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

National Technical University of Athens
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	-1	-3	-12	-19	-33	-54	-115	-191	-339	-385	-478	-544	-624	-680	-743	-797
Structural change and behavioural effects	0	-1	-2	-5	-10	-20	-38	-63	-93	-108	-123	-153	-159	-176	-188	-210	-233
Technological improvement	0	0	0	-1	-1	-2	-5	-7	-10	-8	-14	-71	-109	-142	-170	-182	-190
Energy saving in heat uses	0	0	0	0	1	1	2	3	4	1	-2	-4	-8	-10	-13	-15	-19
Specific Industrial processes	0	0	0	-1	-2	-3	-6	-10	-13	-8	-12	-65	-98	-126	-150	-160	-164
Electrical Equipment	0	0	0	0	0	0	0	0	0	0	-1	-3	-3	-6	-7	-7	-7
Change of fuel mix	0	0	0	0	0	0	0	1	1	-5	-5	1	-3	-4	-3	-3	-3
Change of emission factor of electricity and steam (supply effect)	0	0	-1	-6	-8	-11	-12	-45	-89	-217	-242	-255	-272	-303	-318	-348	-371
Industrial Sectors - **Chemicals**																	
Total CO2 emissions reduction	0	-2	-4	-18	-103	-164	-211	-324	-469	-696	-803	-926	-1045	-1141	-1202	-1265	-1328
Structural change and behavioural effects	0	-1	-1	-4	-6	-11	-24	-29	-37	-52	-51	-57	-62	-69	-83	-88	-113
Technological improvement	0	0	-1	-3	-6	-11	-22	-38	-54	-61	-80	-92	-111	-166	-187	-198	-209
Energy saving in heat uses	0	0	0	0	-1	-1	-2	-4	-6	-8	-10	-11	-11	-15	-24	-29	-35
Specific Industrial processes	0	0	-1	-2	-4	-9	-17	-29	-42	-47	-63	-73	-91	-139	-149	-154	-156
Electrical Equipment	0	0	0	0	-1	-2	-3	-5	-6	-6	-7	-8	-9	-12	-14	-15	-18
Change of fuel mix	0	0	0	0	0	1	1	2	2	3	3	4	4	4	5	5	6
Change of emission factor of electricity and steam (supply effect)	0	-1	-1	-12	-91	-142	-167	-259	-380	-586	-675	-780	-876	-910	-936	-984	-1011
Industrial Sectors - **Materials**																	
Total CO2 emissions reduction	0	-7	-14	-57	-239	-388	-519	-836	-1235	-1894	-2213	-2545	-2856	-3205	-3540	-3814	-4085
Structural change and behavioural effects	0	-1	-2	-6	-10	-20	-41	-65	-98	-138	-175	-215	-92	-90	-112	-140	-197
Technological improvement	0	-2	-3	-10	-18	-34	-63	-102	-147	-181	-245	-308	-523	-759	-988	-1106	-1219
Energy saving in heat uses	0	0	0	-1	-3	-5	-9	-16	-25	-34	-50	-61	-70	-89	-127	-165	-219
Specific Industrial processes	0	-1	-2	-5	-11	-20	-35	-56	-78	-98	-130	-169	-363	-531	-708	-775	-804
Electrical Equipment	0	0	-1	-3	-5	-10	-19	-30	-44	-49	-65	-78	-89	-139	-154	-166	-196
Change of fuel mix	0	-3	-5	-12	-24	-44	-76	-112	-145	-174	-197	-216	-232	-242	-248	-256	-265
Change of emission factor of electricity and steam (supply effect)	0	-1	-4	-30	-187	-290	-338	-557	-844	-1401	-1595	-1806	-2009	-2114	-2192	-2311	-2405
Industrial Sectors - **Others**																	
Total CO2 emissions reduction	0	-4	-10	-56	-162	-253	-327	-641	-1050	-1925	-2212	-2461	-2713	-2976	-3211	-3454	-3608
Structural change and behavioural effects	0	0	-1	-2	-3	-5	-12	-18	-26	-37	-45	-55	-65	-76	-87	-92	-110
Technological improvement	0	-2	-4	-11	-21	-39	-77	-124	-183	-216	-300	-413	-494	-586	-849	-1003	-1054
Energy saving in heat uses	0	0	0	0	0	0	3	-1	-1	10	3	7	-3	-44	43	-2	8
Specific Industrial processes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electrical Equipment	0	-2	-4	-12	-21	-39	-80	-123	-183	-226	-303	-420	-491	-542	-892	-1001	-1062
Change of fuel mix	0	0	0	0	0	0	0	1	3	5	7	9	12	14	-9	19	21
Change of emission factor of electricity and steam (supply effect)	0	-2	-6	-43	-138	-209	-239	-501	-843	-1678	-1874	-2003	-2165	-2328	-2265	-2378	-2466
Industrial Sectors - **Total**																	
Total CO2 emissions reduction	0	-14	-31	-143	-523	-838	-1111	-1916	-2946	-4854	-5612	-6410	-7158	-7946	-8633	-9276	-9818
Structural change and behavioural effects	0	-3	-6	-16	-29	-56	-114	-175	-255	-336	-394	-480	-378	-410	-471	-529	-653
Technological improvement	0	-4	-8	-25	-46	-87	-167	-271	-395	-465	-640	-884	-1237	-1654	-2195	-2489	-2671
Energy saving in heat uses	0	0	0	-1	-2	-5	-6	-18	-28	-31	-59	-69	-92	-158	-122	-211	-265
Specific Industrial processes	0	-2	-3	-9	-17	-32	-59	-95	-134	-153	-205	-307	-553	-796	-1006	-1089	-1123
Electrical Equipment	0	-2	-5	-15	-27	-50	-102	-158	-233	-282	-376	-508	-593	-699	-1067	-1189	-1282
Change of fuel mix	0	-3	-5	-12	-23	-43	-75	-108	-139	-172	-192	-202	-219	-228	-256	-236	-240
Change of emission factor of electricity and steam (supply effect)	0	-5	-12	-90	-424	-652	-756	-1362	-2157	-3882	-4386	-4844	-5323	-5654	-5712	-6022	-6254

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

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	-9	-23	-104	-193	-464	-686	-1198	-1922	-3545	-4120	-4642	-5214	-5816	-6117	-6501	-6890
Structural change and behavioural effects	0	-3	-6	-20	-43	-75	-176	-235	-339	-422	-518	-607	-703	-791	-882	-929	-1030
Technological improvement	0	-2	-6	-12	-39	-233	-343	-400	-509	-599	-855	-1207	-1569	-1920	-1915	-1987	-2230
Space heating and cooling	0	0	-2	-3	-10	-42	-89	-111	-189	-246	-413	-594	-750	-977	-952	-1035	-1103
Other heat uses (water heating, cooking, etc.)	0	-1	-1	-3	-18	-49	-69	-97	-118	-128	-141	-152	-162	-168	-175	-179	-191
Electric uses	0	-1	-3	-6	-11	-143	-184	-192	-202	-225	-301	-461	-657	-774	-788	-773	-936
Change of fuel mix	0	0	0	0	1	2	5	5	6	7	33	12	13	89	14	14	67
Change of emission factor of electricity and steam (supply effect)	0	-4	-11	-73	-112	-157	-172	-568	-1080	-2531	-2780	-2840	-2954	-3195	-3333	-3599	-3697
Agriculture																	
Total CO2 emissions reduction	0	-1	-2	-6	-10	-27	-56	-68	-107	-194	-224	-253	-284	-320	-343	-369	-398
Structural change and behavioural effects	0	0	-1	-2	-4	-7	-29	-23	-35	-46	-59	-71	-85	-98	-110	-119	-131
Technological improvement	0	0	0	-1	-1	-14	-19	-18	-19	-20	-23	-45	-46	-56	-59	-61	-70
Space heating and cooling	0	0	0	0	0	-2	-1	-2	-3	-3	-5	-23	-16	-22	-23	-25	-26
Other heat uses (water heating, cooking, etc.)	0	0	0	0	0	-1	-1	-1	-2	-3	-4	-5	-6	-8	-9	-11	-16
Electric uses	0	0	0	-1	-1	-10	-18	-14	-14	-14	-15	-18	-24	-27	-27	-25	-28
Change of fuel mix	0	0	0	0	0	0	-1	-1	-2	-3	-4	1	-8	-9	-11	-12	-14
Change of emission factor of electricity and steam (supply effect)	0	0	-1	-4	-5	-6	-7	-26	-51	-125	-138	-138	-145	-157	-163	-176	-183
Households																	
Total CO2 emissions reduction	0	-15	-31	-137	-201	-317	-474	-1189	-2071	-4215	-4830	-5239	-5781	-6504	-7018	-8197	-8648
Structural change and behavioural effects	0	-4	-8	-22	-40	-75	-145	-238	-338	-428	-527	-633	-728	-808	-845	-808	-827
Technological improvement	0	-2	-2	-3	-3	-2	-7	-33	-48	-81	-126	-196	-318	-491	-716	-1927	-2006
Space heating	0	0	0	0	0	2	3	-1	-3	-11	-25	-54	-103	-185	-315	-661	-784
Other heat uses (water heating, cooking, air conditioning)	0	-1	-1	-1	-1	-1	-3	-12	-19	-32	-50	-73	-122	-166	-188	-191	-194
Electric appliances	0	-1	-1	-2	-2	-3	-7	-19	-27	-38	-51	-69	-93	-140	-214	-1074	-1029
Change of fuel mix	0	-4	-7	-19	-38	-74	-142	-234	-342	-457	-577	-699	-817	-942	-1044	-1164	-1291
Change of emission factor of electricity and steam (supply effect)	0	-6	-14	-93	-120	-166	-180	-684	-1343	-3250	-3601	-3711	-3918	-4264	-4412	-4298	-4524
Passenger Transports																	
Total CO2 emissions reduction	0	-7	-14	-38	-71	-134	-250	-449	-772	-1343	-1670	-2017	-2390	-2860	-3391	-4034	-5178
Structural change and behavioural effects	0	-1	-2	-6	-12	-24	-48	-87	-158	-290	-399	-512	-639	-798	-914	-940	-148
Technological improvement	0	-5	-10	-25	-50	-97	-187	-308	-512	-808	-998	-1229	-1458	-1739	-2133	-2727	-4696
Train transports	0	-1	-1	-3	-5	-10	-20	-35	-64	-96	-117	-163	-180	-186	-192	-190	-157
Aviation / Navigation	0	-4	-8	-19	-38	-75	-142	-227	-373	-593	-709	-813	-902	-977	-1038	-1092	-1017
Road transports	0	-1	-1	-3	-6	-13	-26	-46	-76	-120	-172	-253	-375	-576	-903	-1445	-3522
Change of fuel mix	0	0	0	0	0	-1	-2	-3	-4	-5	-7	-9	-10	-11	-12	-14	-15
Change of emission factor of electricity and steam (supply effect)	0	0	-1	-7	-9	-12	-13	-50	-98	-239	-265	-267	-283	-313	-331	-353	-319
Goods Transports																	
Total CO2 emissions reduction	0	-2	-4	-10	-19	-37	-75	-143	-231	-369	-620	-724	-975	-1353	-1599	-1813	-2193
Structural change and behavioural effects	0	-1	-3	-7	-14	-29	-62	-113	-180	-262	-444	-436	-369	-359	-350	-399	-549
Technological improvement	0	0	0	-1	-3	-5	-11	-20	-34	-64	-129	-237	-556	-939	-1194	-1356	-1588
Train transports	0	0	0	-1	-1	-3	-5	-9	-12	-15	-36	-23	-27	-25	-26	-25	-44
Aviation / Navigation	0	0	0	0	0	0	0	0	0	-1	-1	-2	-2	-3	-3	-7	-9
Road transports	0	0	0	-1	-1	-2	-5	-11	-21	-48	-92	-212	-526	-911	-1164	-1324	-1535
Change of fuel mix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change of emission factor of electricity and steam (supply effect)	0	0	0	-1	-2	-2	-2	-9	-18	-44	-48	-51	-50	-55	-55	-58	-57
Final Energy Demand Sectors - Total																	
Total CO2 emissions reduction	0	-47	-104	-439	-1017	-1816	-2653	-4962	-8050	-14520	-17076	-19285	-21801	-24799	-27100	-30191	-33125
Structural change and behavioural effects	0	-13	-26	-73	-143	-267	-574	-872	-1304	-1783	-2341	-2739	-2903	-3264	-3571	-3725	-3337
Technological improvement	0	-13	-27	-67	-142	-439	-734	-1050	-1517	-2038	-2771	-3799	-5183	-6797	-8213	-10547	-13261
Change of fuel mix	0	-6	-12	-31	-61	-116	-214	-342	-481	-630	-747	-896	-1041	-1101	-1310	-1412	-1493
Change of emission factor of electricity and steam (supply effect)	0	-15	-39	-267	-670	-994	-1130	-2698	-4747	-10069	-11217	-11850	-12674	-13637	-14006	-14507	-15034

