1	
Specific Industrial processes	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Electrical Equipment	0	5.3	7.4	5.6	4.7	4.5	3.4	3.2	4.2	4.6	6.0	7.5	9.1	9.6	8.9	9.1	9.1	
Change of fuel mix	0	18.2	9.6	5.9	5.6	6.4	4.9	3.5	3.8	3.7	3.3	3.1	3.0	2.9	2.6	2.5	2.6	
Change of emission factor of electricity and steam (supply effect)	0	53.4	74.6	82.6	82.8	80.8	84.2	87.3	84.1	82.4	80.6	78.2	75.2	72.6	70.1	68.3	67.2	
Industrial Sectors - Total																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0	
Structural change and behavioural effects	0	12.7	9.8	6.0	5.3	6.3	5.4	5.0	6.3	7.2	7.0	6.5	6.5	6.8	7.0	7.9	8.2	
Technological improvement	0	15.6	7.0	5.4	5.7	6.2	5.4	4.4	6.0	6.8	8.4	10.7	13.3	15.6	17.3	18.0	19.6	
Energy saving in heat uses	0	5.4	1.4	1.1	1.3	1.7	1.5	1.1	1.6	1.8	2.0	2.6	2.9	3.5	4.2	4.5	4.7	
Specific Industrial processes	0	6.2	2.6	2.0	2.2	2.4	2.2	1.8	2.6	3.1	4.0	5.3	7.2	8.7	9.8	10.2	11.3	
Electrical Equipment	0	3.9	3.0	2.3	2.1	2.2	1.7	1.4	1.9	2.0	2.4	2.8	3.2	3.4	3.3	3.3	3.6	
Change of fuel mix	0	6.7	3.5	2.1	2.0	2.3	1.8	1.3	1.4	1.4	1.3	1.2	1.2	1.1	1.1	1.1	1.1	
Change of emission factor of electricity and steam (supply effect)	0	65.0	79.6	86.4	87.0	85.1	87.4	89.3	86.3	84.6	83.3	81.6	78.9	76.5	74.6	73.0	71.2	

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900	
DECOMPOSITION OF CO2 EMISSIONS REDUCTION (% contribution to avoid CO2 emissions in target year)																		
Services																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	13.5	-1.5	12.2	8.5	11.4	5.1	5.8	6.0	7.6	8.9	9.5	10.0	10.1	10.2	11.0	11.7	
Technological improvement	0	13.5	12.8	34.8	34.4	8.8	17.1	14.7	17.8	19.8	18.8	18.2	19.8	22.1	22.6	23.2	24.1	
Space heating and cooling	0	45.9	32.0	8.1	9.6	-16.9	5.2	7.0	10.6	12.1	10.9	9.5	10.2	12.4	13.3	14.0	14.3	
Other heat uses (water heating, cooking, etc.)	0	16.8	9.7	5.6	4.7	5.5	2.0	2.3	2.4	2.8	2.7	2.6	2.7	2.8	2.8	2.8	3.0	
Electric uses	0	-49.3	-28.9	21.1	20.1	20.1	9.8	5.4	4.8	4.9	5.3	6.1	7.0	6.9	6.5	6.3	6.8	
Change of fuel mix	0	-3.7	-2.0	0.1	-0.2	-0.4	-0.4	-0.1	-0.2	-0.1	0.0	1.8	1.7	1.6	1.6	1.5	1.4	
Change of emission factor of electricity and steam (supply effect)	0	76.7	90.7	52.8	57.3	80.2	78.3	79.7	76.5	72.8	72.3	70.5	68.5	66.2	65.6	64.3	62.8	
Agriculture																		
Total CO2 emissions reduction	0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	9.5	0.6	13.5	9.6	10.6	6.2	7.3	7.6	9.7	11.3	12.3	13.2	13.8	14.0	15.0	15.8	
Technological improvement	0	32.9	23.7	32.2	28.7	28.4	22.4	7.0	1.9	5.3	5.6	6.2	6.4	6.4	6.1	5.9	6.4	
Space heating and cooling	0	38.7	28.2	19.1	17.3	19.1	16.6	3.1	-1.7	1.6	2.0	2.1	2.0	2.0	1.9	1.8	1.6	
Other heat uses (water heating, cooking, etc.)	0	1.6	2.5	2.0	1.6	1.1	0.7	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.5	1.0	
Electric uses	0	-7.3	-6.9	11.1	9.8	8.2	5.0	3.5	3.2	3.3	3.3	3.7	4.0	4.0	3.7	3.6	3.9	
Change of fuel mix	0	10.9	6.6	3.0	3.2	4.2	4.1	3.9	13.3	12.5	11.5	11.6	12.0	12.7	13.2	14.1	15.0	
Change of emission factor of electricity and steam (supply effect)	0	46.6	69.1	51.3	58.5	56.9	67.3	81.9	77.2	72.4	71.5	69.9	68.5	67.1	66.7	65.0	62.7	
Households																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	29.9	20.5	12.4	12.6	14.3	12.6	11.3	14.4	16.7	17.0	18.7	19.5	20.5	20.2	22.3	24.5	
Technological improvement	0	23.5	10.2	5.7	5.1	4.8	4.4	6.4	7.8	9.4	13.1	13.6	16.6	17.8	22.6	23.0	22.3	
Space heating	0	11.5	5.0	2.9	2.7	2.6	2.4	2.7	3.5	4.2	8.0	7.9	11.0	12.8	9.8	9.8	9.6	
Other heat uses (water heating, cooking, air conditioning)	0	6.5	3.3	1.9	1.6	1.8	1.5	3.0	3.5	3.4	3.4	3.3	2.2	2.1	2.9	2.9	2.9	
Electric appliances	0	5.4	1.9	0.9	0.8	0.4	0.4	0.6	0.8	1.7	1.7	2.2	2.3	2.9	10.7	10.2	9.8	
Change of fuel mix	0	3.6	2.3	1.3	1.2	1.3	1.0	0.8	0.9	1.0	0.9	0.9	0.9	2.2	5.3	4.0	3.7	
Change of emission factor of electricity and steam (supply effect)	0	43.1	67.0	80.6	81.1	79.6	82.0	81.5	76.9	72.9	69.0	66.8	63.0	59.5	51.9	50.7	49.5	
Passenger Transports																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	25.0	21.4	19.9	20.1	21.5	21.5	21.0	23.5	21.4	26.2	27.9	28.5	28.3	26.7	16.4	14.4	
Technological improvement	0	67.6	62.4	56.1	55.7	59.4	57.1	53.8	56.4	64.6	61.3	61.1	62.2	63.8	66.3	72.6	81.9	
Train transports	0	4.1	3.5	2.9	2.9	2.9	2.8	2.5	2.7	2.7	3.6	3.6	3.9	3.4	2.9	1.8	1.2	
Aviation / Navigation	0	52.7	48.9	44.0	43.6	46.3	43.9	40.3	40.7	48.5	43.3	40.0	36.4	32.6	28.6	15.2	16.0	
Road transports	0	10.9	10.0	9.2	9.2	10.2	10.4	10.9	13.1	13.5	14.3	17.5	21.9	27.7	34.8	55.7	64.7	
Change of fuel mix	0	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	6.5	0.1	
Change of emission factor of electricity and steam (supply effect)	0	7.0	15.9	23.7	24.0	18.8	21.2	25.0	19.8	13.7	12.2	10.9	9.1	7.7	6.8	4.5	3.6	
Goods Transports																		
Total CO2 emissions reduction	0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Structural change and behavioural effects	0	72.0	61.8	56.1	56.0	60.1	64.7	61.0	62.1	58.1	54.4	48.0	14.9	11.3	11.4	12.2	13.7	
Technological improvement	0	19.5	18.5	15.5	15.6	17.5	19.7	17.9	20.4	28.2	32.2	40.2	74.0	78.5	79.1	81.2	80.3	
Train transports	0	8.3	8.1	6.2	6.2	6.8	12.7	8.9	7.8	9.8	7.8	7.3	6.3	5.8	5.3	3.8	3.5	
Aviation / Navigation	0	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	1.0	1.1	
Road transports	0	11.0	10.2	9.2	9.2	10.5	6.9	8.9	12.4	18.1	24.1	32.6	67.3	72.2	73.2	76.4	75.7	
Change of fuel mix	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	
Change of emission factor of electricity and steam (supply effect)	0	8.5	19.7	28.4	28.4	22.4	15.6	21.1	17.4	13.7	13.3	11.9	11.1	10.1	9.4	6.6	5.9	
Final Energy Demand Sectors - Total																		
Total CO2 emissions reduction	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Structural change and behavioural effects	0	21.0	12.9	10.0	8.9	10.7	9.3	8.4	10.2	11.7	12.1	12.4	11.7	12.1	12.3	12.9	13.7	
