

REFERENCES

- APEC Peer Review on Energy Efficiency (PREE) (2009a), Peer Review on Energy Efficiency in New Zealand, Final Report on 14 April 2009, Endorsed by the APEC Energy Working Group, Available at: http://www.ieej.or.jp/aperc/PREE/PREE_New_Zealand.pdf
- APEC Peer Review on Energy Efficiency (PREE) (2009b), Peer Review on Energy Efficiency in Chile, Final Report on 14 April 2009, Endorsed by the APEC Energy Working Group, Available at: http://www.ieej.or.jp/aperc/PREE/PREE_Chile.pdf
- APEC Peer Review on Energy Efficiency (PREE) (2009c), Peer Review on Energy Efficiency in Vietnam, Final Report, Endorsed by the APEC Energy Working Group, Available at: http://www.ieej.or.jp/aperc/PREE/PREE_Vietnam.pdf
- APEC Peer Review on Energy Efficiency (PREE) (2010a), Peer Review on Energy Efficiency in Chinese Taipei, Final Report on 5 November 2010, Endorsed by the APEC Energy Working Group, Available at: http://www.ieej.or.jp/aperc/PREE/PREE_Chinese_Taipei.pdf
- APEC Peer Review on Energy Efficiency (PREE) (2010b), Peer Review on Energy Efficiency in Thailand, Final Report on 18 March 2010, Endorsed by the APEC Energy Working Group, Available at: http://www.ieej.or.jp/aperc/PREE/PREE_Thailand.pdf
- APEC Peer Review on Energy Efficiency (PREE) (2011), Peer Review on Energy Efficiency in Malaysia, Report on May 2011, Endorsed by the APEC Energy Working Group, Available at: http://www.ieej.or.jp/aperc/PREE/PREE_Malaysia.pdf
- Asia Pacific Energy Research Centre (APERC) (2010), Pathways to Energy Sustainability: Measuring APEC Progress in Promoting Economic Growth, Energy Security, and Environmental Protection, Tokyo, Japan. Available at: www.ieej.or.jp/aperc
- Department of Energy (DOE) (2004), Whole-House Approach Benefits Builders, Buyers, and the Environment. Washington, D.C.: DOE. Available at: http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/34867.pdf
- Department of Provincial Administration (DOPA) (2008). "Thailand Population Statistics". Available at: <http://www.dopa.go.th/xstat/popstat.html>
- Dunn, S. (2007), High Performance Homes in the Southwest: Savings Potential, Cost Effectiveness and Policy Options. Boulder, Colo.: Southwest Energy Efficiency Project. Available at: http://www.swenergy.org/hph/High_Performance_Homes.pdf

- Energy Policy and Planning Office (EPPO) (2010). "Demand and Supply of LPG, Propane and Butane September 2010". Available at: http://www.eppo.go.th/info/2petroleum_stat.html
- Kasetsart University (KU) (2006), Analysis of production and marketing of electrical and appliance labeling and not labeling, Electricity Generating Authority of Thailand.
- Kasikorn Research Center (KRC) (2010). "Air Conditioners, 2010: Hot Summer Boosting Sales, Promotions Abound (Current Issue No.2208)". Available at: <http://www.kasikornresearch.com/TH/KEcon%20Analysis/Pages/ViewSummary.aspx?docid=24976>
- King Mongkut's University of Technology Thonburi (KMUTT) (2003), The Energy Consumption Trend in Residential Sector, Department of Renewable Energy and Conservation, Thailand.
- Sanga, A.G. (2005), Impacts of efficient stoves and cooking fuel substitution in family expenditures of urban households in Dar es Salaam, Tanzania, the International Energy Initiative (Latin American Office), Energy Discussion Paper no 2.59.1/05. Available at: <http://www.iei-la.org/documents/E.%20D.%20PAPER%20No.%202.59.01-05.pdf>
- Tanatvanit, S., Limmeechokchai, B. and Chungpaibulpatana, S. (2003), Sustainable energy development strategies: implications of energy demand management and renewable energy in Thailand, *Renewable and Sustainable Energy Reviews*, 7, 5, October 2003, pp. 367-395.
- The Electric Load Forecast Sub-Committee (2010), Thailand Long-term Load Forecasts April 2010, Administration of Energy Policy, Thailand.
- The National Academies (2009), *Real Prospects for Energy Efficiency in the United States*, America's Energy Future Panel on Energy Efficiency Technologies, The National Academies Press Washington, D.C. Available at: <http://www.nap.edu/catalog/12621.html>