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

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	-28	-65	-342	-491	-890	-1254	-2937	-5162	-10874	-12273	-13144	-14323	-15907	-16985	-18641	-19533
Change of demand	0	-12	-26	-74	-151	-417	-732	-996	-1362	-1456	-1807	-2347	-2898	-3384	-3965	-4990	-5311
Production from non fossil fuels	0	-6	-10	15	4	-97	-91	-415	-715	-2391	-3616	-4250	-4780	-5318	-6031	-7147	-7698
Large hydro	0	-5	-8	13	3	-81	-77	-344	-594	-1625	-2216	-2545	-2825	-3042	-3399	-4013	-4270
Small renewables	0	0	-1	1	0	-7	-6	-35	-61	-179	-251	-358	-403	-439	-596	-761	-825
Biomass and waste	0	-1	-1	1	0	-9	-8	-36	-60	-587	-1149	-1348	-1552	-1837	-2036	-2373	-2602
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change of fossil fuel mix	0	-14	-45	-344	-480	-518	-665	-1783	-3390	-1091	-1148	-1008	-1260	-2378	-2252	-2725	-2804
Technological improvement of fossil fuel plants	0	4	15	60	137	142	234	257	306	-5936	-5701	-5538	-5384	-4827	-4737	-3779	-3720
Steam production																	
Total CO2 emissions reduction	0	0	0	-4	-341	-546	-662	-796	-981	-863	-1069	-1477	-1792	-1830	-1979	-2048	-2163
Change of demand	0	0	0	-3	-6	-11	-27	-28	-42	-68	-91	-112	-139	-200	-316	-337	-377
Production from non fossil fuels	0	0	0	-2	-234	-421	-425	-503	-575	-603	-834	-794	-805	-664	-876	-946	-925
Technological improvement of fossil fuel plants and change of fuel mix	0	0	1	1	-101	-114	-211	-264	-364	-192	-143	-571	-847	-966	-787	-765	-862
Other Supply Sectors production																	
Total CO2 emissions reduction	0	0	0	-2	-10	-18	-26	-32	-48	-64	-95	-141	-188	-257	-282	-322	-369
Statistical Difference	0	0	0	0	1	3	4	130	144	64	62	142	62	78	88	196	123
Avoided CO2 Emissions - As in Final Report																	
Total CO2 emissions reduction	0	-47	-104	-441	-1025	-1832	-2674	-4864	-7953	-14520	-17110	-19285	-21926	-24978	-27294	-30317	-33371
In Final Energy Demand	0	-19	-38	-92	-186	-381	-734	-1219	-1886	-2750	-3689	-4605	-5619	-6978	-8037	-9381	-11289
In Electricity and Steam Generation	0	-28	-66	-347	-829	-1433	-1915	-3613	-6020	-11706	-13326	-14538	-16120	-17743	-18975	-20613	-21712
In Other Energy Conversion Sectors	0	0	0	-2	-10	-18	-26	-32	-48	-64	-95	-141	-188	-257	-282	-322	-369

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

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	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
Structural change and behavioural effects	0	68.8	64.7	43.2	52.7	60.2	70.0	55.3	48.8	32.0	32.0	32.0	29.2	28.1	27.7	28.3	29.2
Technological improvement	0	7.7	7.5	5.7	6.8	7.5	8.5	6.4	5.2	2.4	3.8	14.9	20.1	22.8	25.1	24.4	23.8
Energy saving in heat uses	0	*-4.0*	*-3.9*	*-2.6*	*-3.0*	*-3.3*	*-3.7*	*-2.6*	*-1.9*	*-0.2*	*0.4*	*0.8*	*1.4*	*1.7*	*1.9*	*2.0*	*2.4*
Specific Industrial processes	0	*12.2*	*11.6*	*8.0*	*9.6*	*10.7*	*11.9*	*8.9*	*7.0*	*2.4*	*3.0*	*13.6*	*18.1*	*20.2*	*22.1*	*21.5*	*20.6*
Electrical Equipment	0	*-0.5*	*-0.2*	*0.3*	*0.2*	*0.1*	*0.3*	*0.1*	*0.2*	*0.1*	*0.3*	*0.5*	*0.6*	*0.9*	*1.0*	*0.9*	*0.8*
Change of fuel mix	0	-0.2	-0.1	0.6	0.1	-0.3	-0.1	-0.7	-0.6	1.6	1.4	-0.1	0.6	0.6	0.5	0.4	0.4
Change of emission factor of electricity and steam (supply effect)	0	23.7	27.8	50.4	40.5	32.6	21.7	38.9	46.5	64.0	62.8	53.3	50.1	48.4	46.8	46.9	46.6
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
Structural change and behavioural effects	0	40.0	35.6	20.8	6.1	6.9	11.1	9.0	7.9	7.5	6.3	6.2	6.0	6.0	6.9	7.0	8.5
Technological improvement	0	27.2	25.4	17.1	5.7	6.9	10.6	11.6	11.6	8.8	10.0	9.9	10.6	14.5	15.6	15.7	15.7
Energy saving in heat uses	0	*3.4*	*3.2*	*2.0*	*0.6*	*0.8*	*1.2*	*1.3*	*1.3*	*1.1*	*1.3*	*1.2*	*1.1*	*1.4*	*2.0*	*2.3*	*2.7*
Specific Industrial processes	0	*20.3*	*18.9*	*12.4*	*4.3*	*5.2*	*8.0*	*9.0*	*9.0*	*6.7*	*7.8*	*7.9*	*8.7*	*12.1*	*12.4*	*12.2*	*11.7*
Electrical Equipment	0	*3.5*	*3.4*	*2.6*	*0.8*	*0.9*	*1.5*	*1.4*	*1.3*	*0.9*	*0.9*	*0.9*	*0.8*	*1.0*	*1.2*	*1.2*	*1.3*
Change of fuel mix	0	-1.9	-1.6	-0.8	-0.3	-0.3	-0.5	-0.5	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Change of emission factor of electricity and steam (supply effect)	0	34.7	40.6	63.0	88.5	86.6	78.7	79.9	80.9	84.1	84.1	84.3	83.8	79.8	77.9	77.8	76.2
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	100.0	100.0
Structural change and behavioural effects	0	14.8	14.0	9.9	4.3	5.1	7.9	7.8	7.9	7.3	7.9	8.4	3.2	2.8	3.2	3.7	4.8
Technological improvement	0	25.0	23.7	16.7	7.6	8.8	12.2	12.2	11.9	9.5	11.1	12.1	18.3	23.7	27.9	29.0	29.8
Energy saving in heat uses	0	*3.1*	*3.0*	*2.5*	*1.1*	*1.2*	*1.8*	*1.9*	*2.0*	*1.8*	*2.3*	*2.4*	*2.5*	*2.8*	*3.6*	*4.3*	*5.4*
Specific Industrial processes	0	*16.0*	*14.9*	*9.5*	*4.4*	*5.1*	*6.8*	*6.7*	*6.3*	*5.2*	*5.9*	*6.7*	*12.7*	*16.6*	*20.0*	*20.3*	*19.7*
Electrical Equipment	0	*5.9*	*5.8*	*4.7*	*2.1*	*2.5*	*3.6*	*3.6*	*3.5*	*2.6*	*2.9*	*3.1*	*3.1*	*4.3*	*4.3*	*4.4*	*4.8*
Change of fuel mix	0	38.0	35.1	21.5	9.9	11.3	14.7	13.4	11.8	9.2	8.9	8.5	8.1	7.6	7.0	6.7	6.5
Change of emission factor of electricity and steam (supply effect)	0	22.2	27.2	51.9	78.2	74.8	65.2	66.6	68.4	74.0	72.1	71.0	70.4	66.0	61.9	60.6	58.9
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
Structural change and behavioural effects	0	6.1	5.4	2.9	1.8	2.2	3.6	2.8	2.5	1.9	2.0	2.2	2.4	2.6	2.7	2.7	3.0
Technological improvement	0	38.7	34.8	20.5	12.8	15.4	23.5	19.3	17.5	11.2	13.6	16.8	18.2	19.7	26.4	29.0	29.2
Energy saving in heat uses	0	*-1.5*	*-1.3*	*-0.8*	*-0.2*	*-0.1*	*-1.0*	*0.1*	*0.1*	*-0.5*	*-0.1*	*-0.3*	*0.1*	*1.5*	*-1.3*	*0.0*	*-0.2*
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	*40.3*	*36.2*	*21.2*	*13.0*	*15.5*	*24.5*	*19.2*	*17.4*	*11.7*	*13.7*	*17.1*	*18.1*	*18.2*	*27.8*	*29.0*	*29.4*
Change of fuel mix	0	0.4	0.3	0.1	0.1	0.0	-0.1	-0.2	-0.3	-0.3	-0.3	-0.4	-0.4	-0.5	0.3	-0.5	-0.6
Change of emission factor of electricity and steam (supply effect)	0	54.8	59.4	76.5	85.3	82.4	73.1	78.2	80.3	87.1	84.7	81.4	79.8	78.2	70.6	68.9	68.4
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	100.0	100.0
Structural change and behavioural effects	0	20.6	18.7	11.3	5.6	6.7	10.3	9.1	8.7	6.9	7.0	7.5	5.3	5.2	5.5	5.7	6.6
Technological improvement	0	27.7	25.9	17.3	8.8	10.4	15.0	14.1	13.4	9.6	11.4	13.8	17.3	20.8	25.4	26.8	27.2
Energy saving in heat uses	0	*1.0*	*1.0*	*0.7*	*0.5*	*0.5*	*0.6*	*0.9*	*0.9*	*0.6*	*1.0*	*1.1*	*1.3*	*2.0*	*1.4*	*2.3*	*2.7*
Specific Industrial processes	0	*11.2*	*10.2*	*6.0*	*3.2*	*3.8*	*5.3*	*5.0*	*4.5*	*3.2*	*3.6*	*4.8*	*7.7*	*10.0*	*11.7*	*11.7*	*11.4*
Electrical Equipment	0	*15.5*	*14.8*	*10.5*	*5.2*	*6.0*	*9.2*	*8.2*	*7.9*	*5.8*	*6.7*	*7.9*	*8.3*	*8.8*	*12.4*	*12.8*	*13.1*
Change of fuel mix	0	18.0	16.1	8.6	4.5	5.1	6.7	5.6	4.7	3.5	3.4	3.2	3.1	2.9	3.0	2.5	2.4
Change of emission factor of electricity and steam (supply effect)	0	33.8	39.3	62.8	81.1	77.8	68.0	71.1	73.2	80.0	78.1	75.6	74.4	71.2	66.2	64.9	63.7