Technological improvement	0	20.9	10.7	13.0	12.5	8.1	8.7	7.8	9.7	11.9	13.7	15.5	19.1	21.5	24.2	26.6	29.0	
Change of fuel mix	0	4.3	2.4	1.5	1.4	1.6	1.2	1.0	1.1	1.1	1.1	1.2	1.2	1.5	2.3	2.3	1.8	
Change of emission factor of electricity and steam (supply effect)	0	53.9	74.0	75.4	77.3	79.6	80.8	82.9	78.9	75.2	73.2	70.9	67.9	64.8	61.2	58.1	55.5	

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900	
DECOMPOSITION OF CO2 EMISSIONS REDUCTION (% contribution to avoid CO2 emissions in target year)																		
Electricity production																		
Total CO2 emissions reduction	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Change of demand	0	0.7	7.8	17.8	13.0	5.9	4.7	5.0	5.7	7.2	8.0	9.3	9.0	10.0	12.4	12.9	13.6	
Production from non fossil fuels	0	-248.5	-69.0	3.3	15.7	19.1	7.5	25.2	31.5	29.6	26.2	27.7	27.1	29.6	34.2	37.0	40.1	
Large hydro	0	-72.2	-20.1	1.0	4.5	5.5	2.2	6.8	8.4	8.0	7.1	7.5	7.2	7.8	8.9	9.6	10.2	
Small renewables	0	-13.6	-3.7	0.2	0.9	1.3	0.5	1.8	2.6	2.5	2.3	2.5	2.5	2.7	3.1	3.3	3.6	
Biomass and waste	0	-37.3	-10.4	0.5	2.4	2.9	1.1	4.9	6.4	5.8	5.0	5.4	5.7	6.4	7.6	8.6	9.7	
Nuclear energy	0	-125.4	-34.9	1.7	7.9	9.5	3.8	11.7	14.2	13.3	11.8	12.3	11.8	12.7	14.6	15.5	16.6	
Change of fossil fuel mix	0	-35.6	77.8	43.0	45.2	53.9	69.8	70.5	64.1	64.0	66.1	63.9	18.8	17.3	15.3	14.2	12.7	
Technological improvement of fossil fuel plants	0	383.4	83.3	35.9	26.1	21.0	18.0	-0.7	-1.3	-0.8	-0.2	-0.8	45.1	43.0	38.2	35.8	33.6	
Steam production																		
Total CO2 emissions reduction	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Change of demand	0	-15.8	292.6	25.0	36.9	8.8	5.9	13.5	18.2	18.3	21.0	22.8	25.8	26.8	29.7	32.2	34.9	
Production from non fossil fuels	0	-5116.5	12650.1	601.3	774.2	195.2	125.4	187.9	224.3	178.0	148.8	114.7	103.8	96.8	95.8	89.2	83.9	
Technological improvement of fossil fuel plants and change of fuel mix	0	5232.2	-12842.7	-526.3	-711.2	-104.0	-31.3	-101.4	-142.4	-96.3	-69.8	-37.5	-29.5	-23.6	-25.5	-21.4	-18.8	
Other Supply Sectors production																		
Total CO2 emissions reduction	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Statistical Difference																		
	0	0.8	0.3	0.2	0.3	0.5	0.6	0.5	0.4	0.7	0.7	0.6	0.8	1.0	1.2	1.3	1.3	
Avoided CO2 Emissions - As in Final Report																		
Total CO2 emissions reduction	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
In Final Energy Demand	0	45.2	17.6	9.4	11.9	16.4	16.2	13.2	17.0	19.7	21.2	22.5	24.8	27.2	28.9	32.0	34.3	
In Electricity and Steam Generation	0	54.8	82.4	90.6	88.1	83.6	83.8	86.8	83.0	80.3	78.8	77.5	75.2	72.8	71.1	68.0	65.7	
In Other Energy Conversion Sectors	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900
Heavy Industry																	
Specific energy Consumption of Process Technology (toe per tn of output)																	
Iron and Steel	0.471	0.471	0.471	0.471	0.471	0.471	0.470	0.468	0.465	0.460	0.448	0.434	0.410	0.392	0.377	0.367	0.359
Basic aluminium	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.182	0.111	0.125	0.000	0.000
Other processing of non ferrous	0.072	0.072	0.072	0.071	0.071	0.072	0.072	0.071	0.072	0.072	0.072	0.072	0.071	0.071	0.071	0.071	0.071
Chemicals	0.293	0.293	0.293	0.293	0.292	0.291	0.290	0.287	0.284	0.282	0.277	0.272	0.257	0.245	0.239	0.234	0.228
Cement Production	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.132	0.132	0.131	0.131	0.120	0.119	0.119	0.118	0.130	0.107
Glass basic processing	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.139	0.139	0.136	0.134	0.133	0.125	0.117	0.109	0.103
Pulp and Paper	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.040	0.040	0.040	0.039	0.039	0.038	0.037	0.036	0.035
Structural Change in basic processing (%)																	
Electric steelworks	19.0	19.0	19.0	19.0	19.2	19.8	21.0	22.7	24.9	26.9	27.9	26.8	27.6	29.7	33.0	35.1	38.0
Aluminium recycling	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Glass recycling	57.2	57.2	57.2	57.2	57.3	57.3	57.4	57.6	57.8	58.1	57.4	56.8	56.8	56.9	57.2	57.4	58.1
Paper recycling	52.9	52.9	52.9	52.9	53.0	53.0	53.0	53.0	53.1	53.1	53.1	53.1	53.1	53.1	53.1	53.2	53.3
Fuel Mix																	
electrotechnologies																	
% of mechanical processing in chemistry	61.9	62.0	62.0	62.0	62.4	63.3	64.9	65.9	68.2	70.1	72.8	74.7	77.1	79.8	82.1	83.8	85.7
% of electric furnaces non ferrous	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% of mechanical processing glass production	14.4	14.4	14.4	14.4	14.4	14.5	14.6	14.7	14.9	15.1	15.2	15.4	15.8	16.5	17.3	17.9	18.7
% of mechanical processing in paper and pulp	88.3	88.3	88.3	88.3	88.3	88.2	88.1	87.9	87.7	87.6	87.3	87.3	87.3	87.3	87.3	87.5	87.6
% of heat pumps in specific heat uses	3.4	3.4	3.4	3.6	3.8	4.1	4.8	6.1	8.3	10.6	18.3	29.8	48.9	57.3	61.1	65.1	69.2
natural gas directly substituting other fossil fuels (% in specific uses)	60.1	60.1	60.1	60.2	60.4	60.6	61.0	61.3	61.6	61.7	61.9	62.5	62.3	62.1	62.4	62.4	62.6
market share of steam (% in industrial demand)	17.8	17.8	17.8	17.8	17.9	17.9	18.0	18.1	18.3	18.4	18.6	18.7	19.0	19.2	19.5	19.7	19.8
Contribution of CHP for industrial Steam Production (%)	63.5	63.4	63.1	62.8	63.1	63.6	64.7	64.0	64.0	63.1	63.7	64.5	63.1	63.1	60.9	60.5	60.7
Equipment efficiency of electrical and cross-cutting technologies (index)																	
Industrial Furnaces																	
Process Furnaces	100	100.0	100.0	100.1	100.2	100.3	100.5	100.9	101.4	101.8	102.7	103.4	103.9	104.6	104.9	105.4	107.2
Electric Furnaces	100	100.0	100.0	100.0	100.0	100.1	100.1	100.3	100.5	100.9	101.2	104.9	112.3	116.5	119.3	122.3	124.9
Industrial Motors, Air Compressors, Lighting, etc.																	