Table 1 Thailand's population and urbanization

Year	Population (million)	Population Growth, %	Urban Population, %	Urban, No. people	Growth, %	Average family size	Urban	Rural	Total
1998	61.47		34.47	21.19			5.69	9.89	15.58
2001	62.31		36.50	22.74			6.71	9.14	15.85
2008	63.39 ¹	0.56 ¹	42.32 ¹	26.83	2.39	4.00	6.87	9.07	15.94
2009	63.74	0.56	43.09	27.47		4.00	7.03	8.99	16.03
2010	64.10	0.40	43.87	28.12		3.98	7.24	8.95	16.19
2011	64.36		44.74	28.79		3.95	7.46	8.89	16.36
2012	64.61		45.63	29.48		3.93	7.69	8.84	16.53
2013	64.87		46.53	30.19		3.90	7.92	8.78	16.70
2014	65.13		47.45	30.91		3.88	8.17	8.71	16.88
2015	65.39		48.39	31.64		3.85	8.42	8.64	17.05
2016	65.65		49.35	32.40		3.83	8.67	8.56	17.23
2017	65.92		50.33	33.17		3.80	8.94	8.48	17.42
2018	66.18		51.32	33.97		3.78	9.21	8.39	17.60
2019	66.45		52.34	34.78		3.75	9.50	8.29	17.79
2020	66.71		53.38	35.61		3.73	9.79	8.19	17.98
2021	66.98		54.43	36.46		3.70	10.09	8.09	18.17
2022	67.25		55.51	37.33		3.68	10.40	7.97	18.37
2023	67.52		56.61	38.22		3.65	10.72	7.85	18.57
2024	67.79		57.73	39.13		3.63	11.05	7.72	18.77
2025	68.06		58.87	40.07		3.60	11.40	7.58	18.98
2026	68.33		60.04	41.02		3.58	11.75	7.44	19.19
2027	68.60		61.23	42.00		3.55	12.11	7.29	19.40
2028	68.88		62.44	43.01		3.53	12.49	7.13	19.62
2029	69.15		63.68	44.03		3.50	12.88	6.96	19.84
2030	69.43		64.94	45.08					

Source: 1. <http://www.dopa.go.th/xstat/popstat.html>

Table 2 Number of house classified by sub-sectors

		2001	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	million
Residential sector																								
	Urban	2.6	5.4	5.6	5.8	5.9	6.1	6.3	6.5	6.7	6.9	7.1	7.3	7.6	7.8	8.0	8.3	8.5	8.8	9.1	9.4	9.7	10.0	
	Rural	11.0	8.1	8.0	8.0	7.9	7.9	7.8	7.7	7.7	7.6	7.5	7.4	7.3	7.2	7.1	7.0	6.9	6.8	6.7	6.5	6.4	6.2	
	Total	13.5	13.5	13.6	13.7	13.9	14.0	14.1	14.2	14.4	14.5	14.6	14.8	14.9	15.0	15.2	15.3	15.5	15.6	15.7	15.9	16.0	16.2	
Small commercial sector																								
	Urban	0.8	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.6	2.7	2.7	2.8	2.9	
	Rural	1.3	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	
	Total	2.0	2.5	2.6	2.6	2.7	2.7	2.8	2.8	2.9	2.9	3.0	3.0	3.1	3.1	3.2	3.3	3.3	3.4	3.4	3.5	3.6	3.7	

Table 3 Prediction of electricity consumption of the residential sector classified by end-use activities of Scenario I, 2010-2030