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

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
Structural change and behavioural effects	0	29.4	27.1	18.9	22.0	16.2	25.6	19.6	17.6	11.9	12.6	13.1	13.5	13.6	14.4	14.3	14.9
Technological improvement	0	23.5	26.7	11.6	20.4	50.3	50.0	33.4	26.5	16.9	20.8	26.0	30.1	33.0	31.3	30.6	32.4
Space heating and cooling	0	*4.0*	*7.1*	*2.4*	*5.2*	*9.0*	*13.0*	*9.2*	*9.8*	*7.0*	*10.0*	*12.8*	*14.4*	*16.8*	*15.6*	*15.9*	*16.0*
Other heat uses (water heating, cooking, etc.)	0	*7.0*	*6.4*	*3.1*	*9.2*	*10.5*	*10.1*	*8.1*	*6.2*	*3.6*	*3.4*	*3.3*	*3.1*	*2.9*	*2.9*	*2.7*	*2.8*
Electric uses	0	*12.5*	*13.3*	*6.2*	*6.0*	*30.8*	*26.9*	*16.1*	*10.5*	*6.4*	*7.3*	*9.9*	*12.6*	*13.3*	*12.9*	*11.9*	*13.6*
Change of fuel mix	0	-1.3	-0.9	-0.4	-0.3	-0.3	-0.7	-0.4	-0.3	-0.2	-0.8	-0.3	-0.2	-1.5	-0.2	-0.2	-1.0
Change of emission factor of electricity and steam (supply effect)	0	48.4	47.1	69.8	57.9	33.8	25.1	47.4	56.2	71.4	67.5	61.2	56.7	54.9	54.5	55.4	53.7
Agriculture																	
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
Structural change and behavioural effects	0	45.0	41.3	29.3	38.3	26.3	52.1	33.9	32.4	23.7	26.2	28.1	30.0	30.6	32.0	32.3	33.0
Technological improvement	0	20.1	22.2	11.5	14.0	49.4	34.5	26.1	17.7	10.4	10.5	17.9	16.1	17.6	17.3	16.6	17.6
Space heating and cooling	0	*3.3*	*2.5*	*0.3*	*0.8*	*8.0*	*1.5*	*3.6*	*2.5*	*1.8*	*2.0*	*9.0*	*5.6*	*6.7*	*6.7*	*6.9*	*6.6*
Other heat uses (water heating, cooking, etc.)	0	*3.3*	*2.4*	*0.7*	*0.8*	*3.0*	*1.1*	*2.1*	*1.8*	*1.4*	*1.7*	*2.0*	*2.2*	*2.4*	*2.6*	*3.1*	*3.9*
Electric uses	0	*13.5*	*17.3*	*10.5*	*12.4*	*38.4*	*31.9*	*20.3*	*13.3*	*7.3*	*6.8*	*7.0*	*8.3*	*8.5*	*8.0*	*6.7*	*7.0*
Change of fuel mix	0	2.0	2.0	1.6	2.2	1.4	1.5	1.9	1.9	1.5	1.8	-0.5	2.7	2.8	3.1	3.3	3.6
Change of emission factor of electricity and steam (supply effect)	0	33.0	34.6	57.6	45.5	22.8	11.9	38.1	48.0	64.3	61.5	54.4	51.2	49.0	47.7	47.8	45.9
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
Structural change and behavioural effects	0	27.4	25.2	16.0	20.0	23.7	30.6	20.1	16.3	10.2	10.9	12.1	12.6	12.4	12.0	9.9	9.6
Technological improvement	0	10.6	6.3	2.2	1.5	0.8	1.5	2.8	2.3	1.9	2.6	3.7	5.5	7.5	10.2	23.5	23.2
Space heating	0	*1.8*	*0.7*	*0.1*	*-0.2*	*-0.5*	*-0.6*	*0.1*	*0.1*	*0.3*	*0.5*	*1.0*	*1.8*	*2.8*	*4.5*	*8.1*	*9.1*
Other heat uses (water heating, cooking, air conditioning)	0	*3.6*	*2.2*	*0.7*	*0.6*	*0.3*	*0.6*	*1.0*	*0.9*	*0.8*	*1.0*	*1.4*	*2.1*	*2.6*	*2.7*	*2.3*	*2.2*
Electric appliances	0	*5.2*	*3.4*	*1.4*	*1.2*	*1.0*	*1.5*	*1.6*	*1.3*	*0.9*	*1.1*	*1.3*	*1.6*	*2.1*	*3.0*	*13.1*	*11.9*
Change of fuel mix	0	25.0	24.2	14.0	18.8	23.3	30.0	19.7	16.5	10.8	11.9	13.3	14.1	14.5	14.9	14.2	14.9
Change of emission factor of electricity and steam (supply effect)	0	37.0	44.3	67.7	59.7	52.3	38.0	57.5	64.8	77.1	74.5	70.8	67.8	65.6	62.9	52.4	52.3
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
Structural change and behavioural effects	0	18.4	17.9	15.6	16.9	17.8	19.3	19.5	20.5	21.6	23.9	25.4	26.8	27.9	27.0	23.3	2.9
Technological improvement	0	74.9	74.0	65.7	70.2	72.6	74.9	68.7	66.3	60.2	59.8	61.0	61.0	60.8	62.9	67.6	90.7
Train transports	0	*8.4*	*7.8*	*6.9*	*7.4*	*7.3*	*7.8*	*7.8*	*8.2*	*7.1*	*7.0*	*8.1*	*7.5*	*6.5*	*5.7*	*4.7*	*3.0*
Aviation / Navigation	0	*57.2*	*57.0*	*50.6*	*53.9*	*55.8*	*56.7*	*50.6*	*48.3*	*44.1*	*42.5*	*40.3*	*37.7*	*34.1*	*30.6*	*27.1*	*19.6*
Road transports	0	*9.3*	*9.2*	*8.2*	*8.9*	*9.5*	*10.3*	*10.3*	*9.8*	*8.9*	*10.3*	*12.6*	*15.7*	*20.1*	*26.6*	*35.8*	*68.0*
Change of fuel mix	0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Change of emission factor of electricity and steam (supply effect)	0	6.0	7.5	18.1	12.3	9.0	5.2	11.2	12.7	17.8	15.9	13.2	11.8	10.9	9.8	8.8	6.2
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
Structural change and behavioural effects	0	81.3	80.8	74.1	77.9	80.3	82.5	79.6	77.6	70.9	71.5	60.2	37.8	26.5	21.9	22.0	25.0
Technological improvement	0	14.5	14.0	13.0	13.6	13.8	14.4	14.1	14.6	17.2	20.8	32.7	57.0	69.4	74.7	74.8	72.4
Train transports	0	*8.2*	*7.7*	*7.1*	*7.4*	*7.1*	*7.2*	*6.4*	*5.3*	*4.0*	*5.8*	*3.2*	*2.8*	*1.8*	*1.6*	*1.4*	*2.0*
Aviation / Navigation	0	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.2*	*0.3*	*0.2*	*0.2*	*0.2*	*0.4*	*0.4*
Road transports	0	*6.2*	*6.2*	*5.8*	*6.1*	*6.5*	*7.0*	*7.5*	*9.1*	*13.0*	*14.8*	*29.3*	*54.0*	*67.3*	*72.8*	*73.0*	*70.0*
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	0.0	0.0	0.0	0.0	0.0	0.0
Change of emission factor of electricity and steam (supply effect)	0	4.1	5.2	12.9	8.4	5.8	3.1	6.3	7.7	11.9	7.7	7.0	5.2	4.1	3.5	3.2	2.6
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
Structural change and behavioural effects	0	26.7	24.8	16.6	14.0	14.7	21.6	17.6	16.2	12.3	13.7	14.2	13.3	13.2	13.2	12.3	10.1
Technological improvement	0	27.7	26.1	15.3	14.0	24.1	27.7	21.2	18.8	14.0	16.2	19.7	23.8	27.4	30.3	34.9	40.0
Change of fuel mix	0	13.2	12.0	7.2	6.0	6.4	8.1	6.9	6.0	4.3	4.4	4.6	4.8	4.4	4.8	4.7	4.5
Change of emission factor of electricity and steam (supply effect)	0	32.4	37.1	60.9	65.9	54.7	42.6	54.4	59.0	69.3	65.7	61.4	58.1	55.0	51.7	48.1	45.4