Motor Drives	100	100.0	100.0	100.0	100.1	100.1	100.2	100.4	100.6	100.7	101.1	101.6	102.1	102.8	103.5	104.2	104.8
Air Compressors	100	100.0	100.0	100.1	100.3	100.5	100.9	101.6	102.4	102.9	104.0	104.9	106.0	107.2	108.1	109.0	109.8
Lighting	100	100.0	100.1	100.3	100.6	101.0	102.0	103.3	105.0	106.2	109.7	114.8	122.1	134.5	140.2	144.9	148.9
Electric Equipment in Households																	
Refrigerators	100	100.0	100.0	100.1	100.1	100.1	100.3	100.7	101.1	106.3	106.9	107.6	108.0	108.6	116.6	118.9	120.6
Washing machines	100	100.0	100.1	100.1	100.2	100.3	100.6	101.3	101.8	102.7	103.5	104.3	104.8	105.4	105.8	106.4	109.4
Lighting	100	100.0	100.0	100.1	100.1	100.1	100.2	100.9	101.5	102.9	104.7	107.2	109.9	116.6	466.8	475.8	481.1
TV and similar	100	100.0	100.0	100.0	100.0	100.0	100.1	100.2	100.3	100.5	100.7	100.9	101.1	101.4	101.6	101.9	104.4
Water heating	100	100.0	100.1	100.2	100.4	100.7	101.4	106.6	108.8	111.0	113.5	117.3	119.3	120.7	121.9	122.9	123.7
Air Conditioning	100	100.0	100.0	100.0	100.0	100.0	100.1	100.4	100.6	101.3	102.2	103.6	105.4	108.0	110.3	112.4	156.9
Electric Equipment in Tertiary																	
Offices	100	100.4	102.6	123.5	133.6	137.2	140.8	142.3	143.5	147.9	159.2	179.3	206.9	215.6	219.0	223.8	255.5
Agriculture	100	100.0	100.1	102.6	103.9	104.4	105.2	106.0	106.5	108.0	110.0	114.4	118.2	120.0	120.8	121.8	124.2

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900
Low enthalpy heat uses (index)																	
Industrial heat uses	100	100.0	100.1	100.2	100.4	100.6	101.1	101.8	102.8	104.0	105.5	107.4	110.3	113.7	121.4	124.4	127.1
Buildings (thermal integrity, efficiency of heat generation)																	
Houses																	
efficiency of heat generation	100	100.0	100.0	100.0	100.1	100.2	100.4	100.9	101.4	102.2	103.3	107.3	111.1	114.6	116.7	118.7	120.7
thermal integrity	100	100.0	100.1	100.1	100.2	100.3	100.5	101.0	101.6	102.2	103.0	103.8	104.5	105.2	105.7	106.6	107.8
Offices																	
efficiency of heat generation	100	100.1	100.1	100.2	100.5	98.9	102.0	106.0	107.7	111.2	112.5	114.4	115.7	117.1	118.0	118.9	119.8
thermal integrity	100	100.0	100.0	100.2	100.3	100.4	100.5	101.1	101.4	102.2	103.3	104.2	105.0	105.5	106.0	106.9	107.9
Agriculture																	
efficiency of heat generation	100	100.1	100.2	100.6	101.1	102.0	103.6	101.2	102.7	104.6	105.2	105.3	105.2	105.1	104.8	104.5	104.0
thermal integrity	100	100.0	100.0	100.2	100.3	100.4	100.5	101.1	101.4	102.2	103.3	104.2	105.0	105.6	106.2	107.1	108.2
Transports																	
Passenger Cars (efficiency index)	100	100.0	100.0	100.0	100.0	100.1	100.2	100.3	100.6	101.0	101.4	102.2	103.5	105.6	109.2	125.2	142.7
Trucks (efficiency index)	100	100.0	100.0	100.0	100.1	100.2	100.4	100.7	101.4	102.7	104.6	107.7	118.0	121.9	125.2	143.9	153.1
Transport modes for passengers (% of transport activity)																	