Energy	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity Total electricity (GWh)	30,311	31,605	33,020	34,545	36,123	37,682	39,244	40,884	42,528	44,266	46,113	48,012	49,919	51,877	53,908	56,036	58,247	60,544	62,938	65,428	68,020
Lighting	4,582	4,778	4,992	5,222	5,461	5,697	5,933	6,181	6,429	6,692	6,971	7,258	7,547	7,843	8,150	8,471	8,806	9,153	9,515	9,891	10,283
Cooking	4,000	4,171	4,358	4,559	4,768	4,973	5,180	5,396	5,613	5,842	6,086	6,337	6,588	6,847	7,115	7,396	7,688	7,991	8,307	8,635	8,977
Entertainment	5,265	5,490	5,736	6,001	6,275	6,546	6,817	7,102	7,388	7,689	8,010	8,340	8,671	9,012	9,364	9,734	10,118	10,517	10,933	11,365	11,816
Air-conditioning	4,184	4,363	4,558	4,768	4,986	5,201	5,417	5,643	5,870	6,110	6,365	6,627	6,891	7,161	7,441	7,735	8,040	8,357	8,688	9,031	9,389
Amenity Electric hot water	1,220	1,272	1,329	1,390	1,454	1,516	1,579	1,645	1,711	1,781	1,856	1,932	2,009	2,088	2,169	2,255	2,344	2,436	2,533	2,633	2,737
Other	9,759	10,176	10,632	11,123	11,631	12,133	12,636	13,164	13,693	14,232	14,847	15,459	16,073	16,703	17,357	18,042	18,754	19,494	20,264	21,066	21,901
Other	1,300	1,355	1,416	1,481	1,549	1,616	1,683	1,753	1,824	1,898	1,977	2,059	2,141	2,225	2,312	2,403	2,498	2,596	2,699	2,806	2,917
LPG (10 ³ tons)	1,895	1,901	1,906	1,911	1,916	1,921	1,925	1,929	1,932	1,935	1,938	1,940	1,941	1,942	1,943	1,943	1,943	1,942	1,940	1,938	1,935
Fuel wood (10 ³ tons)	4,745	4,725	4,704	4,681	4,655	4,627	4,597	4,564	4,528	4,490	4,449	4,405	4,357	4,307	4,253	4,196	4,135	4,070	4,001	3,928	3,851
Charcoal (10 ³ tons)	5,453	5,432	5,408	5,383	5,355	5,324	5,290	5,254	5,214	5,172	5,126	5,077	5,024	4,968	4,908	4,844	4,775	4,703	4,626	4,544	4,458

Table 4 Prediction of electricity consumption of the small commercial sector classified by end-use activities of Scenario I, 2010-2030

Energy	Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	Total electricity	12,695	13,365	14,117	14,951	15,828	16,771	17,742	18,768	19,828	20,909	22,036	23,203	24,494	25,864	27,321	28,868	30,513	32,262	34,122	36,099	38,203
(GWh)	Lighting	1,293	1,361	1,438	1,523	1,612	1,708	1,807	1,912	2,019	2,130	2,244	2,363	2,495	2,634	2,783	2,940	3,108	3,286	3,475	3,677	3,891
	Cooking	905	953	1,007	1,066	1,129	1,196	1,265	1,338	1,414	1,491	1,571	1,655	1,747	1,844	1,948	2,059	2,176	2,301	2,433	2,574	2,724
	Entertainment	1,764	1,858	1,962	2,078	2,200	2,331	2,466	2,608	2,756	2,906	3,063	3,225	3,404	3,595	3,797	4,012	4,241	4,484	4,742	5,017	5,310
	Amenity	1,265	1,331	1,406	1,489	1,577	1,671	1,767	1,870	1,975	2,083	2,195	2,312	2,440	2,577	2,722	2,876	3,040	3,214	3,399	3,596	3,806
	Other	5,835	6,142	6,488	6,871	7,274	7,707	8,154	8,625	9,112	9,609	10,127	10,664	11,257	11,887	12,556	13,267	14,023	14,827	15,682	16,591	17,557
		1,633	1,719	1,816	1,924	2,036	2,158	2,283	2,415	2,551	2,690	2,835	2,985	3,151	3,327	3,515	3,714	3,926	4,151	4,390	4,644	4,915
LPG	Cooking	465	493	524	559	597	637	678	722	768	816	866	918	976	1,037	1,103	1,173	1,248	1,328	1,414	1,506	1,604
Fuel wood	Cooking	242	253	267	281	296	312	328	344	361	378	394	411	430	449	468	488	509	530	551	573	595
Charcoal	Cooking	615	653	696	744	794	849	907	968	1,032	1,098	1,168	1,241	1,322	1,408	1,501	1,601	1,708	1,822	1,945	2,077	2,218