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

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
Change of demand	0	42.6	39.0	21.6	30.8	46.8	58.4	33.9	26.4	13.4	14.7	17.9	20.2	21.3	23.3	26.8	27.2
Production from non fossil fuels	0	20.8	15.2	-4.5	-0.7	10.9	7.3	14.1	13.9	22.0	29.5	32.3	33.4	33.4	35.5	38.3	39.4
Large hydro	0	*17.4*	*12.7*	*-3.8*	*-0.6*	*9.1*	*6.1*	*11.7*	*11.5*	*14.9*	*18.1*	*19.4*	*19.7*	*19.1*	*20.0*	*21.5*	*21.9*
Small renewables	0	*1.4*	*1.0*	*-0.3*	*-0.1*	*0.7*	*0.5*	*1.2*	*1.2*	*1.6*	*2.0*	*2.7*	*2.8*	*2.8*	*3.5*	*4.1*	*4.2*
Biomass and waste	0	*2.0*	*1.5*	*-0.4*	*-0.1*	*1.0*	*0.7*	*1.2*	*1.2*	*5.4*	*9.4*	*10.3*	*10.8*	*11.5*	*12.0*	*12.7*	*13.3*
Nuclear 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*
Change of fossil fuel mix	0	49.9	69.4	100.3	97.8	58.2	53.1	60.7	65.7	10.0	9.4	7.7	8.8	15.0	13.3	14.6	14.4
Technological improvement of fossil fuel plants	0	-13.3	-23.5	-17.4	-27.9	-15.9	-18.7	-8.8	-5.9	54.6	46.5	42.1	37.6	30.3	27.9	20.3	19.0
Steam production																	
Total CO2 emissions reduction	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Change of demand	0	3.3	218.3	70.2	1.8	1.9	4.0	3.6	4.3	7.9	8.5	7.6	7.8	10.9	16.0	16.5	17.4
Production from non fossil fuels	0	2.5	169.8	54.6	68.7	77.1	64.2	63.2	58.6	69.9	78.1	53.8	45.0	36.3	44.3	46.2	42.7
Technological improvement of fossil fuel plants and change of fuel mix	0	94.1	-288.2	-24.8	29.5	21.0	31.8	33.2	37.1	22.2	13.4	38.7	47.3	52.8	39.8	37.4	39.8
Other Supply Sectors production																	
Total CO2 emissions reduction	0	0.5	0.4	0.4	1.0	1.0	1.0	0.7	0.6	0.4	0.6	0.7	0.9	1.0	1.0	1.1	1.1
Statistical Difference	0	0.2	0.2	0.1	-0.1	-0.2	-0.2	-2.7	-1.8	-0.4	-0.4	-0.7	-0.3	-0.3	-0.3	-0.6	-0.4
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
In Final Energy Demand	0	40.9	36.7	20.9	18.1	20.8	27.4	25.1	23.7	18.9	21.6	23.9	25.6	27.9	29.4	30.9	33.8
In Electricity and Steam Generation	0	58.6	62.8	78.6	80.9	78.2	71.6	74.3	75.7	80.6	77.9	75.4	73.5	71.0	69.5	68.0	65.1
In Other Energy Conversion Sectors	0	0.5	0.4	0.4	1.0	1.0	1.0	0.7	0.6	0.4	0.6	0.7	0.9	1.0	1.0	1.1	1.1

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	0.343	0.343	0.343	0.342	0.342	0.341	0.340	0.338	0.337	0.339	0.340	0.307	0.284	0.266	0.251	0.242	0.236
Basic aluminium	0.813	0.813	0.813	0.813	0.814	0.814	0.815	0.815	0.815	0.815	0.815	0.815	0.815	0.802	0.786	0.765	0.648
Other processing of non ferrous	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013
Chemicals	0.337	0.337	0.336	0.336	0.335	0.334	0.331	0.328	0.324	0.320	0.314	0.308	0.300	0.285	0.276	0.270	0.261
Cement Production	0.067	0.067	0.067	0.067	0.067	0.067	0.066	0.066	0.066	0.066	0.065	0.065	0.061	0.060	0.060	0.058	0.058
Glass basic processing	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014
Pulp and Paper	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.043	0.043	0.042	0.042	0.041	0.039	0.037	0.036	0.035
Structural Change in basic processing (%)																	
Electric steelworks	53.5	53.6	53.7	54.0	54.6	55.8	57.8	60.8	64.1	64.2	64.9	70.0	71.5	75.0	78.1	82.7	87.2
Aluminium recycling	78.2	78.2	78.2	78.3	78.4	78.6	78.8	78.7	78.5	78.4	78.2	78.1	78.0	76.3	74.3	71.6	72.6
Glass recycling	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.3	38.3	38.3	38.3	38.3	38.2	38.2	38.2	38.3
Paper recycling	42.9	42.9	42.9	42.9	42.9	42.9	42.9	43.0	43.0	43.1	43.1	43.2	43.2	43.3	43.3	43.4	43.5
Fuel Mix																	
electrotechnologies																	
% of mechanical processing in chemistry	70.2	70.2	70.2	70.1	70.1	70.2	70.1	70.8	71.6	71.7	73.8	75.1	76.2	76.8	76.2	75.2	70.5
% of electric furnaces non ferrous	97.4	97.5	97.5	97.5	97.5	97.5	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.5	97.3	97.2	97.4
% of mechanical processing glass production	71.8	71.8	71.8	71.7	71.7	71.7	71.5	71.4	71.2	70.8	71.1	71.6	72.2	64.3	62.4	57.1	53.8
% of mechanical processing in paper and pulp	52.8	52.8	52.8	52.8	52.7	52.7	52.5	52.1	51.6	51.2	50.3	49.9	49.9	50.1	50.4	50.5	50.9
% of heat pumps in specific heat uses	3.7	3.8	3.8	4.0	4.2	4.8	5.9	8.0	11.5	15.7	24.7	45.6	55.3	61.0	65.1	67.1	70.6
natural gas directly substituting other fossil fuels (% in specific uses)	11.7	11.7	11.7	11.8	11.8	11.9	12.1	12.3	12.4	12.5	12.5	12.5	12.5	12.8	14.3	15.1	15.5
market share of steam (% in industrial demand)	23.0	23.0	23.0	22.9	22.9	22.9	22.9	23.0	22.9	22.8	22.8	22.8	22.7	22.5	21.5	21.3	21.0
Contribution of CHP for industrial Steam Production (%)	39.9	39.9	39.9	40.0	40.0	40.0	40.1	40.5	40.8	40.5	40.9	41.2	43.3	44.2	44.6	44.3	46.1
Equipment efficiency of electrical and cross-cutting technologies (index)																	
Industrial Furnaces																	
Process Furnaces	100	100.0	100.0	100.1	100.2	100.4	100.7	101.2	101.8	102.2	103.1	103.7	104.3	105.0	105.9	106.5	107.9
Electric Furnaces	100	100.0	100.0	100.1	100.2	100.3	100.6	101.1	101.9	102.8	104.0	109.4	115.0	118.4	120.9	123.1	127.3
Industrial Motors, Air Compressors, Lighting, etc.																	
Motor Drives	100	100.0	100.0	100.0	100.1	100.1	100.3	100.5	100.7	100.9	101.6	102.1	102.9	104.5	106.4	107.7	108.6
Air Compressors	100	100.0	100.1	100.2	100.3	100.6	101.2	102.0	102.9	103.5	104.5	105.2	106.5	107.6	108.3	108.7	109.3
Lighting	100	100.1	100.1	100.3	100.6	101.2	102.2	103.8	105.6	107.0	111.2	117.7	128.4	138.0	143.1	146.0	149.0
Electric Equipment in Households																	
Refrigerators	100	100.0	100.1	100.1	100.2	100.3	100.6	101.3	101.9	102.8	103.6	104.4	105.2	105.8	106.4	120.8	108.8
Washing machines	100	100.1	100.1	100.2	100.3	100.3	100.8	102.0	103.0	104.6	106.0	107.2	108.3	109.2	110.0	110.6	133.3
Lighting	100	100.0	100.0	100.0	100.0	100.0	100.0	100.1	100.1	100.3	100.6	101.3	102.6	106.3	113.1	460.1	470.0
TV and similar	100	100.0	100.0	100.0	100.0	100.0	100.1	100.2	100.3	100.5	100.8	101.1	101.4	101.7	101.9	102.1	102.4
Water heating	100	100.0	100.0	100.0	100.0	100.1	100.2	100.4	100.7	101.0	101.4	101.8	102.0	102.2	102.4	103.8	104.4
Air Conditioning	100	100.1	100.1	100.1	100.1	100.1	100.3	101.2	102.0	103.9	106.6	110.4	120.5	136.0	144.4	150.4	154.4
Electric Equipment in Tertiary																	
Offices	100	100.1	100.3	100.5	101.5	117.3	118.9	120.3	121.1	123.9	130.1	146.7	176.3	205.4	213.5	218.1	261.2
Agriculture	100	100.0	100.1	100.2	100.5	105.5	107.3	107.0	107.5	108.7	110.2	112.7	118.0	121.7	123.3	124.2	127.1