Passenger Cars	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.3	71.8	71.5	71.1	70.9	71.0	77.1	80.8
Train transport	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.2	6.3	6.5	7.2	7.6	7.9	8.1	8.3	6.2	5.7
Transport modes for goods (% of transport activity)																	
Train transport	36.1	36.1	36.1	36.2	36.3	36.4	37.6	38.1	38.6	39.0	39.2	39.1	35.3	34.4	34.0	33.7	33.7
Renewables in Final Energy (%)																	
Biomass	4.9	4.9	4.9	4.9	5.0	5.0	5.1	5.2	5.4	5.5	5.7	5.9	6.1	6.3	6.6	7.0	7.4
Solar energy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Power Generation																	
Fuel Mix in Thermal (electricity from gas over thermal production)	37.0	37.0	37.7	38.8	40.6	42.8	53.9	71.5	74.4	79.9	91.3	96.3	96.1	95.7	94.9	94.4	93.2
Contribution of Nuclear (% over total production)	24.9	24.9	24.9	25.0	25.1	25.0	25.1	25.4	25.6	26.0	26.5	27.2	27.8	28.4	29.9	30.6	31.4
Renewables (as % over total production)	24.6	24.5	24.4	24.5	24.9	25.2	25.1	29.3	31.3	31.9	32.6	34.1	36.4	37.9	40.4	42.3	44.4
hydro of utilities (as % over total production)	14.3	14.3	14.3	14.4	14.4	14.4	14.5	14.6	15.2	15.6	16.1	16.5	17.1	17.4	18.4	18.8	19.3
hydro of other generators (as % over total production)	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.4	0.5	0.5	0.6	0.7	0.7	0.9	0.9	0.9	1.0
biomass (as % over total production)	7.6	7.4	7.4	7.3	7.6	7.5	7.2	10.7	11.5	11.4	11.3	11.9	13.4	14.3	15.6	16.9	18.3
wind energy and other renewables (as % over total production)	2.6	2.6	2.5	2.6	2.6	3.1	3.1	3.6	4.2	4.4	4.6	4.9	5.1	5.2	5.5	5.6	5.8
CHP indicators																	
Steam/electricity ratio from CHP	0.97	0.97	0.98	0.97	1.01	1.07	1.15	1.27	1.31	1.54	1.59	1.32	1.21	1.18	1.15	1.07	1.01
% of electricity from CHP	28.5	28.5	28.2	28.5	27.6	25.8	24.3	21.8	21.1	17.9	17.3	21.1	22.9	23.4	24.3	25.9	27.5
% of steam from chp	44.6	44.5	44.5	44.4	44.5	44.7	45.1	45.0	44.9	44.7	45.1	45.4	45.0	44.9	43.7	43.7	43.8
Implications for other policies																	
Import dependency (percent)	65.3	65.3	65.3	65.1	64.8	64.3	63.2	60.2	58.9	59.6	58.9	59.0	57.4	56.0	54.0	51.9	49.6
Market Liberalisation (% of utilities production)	76.6	76.6	76.6	76.3	75.9	76.2	73.6	73.2	72.8	73.3	73.3	71.7	69.7	69.7	70.4	70.2	69.4

ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900
ADDITIONAL SYSTEM COSTS INCLUDING CARBON VALUE (mio Eur'90)																	
Total area in the marginal cost abatement curve as % of GDP	0 0.00%	0 0.00%	0 0.00%	3 0.00%	8 0.01%	20 0.01%	105 0.07%	326 0.21%	425 0.27%	601 0.38%	899 0.56%	1150 0.72%	1392 0.87%	1615 1.01%	1929 1.21%	2358 1.48%	2952 1.85%
COST ANALYSIS BY SECTOR																	
Industrial Sectors - Metals																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	533	533	533	533	533	533	533	534	534	534	535	534	532	530	528	528	529