Table 5 Prediction of electricity consumption of the within-municipal residential sub-sector classified by end-use activities of Scenario I, 2010-2030

Energy	Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	Total electricity	10,344	10,786	11,269	11,789	12,328	12,860	13,393	13,953	14,514	15,107	15,737	16,385	17,036	17,704	18,398	19,124	19,878	20,662	21,479	22,329	23,214
(GWh)	Lighting	1,288	1,343	1,403	1,468	1,535	1,601	1,667	1,737	1,807	1,881	1,959	2,040	2,121	2,204	2,290	2,381	2,475	2,572	2,674	2,780	2,890
	Cooking	1,149	1,198	1,252	1,310	1,370	1,429	1,488	1,550	1,612	1,678	1,748	1,820	1,893	1,967	2,044	2,125	2,208	2,296	2,386	2,481	2,579
	Entertainment	1,719	1,793	1,873	1,959	2,049	2,137	2,226	2,319	2,412	2,511	2,616	2,723	2,831	2,942	3,058	3,178	3,304	3,434	3,570	3,711	3,858
	Air-conditioning	2,401	2,503	2,616	2,736	2,861	2,985	3,109	3,238	3,369	3,506	3,653	3,803	3,954	4,109	4,270	4,439	4,614	4,796	4,985	5,183	5,388
	Amenity	737	768	802	839	878	916	954	993	1,033	1,076	1,120	1,167	1,213	1,261	1,310	1,362	1,415	1,471	1,529	1,590	1,653
	Electric hot water	2,679	2,794	2,919	3,053	3,193	3,331	3,469	3,614	3,759	3,913	4,076	4,244	4,412	4,585	4,765	4,953	5,148	5,352	5,563	5,783	6,012
	Other	371	387	405	423	443	462	481	501	521	542	565	588	612	636	660	687	714	742	771	802	833
LPG	Cooking	443	457	470	485	500	515	530	547	563	581	599	617	636	656	676	697	718	741	764	787	812
Fuel wood	Cooking	172	177	182	188	194	200	206	212	219	225	232	239	247	254	262	270	279	287	296	305	315
Charcoal	Cooking	228	235	242	250	257	265	273	281	290	299	308	318	327	337	348	359	370	381	393	405	418

Table 6 Prediction of electricity consumption of the outside-municipal residential sub-sector classified by end-use activities of Scenario I, 2010-2030