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

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	100.0	100.0	100.0	100.1	100.1	100.2	100.3	100.4	100.5	100.8	101.1	101.7	102.5	105.0	110.9
Buildings (thermal integrity, efficiency of heat generation)																	
Houses																	
efficiency of heat generation	100	100.0	100.0	100.0	100.0	99.9	99.8	99.8	99.7	99.7	99.7	99.9	100.4	101.3	103.2	109.3	113.4
thermal integrity	100	100.0	100.0	100.1	100.2	100.3	100.6	101.1	101.6	102.3	102.9	103.7	104.5	105.3	106.1	106.8	107.9
Offices																	
efficiency of heat generation	100	100.0	100.1	100.1	100.2	100.4	100.8	102.1	103.5	106.2	109.9	115.6	120.3	127.2	130.2	135.4	139.2
thermal integrity	100	100.0	100.0	100.1	100.2	100.4	100.9	101.3	101.9	102.7	103.4	104.2	105.1	106.0	106.9	107.6	108.8
Agriculture																	
efficiency of heat generation	100	100.0	100.0	100.0	100.0	100.0	100.0	100.1	100.1	100.2	100.2	101.6	101.7	102.6	102.8	102.9	102.9
thermal integrity	100	100.0	100.0	100.1	100.2	100.4	101.7	101.3	102.1	102.9	103.8	104.7	105.7	106.7	107.7	108.5	109.7
Transports																	
Passenger Cars (efficiency index)	100	100.0	100.0	100.0	100.1	100.1	100.2	100.4	100.6	101.0	101.4	102.1	103.1	104.8	108.0	115.0	148.4
Trucks (efficiency index)	100	100.0	100.0	100.0	100.0	100.0	100.1	100.2	100.3	100.7	101.5	103.4	108.9	116.5	122.1	126.1	132.2
Transport modes for passengers (% of transport activity)																	
Passenger Cars	54.1	54.1	54.1	54.1	54.1	54.2	54.2	54.2	54.1	53.7	53.4	53.2	52.9	52.3	52.2	53.5	67.6
Train transport	14.8	14.8	14.8	14.8	14.8	14.8	14.9	15.0	15.4	16.2	16.7	17.1	17.5	17.7	17.7	17.4	12.0
Transport modes for goods (% of transport activity)																	
Train transport	11.3	11.3	11.3	11.3	11.3	11.4	11.6	11.9	12.3	12.8	14.7	13.7	12.4	11.8	11.0	10.5	11.7
Renewables in Final Energy (%)																	
Biomass	6.8	6.8	6.9	6.9	6.9	7.0	7.1	7.3	7.5	7.8	8.1	8.4	8.8	9.2	9.6	10.2	10.6
Solar energy	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6
Power Generation																	
Fuel Mix in Thermal (electricity from gas over thermal production)	61.6	61.6	61.7	62.9	63.4	63.6	64.1	68.4	74.7	89.5	89.7	88.6	90.1	97.5	97.2	98.3	99.1
Contribution of Nuclear (% over total production)	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
Renewables (as % over total production)	23.6	23.6	23.6	23.5	23.6	23.9	23.9	24.9	25.9	33.0	37.9	40.6	43.2	46.2	49.8	55.3	58.5
hydro of utilities (as % over total production)	19.7	19.8	19.8	19.7	19.8	20.0	20.0	20.6	21.5	22.4	23.2	24.3	25.5	26.4	28.0	31.1	32.5
hydro of other generators (as % over total production)	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.9	2.0	2.0	2.1	2.7	2.8	2.9	3.1	3.9	4.1
biomass (as % over total production)	2.3	2.3	2.3	2.3	2.2	2.3	2.2	2.2	2.2	8.1	12.1	12.9	14.0	16.0	16.8	18.4	19.8
wind energy and other renewables (as % over total production)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5	0.8	0.8	0.9	1.8	2.0	2.2
CHP indicators																	
Steam/electricity ratio from CHP	2.07	2.09	2.13	2.29	2.30	2.39	2.41	2.31	2.37	2.51	2.33	2.25	1.73	1.59	1.52	1.60	1.22
% of electricity from CHP	5.2	5.2	5.1	4.7	4.7	4.6	4.5	4.8	4.7	4.5	4.9	5.2	7.1	8.0	8.1	8.1	11.1
% of steam from chp	33.2	33.2	33.2	33.3	33.3	33.2	33.2	33.3	33.3	32.9	33.0	32.9	34.2	34.6	34.3	33.4	34.4
Implications for other policies																	
Import dependency (percent)	90.2	90.2	90.2	90.2	89.8	89.5	89.4	88.9	88.2	84.6	82.1	81.1	80.0	79.0	78.0	76.7	75.4
Market Liberalisation (% of utilities production)	94.1	94.1	94.1	94.1	94.1	94.0	93.9	92.6	92.1	93.2	92.3	91.3	90.0	88.2	88.9	88.5	87.0

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

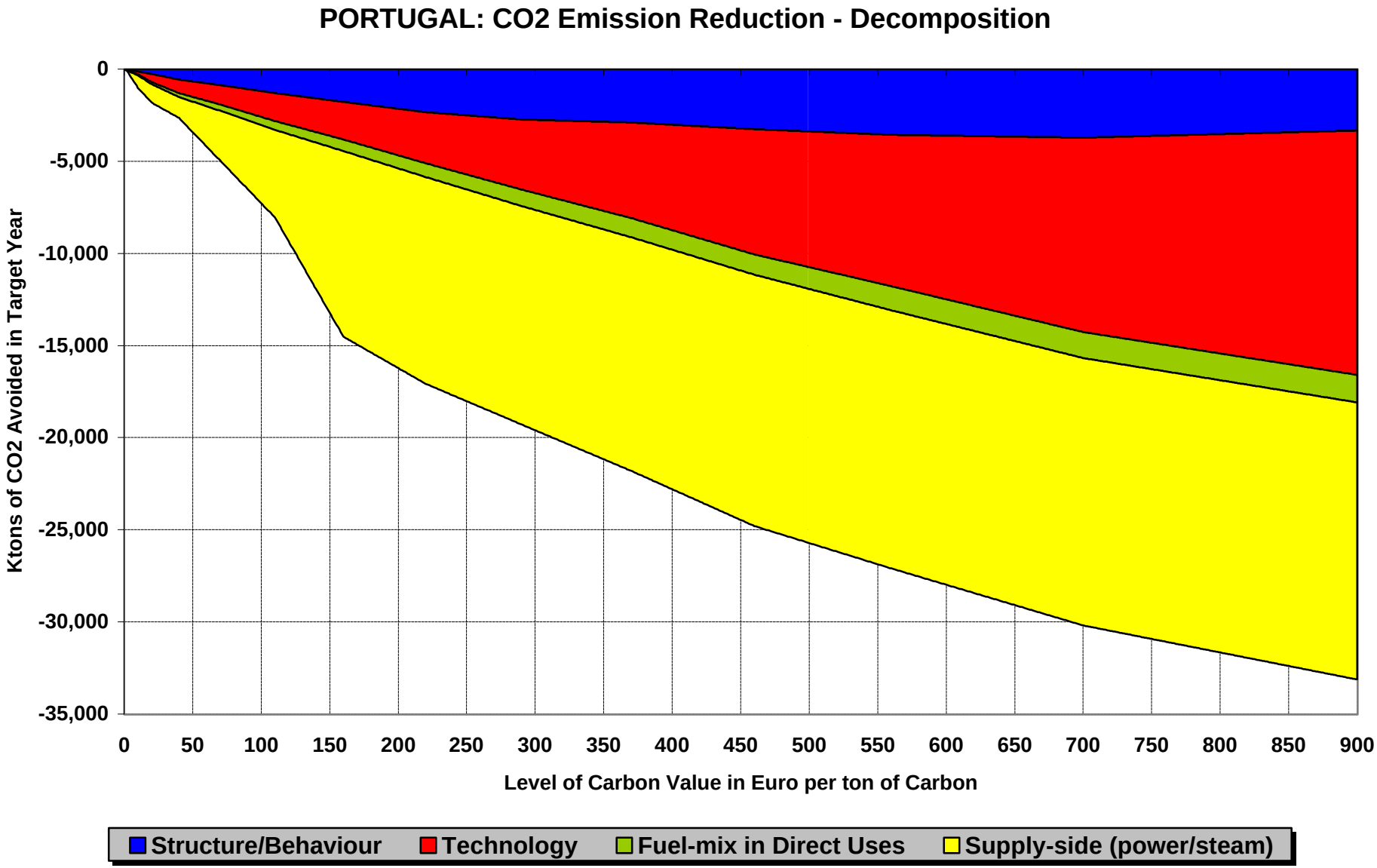
Level of Carbon Value (in Eur'90/ton of Carbon)	**0**	**1**	**2**	**5**	**10**	**20**	**40**	**70**	**110**	**160**	**220**	**290**	**370**	**460**	**560**	**700**	**900**
ADDITIONAL SYSTEM COSTS INCLUDING CARBON VALUE (mio Eur'90)																	
Total area in the marginal cost abatement curve	0	0	0	1	4	12	29	95	218	547	702	854	1066	1340	1572	1995	2606
as % of GDP	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.03%	0.10%	0.22%	0.55%	0.71%	0.86%	1.07%	1.35%	1.58%	2.01%	2.62%
COST ANALYSIS BY SECTOR																	
Industrial Sectors - **Metals**																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	561	562	562	562	562	562	562	562	563	566	565	565	562	563	563	563	564
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	*0.1*	*0.2*	*0.8*	*0.7*	*0.6*	*0.1*	*0.3*	*0.3*	*0.3*	*0.5*
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	561	562	562	563	565	568	574	583	593	604	615	624	632	640	648	658	673
% change from Baseline	*0.0*	*0.1*	*0.1*	*0.3*	*0.6*	*1.2*	*2.3*	*3.8*	*5.6*	*7.6*	*9.6*	*11.2*	*12.5*	*14.0*	*15.5*	*17.1*	*19.9*
Structure of costs (%)																	
Non energy costs	84.7	84.7	84.7	84.6	84.4	84.1	83.4	82.7	81.7	80.4	79.1	78.5	77.7	77.0	76.2	75.5	74.2
Technology and fuel costs	15.3	15.3	15.2	15.2	15.1	14.8	14.4	13.8	13.2	13.4	12.8	12.0	11.3	11.0	10.6	10.1	9.6
Carbon value cost	0.0	0.1	0.1	0.3	0.5	1.1	2.1	3.5	5.1	6.3	8.1	9.5	11.0	12.0	13.1	14.4	16.2
Industrial Sectors - **Chemicals**																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	549	549	549	549	548	548	547	545	544	546	545	546	546	546	547	545	548
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.4*	*-0.7*	*-0.9*	*-0.6*	*-0.7*	*-0.5*	*-0.5*	*-0.5*	*-0.4*	*-0.7*	*-0.2*
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	549	549	549	550	550	551	554	556	560	566	570	576	580	584	590	595	607
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.1*	*0.2*	*0.4*	*0.9*	*1.3*	*2.0*	*3.1*	*3.9*	*4.9*	*5.7*	*6.4*	*7.5*	*8.4*	*10.5*
Structure of costs (%)																	
Non energy costs	71.0	71.0	71.0	71.0	70.9	70.8	70.5	70.2	69.7	69.1	68.5	67.9	67.4	67.0	66.4	65.8	64.7
Technology and fuel costs	29.0	28.9	28.9	28.9	28.8	28.6	28.3	27.8	27.4	27.4	27.0	26.9	26.8	26.5	26.3	25.8	25.6
Carbon value cost	0.0	0.0	0.1	0.2	0.3	0.6	1.2	2.0	2.9	3.5	4.4	5.2	5.9	6.5	7.3	8.4	9.7
Industrial Sectors - **Materials**																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	299	299	299	299	299	299	299	299	299	299	299	299	295	295	295	295	295
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.1*	*0.1*	*0.1*	*0.2*	*-1.2*	*-1.2*	*-1.3*	*-1.4*	*-1.2*
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	299	299	299	299	299	300	301	303	305	308	310	313	313	316	319	324	331
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.1*	*0.2*	*0.4*	*0.8*	*1.3*	*2.0*	*2.9*	*3.8*	*4.9*	*4.6*	*5.8*	*6.8*	*8.4*	*10.8*
Structure of costs (%)																	
Non energy costs	91.5	91.5	91.5	91.4	91.3	91.1	90.8	90.4	89.8	89.0	88.3	87.4	86.2	85.3	84.4	83.2	81.3
Technology and fuel costs	8.5	8.5	8.5	8.5	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.1	8.3	8.2	8.1	7.9	7.8
Carbon value cost	0.0	0.0	0.0	0.1	0.2	0.4	0.8	1.4	2.0	2.7	3.6	4.5	5.6	6.6	7.6	9.0	10.9
Industrial Sectors - **Others**																	
Average cost of Sectoral Production excluding Carbon Value																	
Eur'90 per tn of output	3119	3119	3119	3119	3119	3119	3119	3118	3119	3121	3122	3122	3122	3123	3120	3119	3120
% change from Baseline	*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*	*0.1*	*0.1*	*0.0*	*0.0*
Average cost of Sectoral Production including Carbon Value																	
Eur'90 per tn of output	3119	3119	3119	3120	3120	3121	3124	3127	3131	3137	3142	3147	3153	3159	3162	3167	3181
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.2*	*0.3*	*0.4*	*0.6*	*0.7*	*0.9*	*1.1*	*1.3*	*1.4*	*1.6*	*2.0*
Structure of costs (%)																	
Non energy costs	97.9	97.9	97.9	97.9	97.9	97.9	97.8	97.7	97.6	97.4	97.2	97.1	96.9	96.7	96.6	96.4	96.0
Technology and fuel costs	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.1	2.0	2.1
Carbon value cost	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.1	1.3	1.5	1.9