% change from Baseline	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.2	0.2	0.2	0.3	0.2	-0.2	-0.7	-0.9	-1.0	-0.8
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	533	534	534	535	537	540	546	556	567	580	594	608	619	631	641	662	690
% change from Baseline	0.0	0.1	0.1	0.3	0.6	1.2	2.4	4.2	6.3	8.8	11.3	14.0	16.2	18.2	20.3	24.0	29.3
Structure of costs (%)																	
Non energy costs	77.0	77.0	76.9	76.8	76.6	76.3	75.6	74.6	73.4	72.1	70.7	69.1	67.9	66.9	66.1	64.2	61.8
Technology and fuel costs	23.0	22.9	22.9	22.9	22.7	22.5	22.0	21.6	20.8	20.0	19.4	18.8	18.0	17.1	16.3	15.6	14.9
Carbon value cost	0.0	0.1	0.1	0.3	0.6	1.3	2.4	3.9	5.8	7.9	9.9	12.1	14.1	16.0	17.6	20.2	23.3
Industrial Sectors - Chemicals																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	413	413	413	413	413	413	414	417	418	420	423	428	428	427	427	431	438
% change from Baseline	0.0	0.0	0.0	0.1	0.1	0.1	0.2	1.1	1.4	1.7	2.6	3.6	3.7	3.4	3.5	4.6	6.1
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	413	413	413	414	415	416	419	425	431	437	443	451	454	455	458	467	478
% change from Baseline	0.0	0.0	0.1	0.3	0.5	0.9	1.6	3.1	4.4	5.8	7.4	9.2	10.0	10.4	11.1	13.1	15.9
Structure of costs (%)																	
Non energy costs	78.4	78.3	78.3	78.1	78.0	77.7	77.2	76.1	75.2	74.2	73.1	71.9	71.4	71.2	70.7	69.5	68.0
Technology and fuel costs	21.6	21.6	21.7	21.7	21.6	21.6	21.5	21.9	21.9	22.0	22.4	23.0	22.9	22.5	22.5	22.9	23.6
Carbon value cost	0.0	0.0	0.1	0.2	0.4	0.8	1.4	2.0	2.9	3.8	4.5	5.1	5.7	6.3	6.8	7.6	8.5
Industrial Sectors - Materials																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	1388	1388	1388	1389	1389	1389	1389	1392	1394	1395	1398	1400	1401	1400	1400	1407	1405
% change from Baseline	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.5	0.7	0.8	0.9	0.9	1.4	1.2	
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	1388	1388	1389	1389	1390	1391	1393	1398	1402	1407	1412	1416	1421	1423	1426	1437	1440
% change from Baseline	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.7	1.0	1.4	1.7	2.0	2.3	2.5	2.7	3.5	3.7
Structure of costs (%)																	
Non energy costs	95.8	95.8	95.8	95.8	95.8	95.7	95.6	95.3	95.1	94.9	94.7	94.3	94.1	93.9	93.8	93.4	92.8
Technology and fuel costs	4.2	4.1	4.2	4.2	4.2	4.1	4.1	4.2	4.2	4.2	4.3	4.5	4.5	4.4	4.4	4.5	4.7
Carbon value cost	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.6	0.9	1.0	1.2	1.4	1.6	1.8	2.1	2.4
Industrial Sectors - Others																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	2776	2776	2777	2777	2777	2777	2777	2779	2779	2780	2781	2782	2783	2783	2783	2785	2787
% change from Baseline	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.4	
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	2776	2777	2777	2777	2778	2779	2780	2784	2787	2791	2795	2800	2804	2807	2810	2817	2827