Energy	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	19,966	20,819	21,751	22,756	23,795	24,822	25,851	26,931	28,014	29,159	30,376	31,627	32,883	34,173	35,510	36,912	38,369	39,882	41,459	43,099	44,806
(GWh)																					
Lighting	3,294	3,435	3,589	3,755	3,926	4,096	4,265	4,444	4,622	4,811	5,012	5,218	5,426	5,638	5,859	6,091	6,331	6,581	6,841	7,111	7,393
Cooking	2,851	2,973	3,106	3,249	3,398	3,545	3,692	3,846	4,000	4,164	4,338	4,516	4,696	4,880	5,071	5,271	5,479	5,695	5,920	6,155	6,398
Entertainment	3,546	3,697	3,863	4,041	4,226	4,408	4,591	4,783	4,975	5,179	5,395	5,617	5,840	6,069	6,307	6,556	6,814	7,083	7,363	7,654	7,958
Air-conditioning	1,783	1,859	1,942	2,032	2,125	2,217	2,309	2,405	2,502	2,604	2,713	2,824	2,936	3,052	3,171	3,296	3,426	3,561	3,702	3,849	4,001
Amenity	483	504	526	551	576	601	626	652	678	706	735	765	796	827	859	893	929	965	1,003	1,043	1,084
Electric hot water	7,080	7,382	7,713	8,069	8,438	8,802	9,167	9,550	9,934	10,340	10,771	11,215	11,660	12,118	12,592	13,089	13,605	14,142	14,701	15,283	15,888
Other	928	968	1,011	1,058	1,106	1,154	1,202	1,252	1,303	1,356	1,412	1,471	1,529	1,589	1,651	1,716	1,784	1,855	1,928	2,004	2,083
LPG																					
(10³ tons)																					
Cooking	1,452	1,444	1,436	1,427	1,417	1,406	1,394	1,382	1,369	1,354	1,339	1,323	1,305	1,287	1,267	1,246	1,224	1,201	1,176	1,150	1,123
Fuel wood																					
(10³ tons)																					
Cooking	4,573	4,548	4,522	4,493	4,462	4,428	4,391	4,352	4,310	4,265	4,217	4,166	4,111	4,053	3,991	3,925	3,856	3,783	3,705	3,623	3,536
Charcoal																					
(10³ tons)																					
Cooking	5,224	5,197	5,166	5,133	5,097	5,059	5,017	4,972	4,924	4,873	4,818	4,759	4,697	4,630	4,560	4,485	4,406	4,322	4,233	4,139	4,040

Table 7Prediction of electricity consumption of the within-municipal small commercial sub-sector classified by end use activities of Scenario I, 2010-2030

Energy	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	5,437	5,724	6,046	6,403	6,779	7,182	7,598	8,038	8,491	8,955	9,437	9,937	10,490	11,077	11,700	12,363	13,068	13,817	14,613	15,460	16,361
(GWh)																					
Lighting	638	672	710	752	796	843	892	944	997	1,051	1,108	1,167	1,231	1,300	1,374	1,451	1,534	1,622	1,716	1,815	1,921
Cooking	391	412	435	461	488	517	547	579	611	645	679	715	755	798	842	890	941	995	1,052	1,113	1,178
Entertainment	1,047	1,102	1,164	1,233	1,305	1,383	1,463	1,547	1,635	1,724	1,817	1,913	2,019	2,132	2,252	2,380	2,516	2,660	2,813	2,976	3,149
Air-conditioning	896	943	996	1,055	1,117	1,184	1,252	1,325	1,399	1,476	1,555	1,638	1,729	1,825	1,928	2,037	2,154	2,277	2,408	2,548	2,696
Amenity	1,995	2,100	2,218	2,349	2,487	2,635	2,788	2,949	3,116	3,285	3,462	3,646	3,849	4,064	4,293	4,536	4,795	5,069	5,361	5,672	6,003
Other	470	495	522	553	586	621	656	694	734	774	815	859	906	957	1,011	1,068	1,129	1,194	1,263	1,336	1,414
LPG																					
(10³ tons)																					
Cooking	164	178	193	211	230	251	274	299	325	353	384	417	453	493	537	585	638	695	758	827	903
Fuel wood																					
(10³ tons)																					
Cooking	10	11	12	13	14	16	17	19	20	22	24	26	28	31	34	36	40	43	47	52	56
Charcoal																					
(10³ tons)																					
Cooking	247	268	292	318	347	379	413	451	491	533	579	629	684	745	811	883	963	1,049	1,144	1,248	1,362

Table 8 Prediction of electricity consumption of the outside-municipal small commercial sub-sector classified by end-use activities of Scenario I, 2010-2030