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

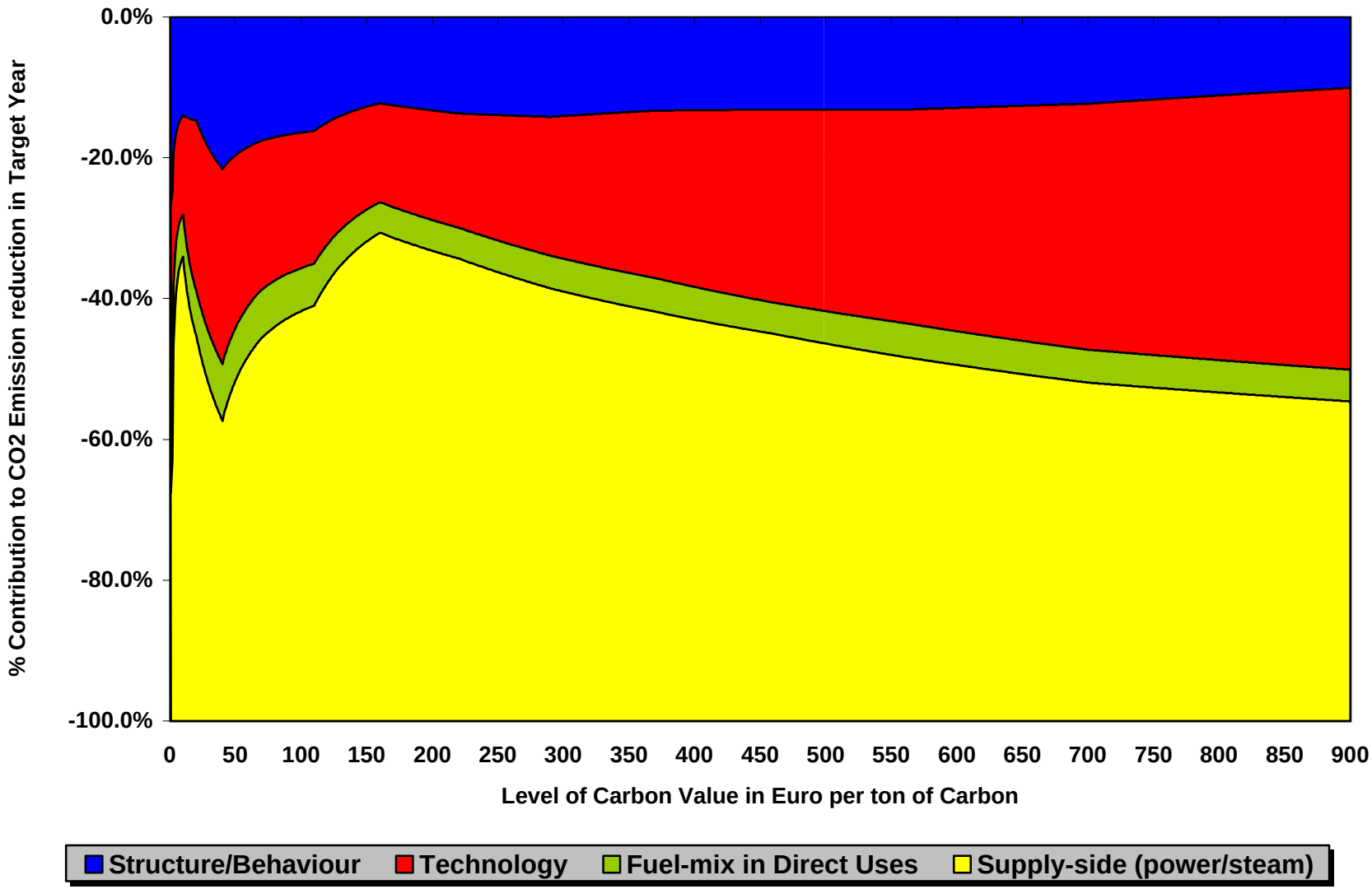
Level of Carbon Value (in Eur'90/ton of Carbon)	0	1	2	5	10	20	40	70	110	160	220	290	370	460	560	700	900
Services																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per unit of energy service	4164	4164	4164	4165	4166	4154	4151	4148	4148	4164	4162	4155	4165	4189	4204	4211	4309
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.3*	*-0.3*	*-0.4*	*-0.4*	*0.0*	*-0.1*	*-0.2*	*0.0*	*0.6*	*1.0*	*1.1*	*3.5*
Average cost of Energy Service including Carbon Value																	
Eur'90 per unit of energy service	4164	4165	4166	4170	4176	4175	4192	4216	4248	4281	4310	4335	4372	4416	4465	4505	4651
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.1*	*0.3*	*0.2*	*0.7*	*1.2*	*2.0*	*2.8*	*3.5*	*4.1*	*5.0*	*6.1*	*7.2*	*8.2*	*11.7*
Structure of costs (%)																	
Non energy costs	64.6	64.6	64.6	64.5	64.4	64.5	64.2	63.8	63.3	62.7	62.3	61.9	61.4	60.8	60.1	59.5	57.6
Technology and fuel costs	35.4	35.4	35.4	35.3	35.3	35.0	34.8	34.6	34.4	34.6	34.3	34.0	33.9	34.1	34.1	34.0	35.0
Carbon value cost	0.0	0.0	0.1	0.1	0.3	0.5	1.0	1.6	2.3	2.7	3.4	4.1	4.7	5.1	5.8	6.5	7.3
Agriculture																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per unit of energy service	5373	5373	5373	5374	5375	5360	5363	5364	5370	5389	5399	5396	5404	5419	5436	5452	5522
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-0.2*	*-0.2*	*-0.2*	*-0.1*	*0.3*	*0.5*	*0.4*	*0.6*	*0.9*	*1.2*	*1.5*	*2.8*
Average cost of Energy Service including Carbon Value																	
Eur'90 per unit of energy service	5373	5375	5376	5381	5388	5387	5417	5456	5511	5574	5647	5714	5799	5891	5999	6133	6369
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.1*	*0.3*	*0.3*	*0.8*	*1.5*	*2.6*	*3.7*	*5.1*	*6.3*	*7.9*	*9.6*	*11.6*	*14.1*	*18.5*
Structure of costs (%)																	
Non energy costs	79.9	79.9	79.9	79.8	79.7	79.6	79.2	78.6	77.9	77.0	76.1	75.3	74.2	73.1	71.9	70.4	68.0
Technology and fuel costs	20.1	20.1	20.1	20.1	20.1	19.9	19.8	19.7	19.6	19.6	19.5	19.1	19.0	18.9	18.8	18.5	18.7
Carbon value cost	0.0	0.0	0.1	0.1	0.3	0.5	1.0	1.7	2.6	3.3	4.4	5.6	6.8	8.0	9.4	11.1	13.3
Households																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per unit of energy service	258	258	258	258	258	257	257	256	255	256	256	255	254	255	255	255	260
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.2*	*-0.5*	*-0.8*	*-1.1*	*-0.5*	*-0.7*	*-1.2*	*-1.4*	*-1.2*	*-1.0*	*-1.1*	*0.7*
Average cost of Energy Service including Carbon Value																	
Eur'90 per unit of energy service	258	258	258	258	259	260	261	264	266	270	273	276	279	282	286	285	294
% change from Baseline	*0.0*	*0.0*	*0.1*	*0.2*	*0.4*	*0.7*	*1.4*	*2.3*	*3.4*	*4.6*	*5.8*	*7.0*	*8.3*	*9.5*	*10.9*	*10.4*	*13.9*
Structure of costs (%)																	
Non energy costs	27.1	27.1	27.1	27.1	27.0	26.8	26.6	26.2	25.8	25.3	24.8	24.4	23.9	23.5	23.2	23.4	22.9
Technology and fuel costs	72.9	72.8	72.8	72.7	72.5	72.2	71.6	70.8	69.9	69.8	69.0	68.0	67.1	66.7	66.1	66.1	65.5
Carbon value cost	0.0	0.0	0.1	0.2	0.5	0.9	1.8	3.0	4.3	4.9	6.2	7.6	8.9	9.8	10.7	10.4	11.6
Passenger Transports																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per 1000 passenger-km	190	190	190	190	190	190	190	190	190	189	188	188	187	187	188	193	248
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.1*	*0.0*	*-0.5*	*-0.7*	*-1.0*	*-1.2*	*-1.6*	*-1.1*	*1.7*	*30.5*
Average cost of Energy Service including Carbon Value																	
Eur'90 per 1000 passenger-km	190	190	190	190	190	190	191	192	193	193	194	196	197	198	201	209	266
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.1*	*0.2*	*0.4*	*0.7*	*1.2*	*1.6*	*1.8*	*2.4*	*3.1*	*3.8*	*4.4*	*5.9*	*10.0*	*40.0*
Structure of costs (%)																	
Non energy costs	13.5	13.5	13.5	13.4	13.4	13.4	13.4	13.3	13.2	13.3	13.2	13.2	13.1	13.1	12.8	12.2	8.3
Technology and fuel costs	86.5	86.5	86.5	86.5	86.4	86.3	86.0	85.6	85.1	84.4	83.7	82.9	82.1	81.2	80.5	80.3	84.9
Carbon value cost	0.0	0.0	0.0	0.1	0.2	0.3	0.6	1.1	1.6	2.3	3.1	3.9	4.8	5.7	6.6	7.5	6.8
Goods Transports																	
Average cost of Energy Service excluding Carbon Value																	
Eur'90 per 1000 tonne-km	183	183	183	183	182	182	182	181	181	180	177	177	177	174	172	170	166
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.1*	*-0.3*	*-0.6*	*-1.0*	*-1.5*	*-3.1*	*-3.0*	*-3.0*	*-4.6*	*-5.7*	*-7.0*	*-9.1*
Average cost of Energy Service including Carbon Value																	
Eur'90 per 1000 tonne-km	183	183	183	183	183	184	185	186	188	190	190	194	198	199	201	205	209
% change from Baseline	*0.0*	*0.0*	*0.1*	*0.1*	*0.3*	*0.6*	*1.1*	*1.8*	*2.7*	*3.9*	*4.1*	*6.4*	*8.5*	*8.9*	*10.2*	*12.3*	*14.3*
Structure of costs (%)																	
Non energy costs	20.8	20.8	20.8	20.8	20.7	20.7	20.6	20.5	20.4	20.2	20.3	19.8	19.3	19.1	18.8	18.4	18.1
Technology and fuel costs	79.2	79.2	79.1	79.1	78.9	78.6	78.0	77.1	76.0	74.7	72.8	71.4	70.1	68.5	66.8	64.4	61.4
Carbon value cost	0.0	0.0	0.1	0.2	0.3	0.7	1.4	2.4	3.6	5.2	6.9	8.8	10.6	12.4	14.4	17.2	20.5