% change from Baseline	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.5	0.7	0.8	1.0	1.1	1.2	1.5	1.8
Structure of costs (%)																	
Non energy costs	98.4	98.4	98.4	98.4	98.4	98.3	98.3	98.2	98.0	97.9	97.8	97.6	97.5	97.4	97.3	97.0	96.7
Technology and fuel costs	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9
Carbon value cost	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.2	1.4

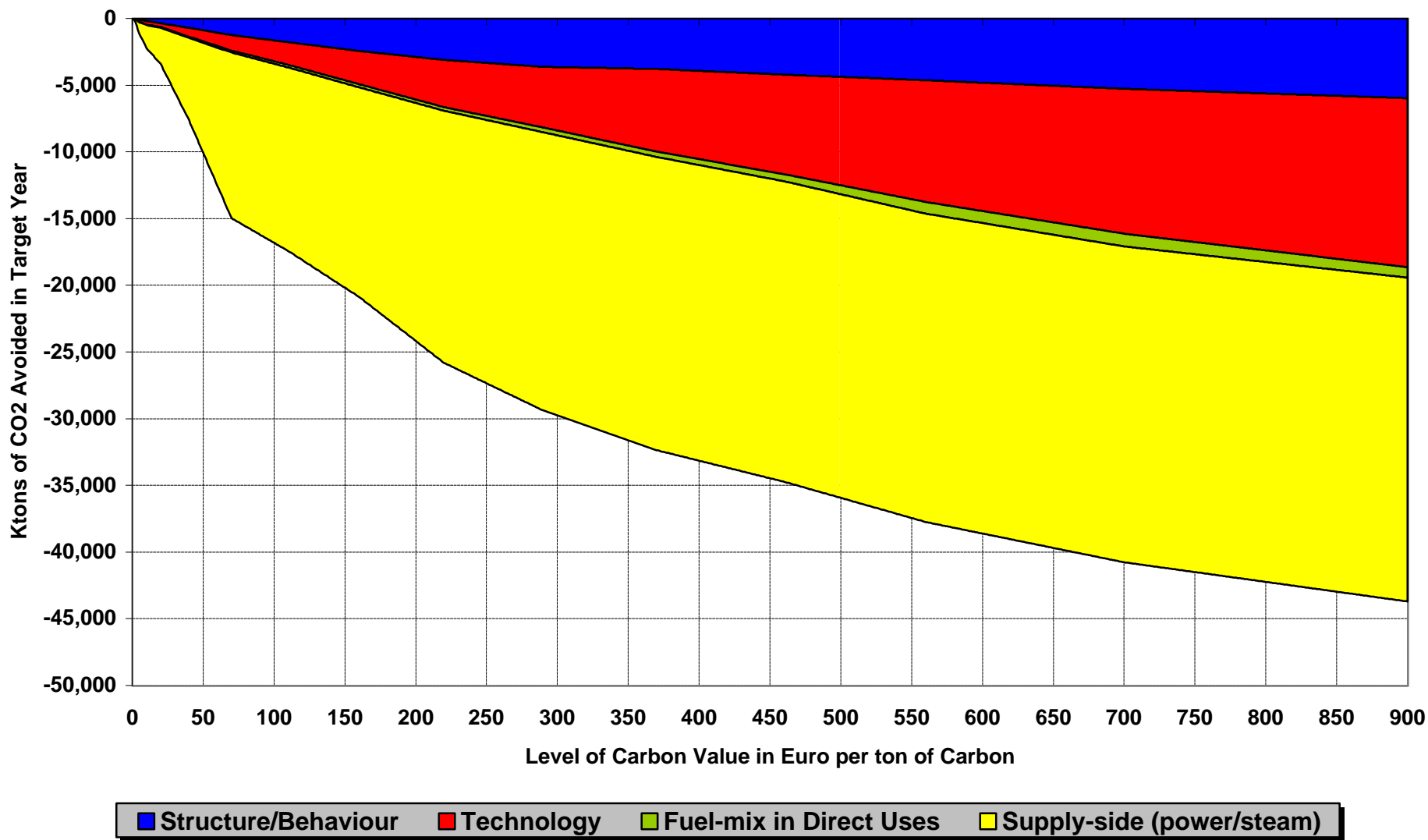
ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900
Services																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per unit of energy service	4017	4017	4016	4021	4015	4035	4016	4035	4026	4042	4097	4135	4169	4169	4188	4252	4368
% change from Baseline	0.0	0.0	0.0	0.1	-0.1	0.5	0.0	0.5	0.2	0.6	2.0	2.9	3.8	3.8	4.2	5.9	8.7
Average cost of Energy Service including Carbon Value																	
Eur'90 per unit of energy service	4017	4018	4018	4025	4022	4050	4042	4073	4081	4114	4181	4232	4281	4296	4328	4414	4556
% change from Baseline	0.0	0.0	0.0	0.2	0.1	0.8	0.6	1.4	1.6	2.4	4.1	5.4	6.6	6.9	7.7	9.9	13.4
Structure of costs (%)																	
Non energy costs	70.2	70.2	70.2	70.1	70.2	69.7	69.8	69.3	69.1	68.6	67.5	66.6	65.8	65.5	65.0	63.7	61.6
Technology and fuel costs	29.8	29.8	29.8	29.8	29.7	30.0	29.5	29.8	29.5	29.7	30.5	31.0	31.6	31.5	31.8	32.7	34.2
Carbon value cost	0.0	0.0	0.0	0.1	0.2	0.4	0.6	0.9	1.3	1.7	2.0	2.3	2.6	3.0	3.2	3.7	4.1
Agriculture																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per unit of energy service	6278	6277	6274	6276	6266	6264	6237	6288	6263	6270	6327	6364	6408	6423	6456	6541	6684
% change from Baseline	0.0	0.0	-0.1	0.0	-0.2	-0.2	-0.7	0.2	-0.2	-0.1	0.8	1.4	2.1	2.3	2.8	4.2	6.5
Average cost of Energy Service including Carbon Value																	
Eur'90 per unit of energy service	6278	6278	6276	6282	6277	6287	6278	6351	6356	6396	6483	6553	6634	6693	6766	6908	7123
% change from Baseline	0.0	0.0	0.0	0.1	0.0	0.1	0.0	1.2	1.2	1.9	3.3	4.4	5.7	6.6	7.8	10.0	13.5
Structure of costs (%)																	
Non energy costs	80.0	80.0	80.1	79.9	79.9	79.8	79.9	79.0	78.9	78.4	77.4	76.6	75.8	75.2	74.5	73.0	71.1
Technology and fuel costs	20.0	19.9	19.9	20.0	19.9	19.8	19.4	20.0	19.6	19.6	20.2	20.5	20.8	20.8	21.0	21.6	22.7
Carbon value cost	0.0	0.0	0.0	0.1	0.2	0.4	0.7	1.0	1.5	2.0	2.4	2.9	3.4	4.0	4.6	5.3	6.2
Households																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per unit of energy service	393	393	394	394	393	393	393	396	396	398	400	402	402	399	386	391	399
% change from Baseline	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.6	0.9	1.3	1.7	2.3	2.4	1.6	-1.8	-0.6	1.6
Average cost of Energy Service including Carbon Value																	
Eur'90 per unit of energy service	393	393	394	395	396	398	401	408	414	422	429	437	442	444	432	443	459