Energy	Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	Total electricity	7,259	7,642	8,071	8,548	9,050	9,588	10,144	10,731	11,336	11,955	12,599	13,266	14,004	14,788	15,620	16,505	17,446	18,445	19,509	20,639	21,842
(GWh)	Lighting	655	689	728	771	816	865	915	968	1,023	1,078	1,136	1,197	1,263	1,334	1,409	1,489	1,574	1,664	1,760	1,862	1,970
	Cooking	514	541	571	605	641	679	718	760	803	846	892	939	991	1,047	1,106	1,169	1,235	1,306	1,381	1,461	1,546
	Entertainment	718	756	798	845	895	948	1,003	1,061	1,121	1,182	1,246	1,312	1,385	1,463	1,545	1,632	1,725	1,824	1,929	2,041	2,160
	Air-conditioning	369	388	410	434	460	487	515	545	576	607	640	674	711	751	794	838	886	937	991	1,048	1,110
	Amenity	3,840	4,042	4,270	4,522	4,787	5,072	5,366	5,676	5,997	6,324	6,665	7,018	7,408	7,823	8,263	8,731	9,229	9,758	10,320	10,918	11,555
	Other	1,164	1,225	1,294	1,370	1,451	1,537	1,626	1,720	1,817	1,916	2,020	2,127	2,245	2,370	2,504	2,646	2,797	2,957	3,127	3,309	3,501
LPG (10 ³ tons)	Cooking	301	315	331	349	366	385	404	424	443	463	482	502	522	544	566	588	611	633	656	679	701
Fuel wood (10 ³ tons)	Cooking	231	242	255	268	282	296	311	326	341	356	371	385	401	418	435	452	469	487	504	521	539
Charcoal (10 ³ tons)	Cooking	368	385	404	425	447	470	493	517	541	565	588	612	638	664	690	718	745	773	800	828	855

Table 9 Prediction of electricity consumption of the residential sector classified by end-use activities of Scenario II, 2010-2030

Energy	Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	Total electricity	35,307	36,294	37,280	38,263	39,245	40,225	41,202	42,177	43,149	44,119	45,086	46,049	47,010	47,967	48,920	49,870	50,815	51,756	52,693	53,625	54,552
(GWh)	Lighting	4,582	4,604	4,625	4,646	4,666	4,686	4,705	4,724	4,742	4,760	4,777	4,794	4,810	4,825	4,839	4,853	4,866	4,877	4,888	4,898	4,907
	Cooking	4,000	4,020	4,039	4,059	4,077	4,096	4,114	4,131	4,148	4,165	4,181	4,197	4,212	4,227	4,241	4,254	4,267	4,279	4,290	4,301	4,310
	Entertainment	5,265	5,299	5,332	5,365	5,398	5,431	5,463	5,496	5,528	5,560	5,592	5,624	5,655	5,686	5,717	5,747	5,777	5,806	5,835	5,864	5,892
	Air-conditioning	8,123	8,769	9,415	10,061	10,707	11,354	12,000	12,646	13,292	13,938	14,585	15,231	15,877	16,523	17,169	17,815	18,462	19,108	19,754	20,400	21,046
	Amenity	2,277	2,494	2,711	2,927	3,144	3,361	3,578	3,795	4,012	4,228	4,445	4,662	4,879	5,096	5,313	5,529	5,746	5,963	6,180	6,397	6,614
	Electric hot water	9,759	9,803	9,845	9,887	9,928	9,968	10,006	10,043	10,079	10,114	10,147	10,179	10,209	10,238	10,265	10,290	10,313	10,334	10,353	10,369	10,384
	Other	1,300	1,306	1,312	1,318	1,324	1,330	1,336	1,342	1,347	1,353	1,358	1,363	1,368	1,372	1,377	1,381	1,385	1,389	1,392	1,395	1,398
LPG (10 ³ tons)	Cooking	1,895	1,901	1,906	1,911	1,916	1,921	1,925	1,929	1,932	1,935	1,938	1,940	1,941	1,942	1,943	1,943	1,943	1,942	1,940	1,938	1,935
Fuel wood (10 ³ tons)	Cooking	4,745	4,725	4,704	4,681	4,655	4,627	4,597	4,564	4,528	4,490	4,449	4,405	4,357	4,307	4,253	4,196	4,135	4,070	4,001	3,928	3,851
Charcoal (10 ³ tons)	Cooking	5,453	5,432	5,408	5,383	5,355	5,324	5,290	5,254	5,214	5,172	5,126	5,077	5,024	4,968	4,908	4,844	4,775	4,703	4,626	4,544	4,458