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

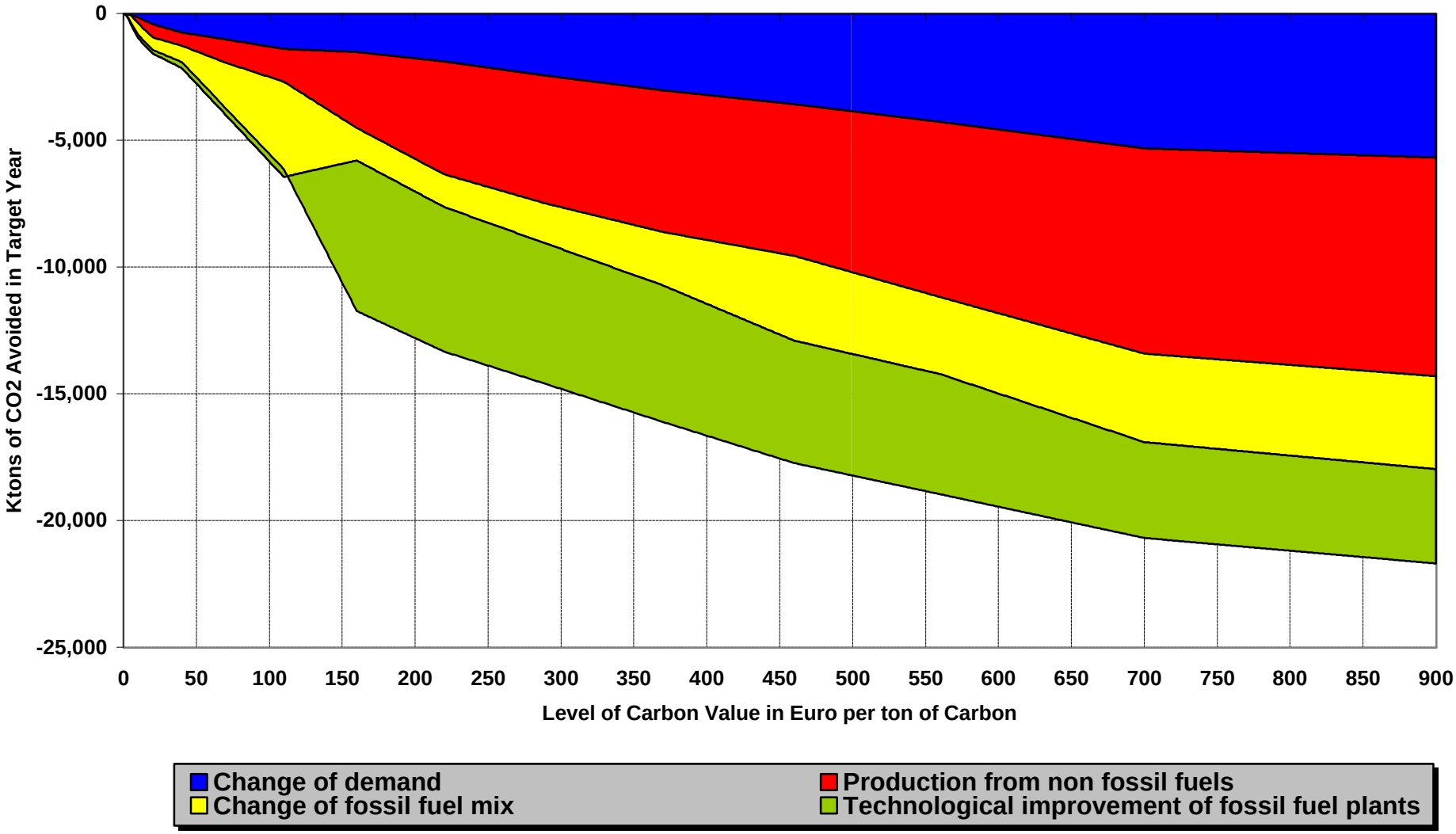
Level of Carbon Value (in Eur'90/ton of Carbon)	**0**	**1**	**2**	**5**	**10**	**20**	**40**	**70**	**110**	**160**	**220**	**290**	**370**	**460**	**560**	**700**	**900**
Electricity and Steam production																	
Average cost of production excluding Carbon Value																	
mEur'90 per kWhe+kWhth	45	45	45	45	45	45	45	45	46	48	49	50	51	53	54	54	56
% change from Baseline	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.7*	*2.7*	*8.3*	*10.1*	*11.4*	*13.9*	*17.4*	*20.4*	*21.5*	*24.8*
Average cost of production including Carbon Value																	
mEur'90 per kWhe+kWhth	45	45	45	45	46	47	48	51	55	58	62	65	69	73	77	81	87
% change from Baseline	*0.0*	*0.2*	*0.4*	*1.1*	*2.0*	*4.0*	*8.1*	*14.1*	*21.9*	*30.0*	*37.6*	*45.6*	*54.4*	*63.3*	*72.9*	*80.1*	*93.7*
Structure of costs (%)																	
Annual Capital cost	29.5	29.5	29.4	29.2	28.9	28.4	27.3	26.1	25.3	26.5	26.2	25.5	25.5	26.2	26.4	27.0	26.8
O & M costs	14.3	14.3	14.3	14.2	13.8	13.5	13.3	12.4	11.7	11.7	11.4	10.8	10.6	10.5	10.3	10.3	10.2
Transm. $ Distr. Costs	26.6	26.6	26.5	26.3	26.1	25.6	24.6	23.1	21.7	20.3	19.0	17.8	16.7	15.6	15.0	13.4	12.5
Fuel Costs	29.5	29.5	29.4	29.4	29.2	28.6	27.5	26.7	25.3	24.6	23.4	22.4	21.0	19.6	18.0	16.8	15.0
Carbon value costs	0.0	0.2	0.4	1.1	2.0	3.9	7.5	11.8	15.8	16.7	20.0	23.5	26.2	28.1	30.4	32.5	35.6
Investment expenditure for Electricity and Steam production																	
000mio Eur'90 spent in 1995 to 2010	5515	5509	5499	5469	5387	5267	5092	5050	5330	6483	6791	6692	6954	7507	7587	7364	7668
% change from Baseline	*0.0*	*-0.1*	*-0.3*	*-0.8*	*-2.3*	*-4.5*	*-7.7*	*-8.4*	*-3.4*	*17.5*	*23.1*	*21.3*	*26.1*	*36.1*	*37.6*	*33.5*	*39.0*
Investment expenditure for Electricity and Steam production per KWh produced in 2010																	
mEur'90 per kWhe+kWhth	66.4	66.4	66.4	66.3	65.8	65.5	65.3	67.2	74.7	96.7	108.7	116.7	133.3	159.6	182.2	207.5	251.5
% change from Baseline	*0.0*	*0.0*	*0.0*	*-0.1*	*-0.9*	*-1.3*	*-1.6*	*1.3*	*12.5*	*45.7*	*63.8*	*75.8*	*100.7*	*140.4*	*174.4*	*212.6*	*278.9*
Electricity tarifs (mEur'90 per kWh - includes effect of carbon value for electricity production)																	
Sectoral Average	63	63	63	63	64	65	68	71	75	80	85	90	95	102	109	112	126
Industry	53	54	54	54	55	56	58	61	64	70	74	80	84	90	97	102	114
Tertiary	66	66	66	66	67	68	71	75	79	84	88	92	98	105	112	115	129
Households	71	71	71	71	72	74	76	80	84	89	94	99	105	112	120	123	137
Transports	55	55	55	56	56	58	60	64	68	74	79	84	90	97	105	109	123
Others	53	53	53	53	54	55	57	61	65	71	76	81	88	94	102	107	121
Electricity tarifs (% change from Baseline)																	
Sectoral Average	*0.0*	*0.1*	*0.4*	*1.2*	*2.3*	*4.1*	*8.0*	*13.3*	*20.0*	*28.2*	*35.5*	*43.3*	*51.7*	*62.4*	*73.8*	*79.0*	*100.5*
Industry	*0.0*	*0.2*	*0.4*	*1.3*	*2.2*	*4.1*	*7.7*	*13.3*	*20.6*	*30.9*	*39.1*	*48.9*	*57.5*	*68.9*	*81.8*	*90.3*	*113.1*
Tertiary	*0.0*	*0.0*	*0.3*	*1.1*	*2.4*	*4.3*	*8.4*	*13.7*	*20.3*	*27.5*	*34.5*	*40.9*	*49.0*	*60.0*	*70.4*	*75.9*	*97.3*
Households	*0.0*	*0.1*	*0.4*	*1.1*	*2.1*	*4.1*	*7.9*	*13.0*	*19.3*	*26.6*	*33.3*	*40.7*	*49.0*	*59.2*	*69.3*	*74.6*	*94.6*
Transports	*0.0*	*0.2*	*0.5*	*1.3*	*2.6*	*4.9*	*9.5*	*15.9*	*24.1*	*34.3*	*43.2*	*53.1*	*65.0*	*77.4*	*90.7*	*98.4*	*123.9*
Others	*0.0*	*0.4*	*0.6*	*1.3*	*2.3*	*4.2*	*8.5*	*14.8*	*22.8*	*35.1*	*43.8*	*54.5*	*67.0*	*78.6*	*93.2*	*102.3*	*129.0*