% change from Baseline	0.0	0.1	0.3	0.4	0.6	1.1	2.0	3.7	5.4	7.5	9.1	11.1	12.4	12.8	9.9	12.7	16.7
Structure of costs (%)																	
Non energy costs	29.6	29.5	29.5	29.4	29.3	29.2	28.9	28.3	27.8	27.2	26.7	26.2	26.1	26.1	26.9	26.2	25.2
Technology and fuel costs	70.4	70.4	70.4	70.3	70.1	69.8	69.1	68.7	67.9	67.1	66.6	65.9	65.1	63.9	62.5	62.0	61.8
Carbon value cost	0.0	0.1	0.1	0.3	0.5	1.1	2.0	2.9	4.3	5.7	6.7	7.9	8.9	10.0	10.6	11.8	13.0
Passenger Transports																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per 1000 passenger-km	175	175	175	175	175	175	175	176	176	175	175	175	174	174	175	189	198
% change from Baseline	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.3	-0.5	-0.7	-0.8	-0.4	7.5	12.7
Average cost of Energy Service including Carbon Value																	
Eur'90 per 1000 passenger-km	175	175	176	176	176	176	177	178	179	181	182	183	185	187	190	206	218
% change from Baseline	0.0	0.0	0.0	0.1	0.2	0.4	0.8	1.4	2.1	2.9	3.6	4.6	5.6	6.9	8.5	17.6	24.2
Structure of costs (%)																	
Non energy costs	12.4	12.4	12.4	12.4	12.4	12.4	12.3	12.2	12.2	12.1	12.1	12.0	11.9	11.8	11.5	9.9	9.0
Technology and fuel costs	87.6	87.6	87.5	87.5	87.4	87.2	86.9	86.4	85.8	85.1	84.1	83.2	82.1	81.1	80.3	81.6	81.7
Carbon value cost	0.0	0.0	0.0	0.1	0.2	0.4	0.8	1.3	2.0	2.8	3.8	4.9	6.0	7.1	8.2	8.6	9.3
Goods Transports																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per 1000 tonne-km	84	84	84	84	84	84	83	83	83	82	82	81	82	82	81	79	78
% change from Baseline	0.0	0.0	0.0	-0.1	-0.1	-0.2	-1.0	-1.3	-1.8	-2.4	-3.0	-3.5	-2.3	-2.6	-3.2	-5.6	-7.2
Average cost of Energy Service including Carbon Value																	
Eur'90 per 1000 tonne-km	84	84	84	84	84	84	85	85	86	87	88	91	93	93	94	94	95
% change from Baseline	0.0	0.0	0.1	0.1	0.2	0.5	0.3	0.9	1.6	2.4	3.5	4.8	8.3	10.3	12.3	11.3	13.1
Structure of costs (%)																	
Non energy costs	51.3	51.3	51.3	51.3	51.2	51.2	51.4	51.2	51.0	50.7	50.2	49.5	47.0	45.9	45.0	45.6	44.8
Technology and fuel costs	48.7	48.6	48.6	48.5	48.4	48.2	47.3	46.6	45.6	44.6	43.5	42.5	43.2	42.3	41.2	39.3	37.2
Carbon value cost	0.0	0.0	0.1	0.2	0.3	0.7	1.3	2.2	3.4	4.7	6.3	8.0	9.8	11.7	13.8	15.1	18.0

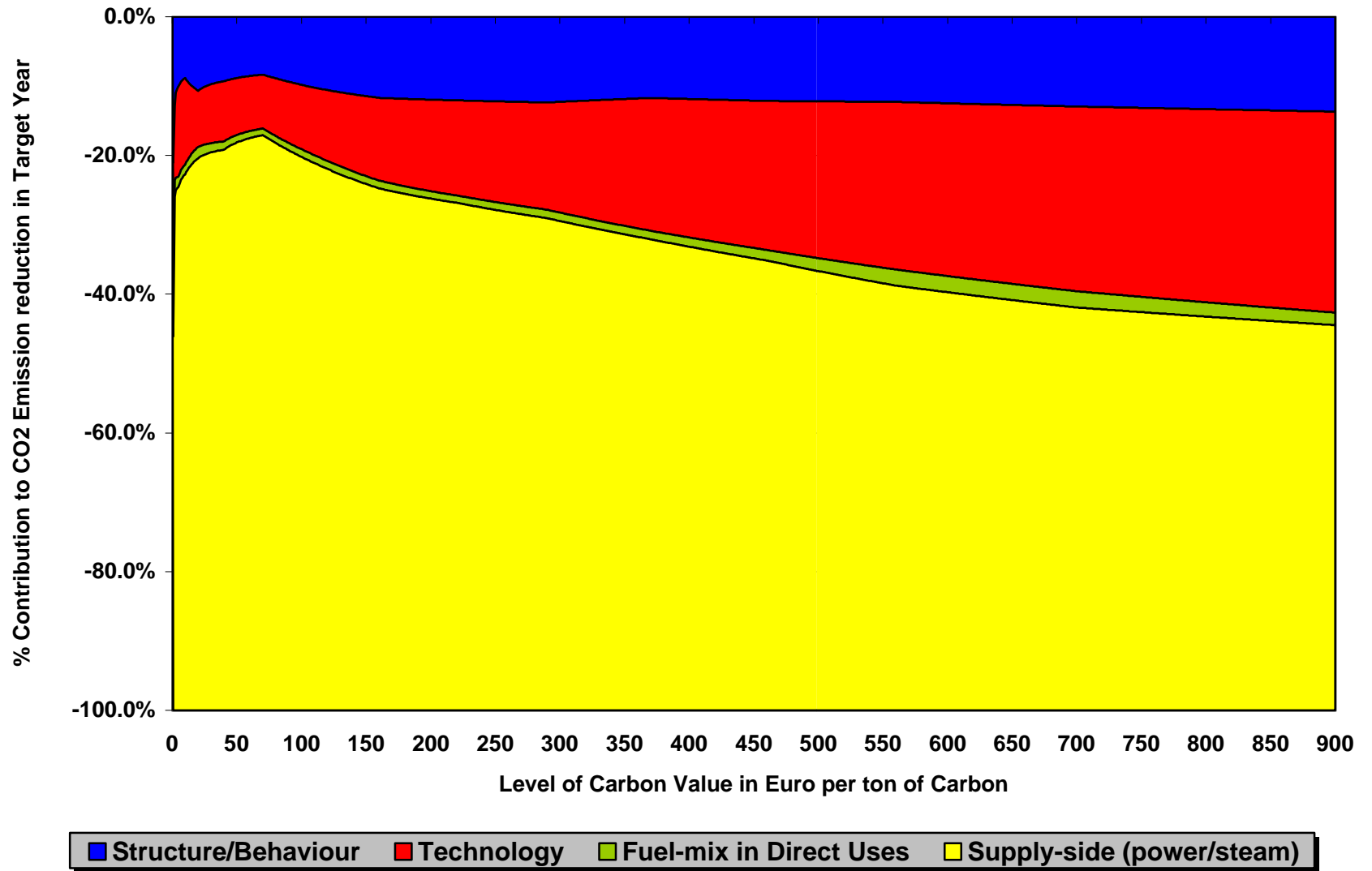
ANALYSIS OF ENERGY SYSTEM CHANGES TO REDUCE CO2 EMISSIONS IN 2010 FOR FINLAND

Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900
Electricity and Steam production																	
Average cost of production excluding Carbon Value																	
mEur'90 per kWh+kWhth	36	36	36	36	36	36	36	37	37	38	39	40	41	41	41	42	43
% change from Baseline	0.0	0.0	0.0	0.0	0.0	0.3	1.1	3.1	3.9	5.6	9.2	12.0	13.9	15.3	15.3	17.3	20.1
Average cost of production including Carbon Value																	
mEur'90 per kWh+kWhth	36	36	36	36	37	37	39	40	42	45	47	49	51	54	55	58	62
% change from Baseline	0.0	0.3	0.3	0.8	1.9	3.9	7.8	12.3	17.5	24.0	30.4	36.8	42.6	49.3	52.9	61.3	72.4