PORTUGAL: CO2 Emission Reduction - Decomposition
Ktons of CO2 Avoided in Target Year
0
-5,000
-10,000
-15,000
-20,000
-25,000
-30,000
-35,000
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
Level of Carbon Value in Euro per ton of Carbon
Structure/Behaviour
Technology
Fuel-mix in Direct Uses
Supply-side (power/steam)

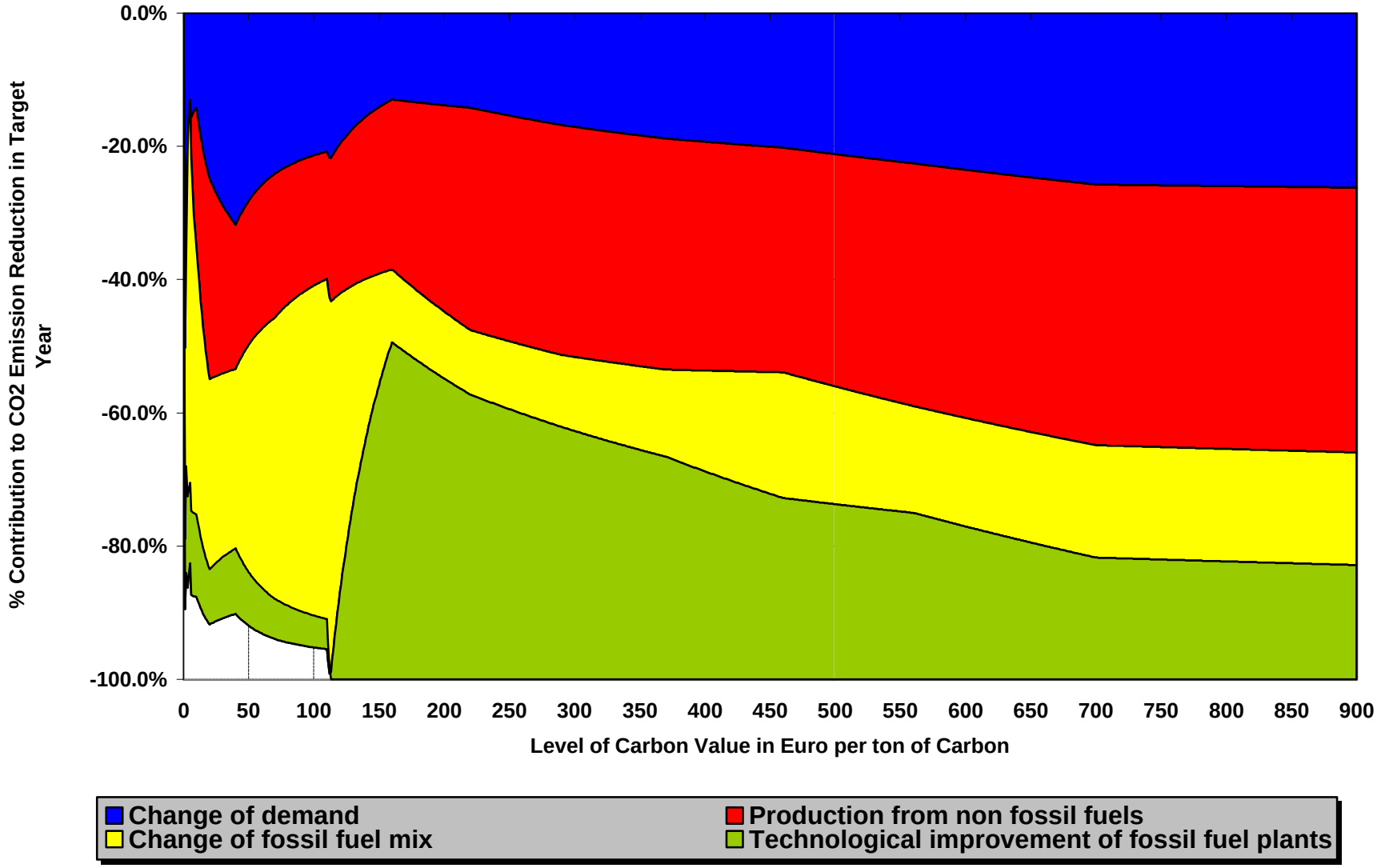
PORTUGAL: CO2 Emission Reduction - Decomposition in Percentage



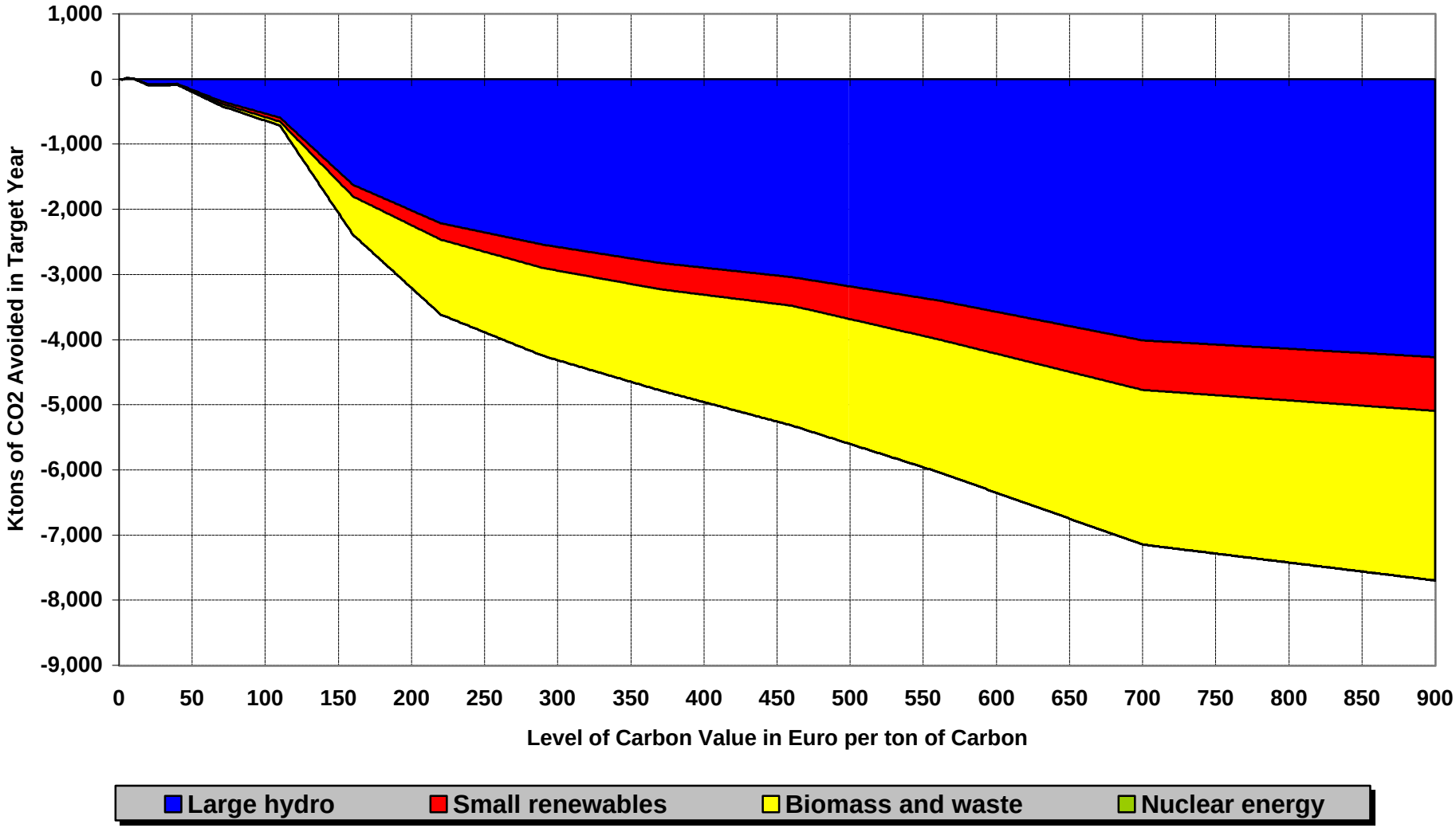
PORTUGAL: CO2 Emission Reduction in Power and Steam Generation - Decomposition



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



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



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