Structure of costs (%)																	
Annual Capital cost	32.3	32.2	32.2	32.0	31.7	31.4	30.5	29.8	29.1	28.5	28.8	28.9	29.5	29.1	29.3	28.8	28.1
O & M costs	18.1	18.1	18.1	17.7	17.8	17.4	16.8	16.4	15.6	15.1	14.7	14.7	14.5	14.0	13.8	13.5	12.9
Transm. \$ Distr. Costs	26.2	26.1	26.4	26.0	25.7	25.2	24.3	23.3	22.3	21.1	19.9	18.9	18.2	17.2	15.8	15.2	14.2
Fuel Costs	23.4	23.3	23.6	23.2	23.0	22.5	22.2	22.1	21.3	20.4	20.1	19.6	18.0	17.0	16.2	15.4	14.4
Carbon value costs	0.0	0.3	0.3	0.8	1.9	3.5	6.2	8.2	11.6	14.8	16.2	18.1	20.1	22.8	24.6	27.3	30.4
Investment expenditure for Electricity and Steam production																	
000mio Eur'90 spent in 1995 to 2010	7474	7474	7450	7406	7465	7590	7571	7548	7749	8010	8639	8965	9766	9966	9844	10076	10108
% change from Baseline	0.0	0.0	-0.3	-0.9	-0.1	1.6	1.3	1.0	3.7	7.2	15.6	19.9	30.7	33.3	31.7	34.8	35.2
Investment expenditure per kWh produced in 2010																	
mEur'90 per kWh+kWhth	51.2	51.2	51.1	51.2	52.0	53.3	54.4	56.8	60.9	66.8	77.4	87.1	103.1	114.3	125.3	143.1	165.1
% change from Baseline	0.0	0.1	0.0	0.1	1.6	4.2	6.4	11.0	19.0	30.5	51.3	70.2	101.5	123.5	145.0	179.7	222.7
Electricity tariffs (mEur'90 per kWh - includes effect of carbon value for electricity production)																	
Sectoral Average	48	48	48	49	49	50	51	55	57	61	65	69	72	75	76	83	92
Industry	42	42	42	43	43	44	45	49	52	55	59	63	66	68	70	77	86
Tertiary	56	56	56	58	58	59	59	63	63	67	73	78	82	85	88	97	108
Households	59	59	59	59	59	60	61	65	68	71	75	79	82	85	87	93	101
Transports	46	46	46	46	47	48	49	53	56	59	64	68	71	74	75	82	90
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity tariffs (% change from Baseline)																	
Sectoral Average	0.0	0.2	0.2	1.5	2.2	3.8	6.4	14.6	19.3	25.7	34.2	43.2	49.0	54.9	58.2	71.9	91.0
Industry	0.0	0.2	0.2	1.7	2.6	4.3	7.8	17.3	23.5	30.4	39.0	49.6	55.8	62.5	67.2	82.4	103.6
Tertiary	0.0	0.2	0.4	2.8	3.0	5.2	5.5	12.6	12.8	19.4	30.6	38.8	45.7	51.4	57.3	72.1	92.9
Households	0.0	0.0	0.2	0.7	1.2	2.2	4.3	10.9	15.7	21.5	28.7	35.5	40.3	45.2	47.6	58.2	72.9
Transports	0.0	0.2	0.2	0.9	2.2	4.4	7.9	16.9	22.4	30.1	40.2	49.2	55.8	62.2	65.7	79.6	98.7
Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

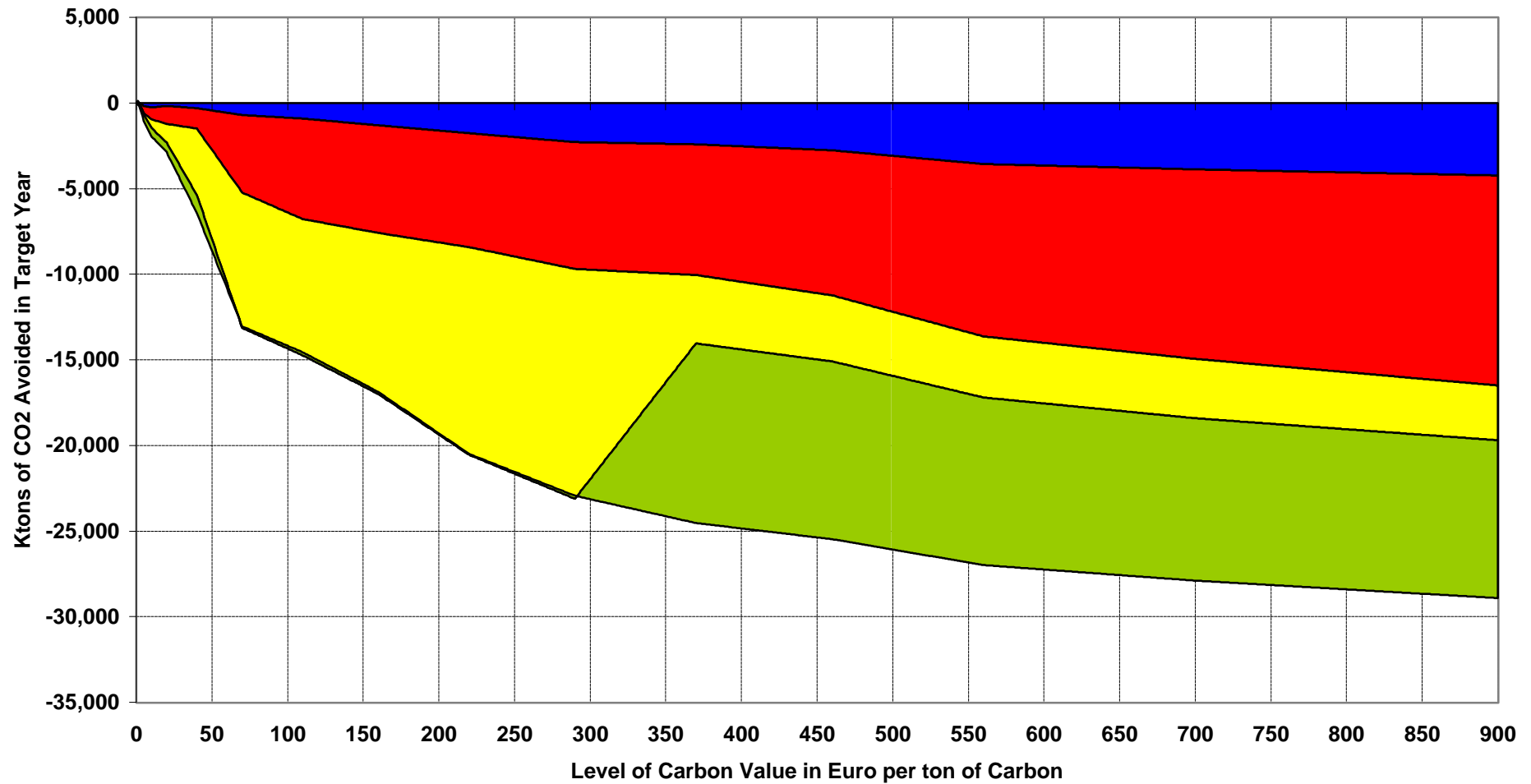
FINLAND: CO2 Emission Reduction - Decomposition



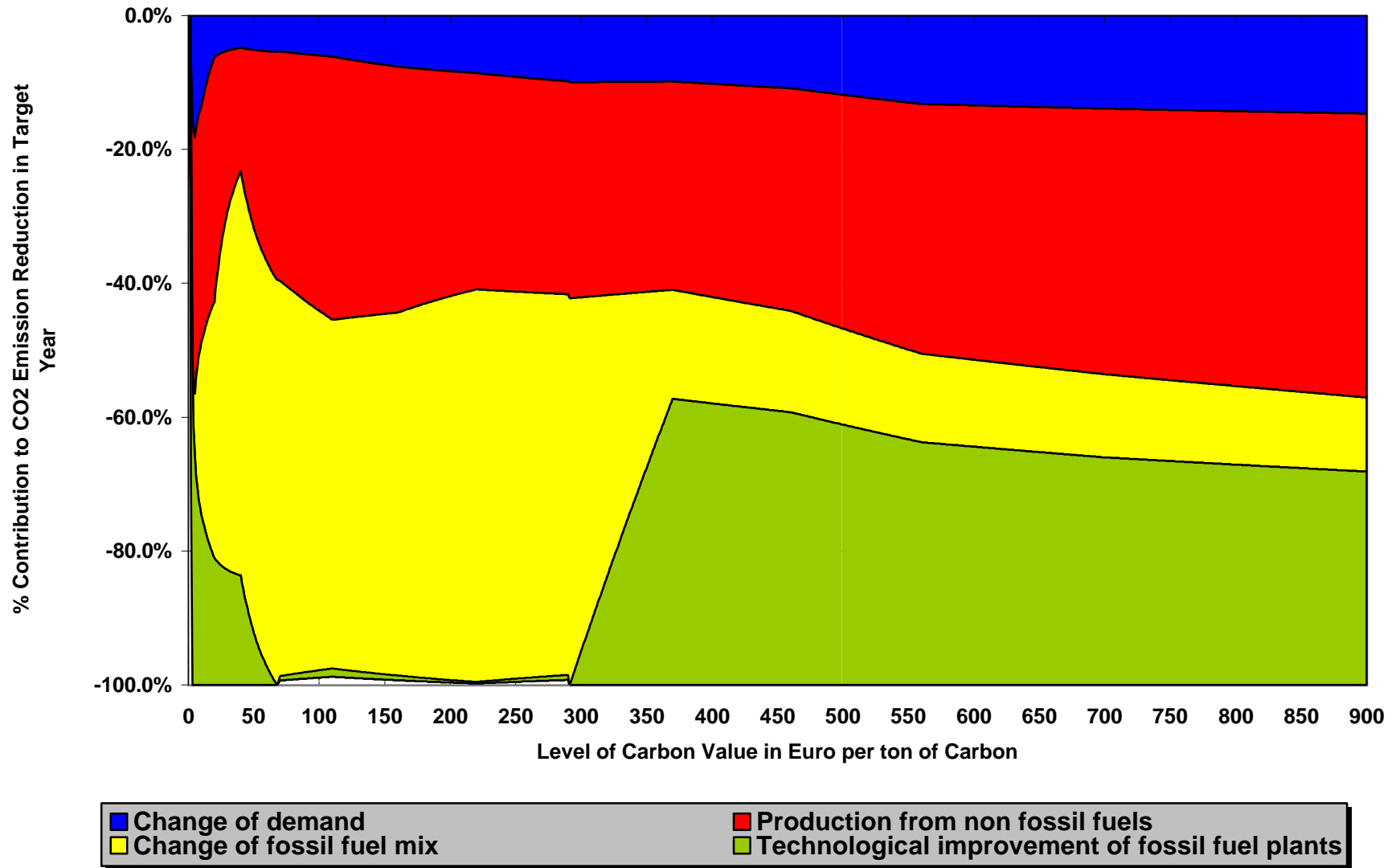
FINLAND: CO2 Emission Reduction - Decomposition in Percentage



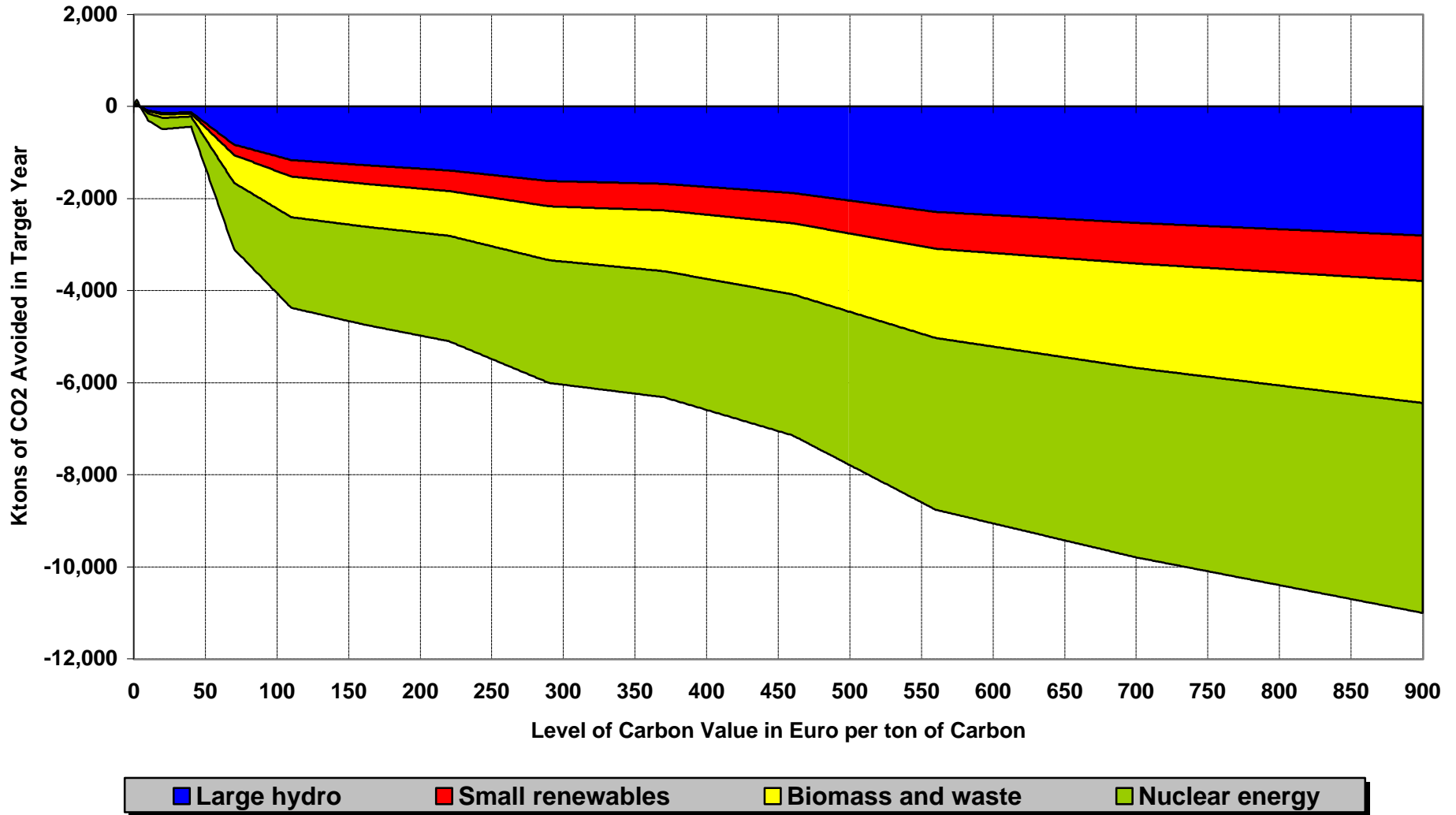
FINLAND: CO2 Emission Reduction in Power and Steam Generation - Decomposition



FINLAND: CO2 Emission Reduction in Power and Steam Generation - Decomposition in %



FINLAND: CO2 Emission Reduction - Contribution of Non-Fossil Fuel in Power and Steam



FINLAND: CO2 Emission Reduction - Contribution of Non-Fossil Fuel in Power and Steam - in %