Table 10 Prediction of electricity consumption of the small commercial sector classified by end-use activities of Scenario II, 2010-2030

Energy	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity Total electricity (GWh)	13,304	14,163	15,108	16,143	17,232	18,399	19,610	20,892	22,224	23,598	25,036	26,537	28,184	29,936	31,802	33,791	35,912	38,174	40,589	43,168	45,923
Lighting	1,293	1,378	1,473	1,580	1,693	1,817	1,946	2,085	2,231	2,383	2,544	2,714	2,903	3,106	3,324	3,560	3,814	4,087	4,382	4,700	5,043
Cooking	905	963	1,027	1,099	1,175	1,258	1,345	1,437	1,534	1,634	1,740	1,852	1,975	2,108	2,250	2,403	2,567	2,743	2,932	3,135	3,354
Entertainment	1,764	1,887	2,025	2,179	2,344	2,524	2,714	2,919	3,135	3,361	3,602	3,858	4,143	4,450	4,783	5,143	5,532	5,954	6,410	6,905	7,441
Air-conditioning	1,873	2,023	2,172	2,321	2,470	2,619	2,768	2,917	3,066	3,215	3,364	3,513	3,662	3,811	3,960	4,109	4,258	4,407	4,556	4,705	4,854
Other	5,835	6,185	6,577	7,013	7,474	7,972	8,490	9,040	9,613	10,203	10,822	11,468	12,183	12,945	13,758	14,626	15,553	16,543	17,600	18,728	19,933
Other	1,633	1,728	1,834	1,952	2,076	2,209	2,347	2,494	2,646	2,801	2,964	3,132	3,319	3,517	3,727	3,951	4,188	4,441	4,709	4,994	5,298
LPG (10 ³ tons)	465	493	524	559	597	637	678	722	768	816	866	918	976	1,037	1,103	1,173	1,248	1,328	1,414	1,506	1,604
Fuel wood (10 ³ tons)	242	253	267	281	296	312	328	344	361	378	394	411	430	449	468	488	509	530	551	573	595
Charcoal (10 ³ tons)	615	653	696	744	794	849	907	968	1,032	1,098	1,168	1,241	1,322	1,408	1,501	1,601	1,708	1,822	1,945	2,077	2,218

Table 11 Prediction of electricity consumption of the within-municipal residential sub-sector classified by end-use activities of Scenario II, 2010-2030

Energy	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity Total electricity (GWh)	13,720	14,478	15,244	16,016	16,796	17,583	18,378	19,182	19,994	20,814	21,644	22,483	23,332	24,190	25,059	25,939	26,830	27,732	28,646	29,573	30,512
Lighting	1,288	1,327	1,367	1,409	1,452	1,496	1,542	1,589	1,637	1,688	1,739	1,793	1,848	1,905	1,964	2,025	2,087	2,152	2,219	2,288	2,360
Cooking	1,149	1,184	1,220	1,257	1,295	1,335	1,376	1,418	1,461	1,506	1,552	1,600	1,649	1,700	1,753	1,807	1,863	1,921	1,980	2,042	2,106
Entertainment	1,719	1,771	1,825	1,881	1,938	1,997	2,058	2,121	2,186	2,253	2,322	2,393	2,467	2,543	2,622	2,703	2,787	2,873	2,962	3,055	3,150
Air-conditioning	5,138	5,547	5,956	6,365	6,774	7,182	7,591	8,000	8,409	8,817	9,226	9,635	10,044	10,452	10,861	11,270	11,679	12,088	12,496	12,905	13,314
Amenity Electric hot water	1,375	1,506	1,637	1,768	1,899	2,030	2,161	2,292	2,423	2,553	2,684	2,815	2,946	3,077	3,208	3,339	3,470	3,601	3,732	3,863	3,994
Other	2,679	2,760	2,844	2,931	3,020	3,112	3,207	3,305	3,406	3,511	3,618	3,730	3,845	3,963	4,086	4,212	4,342	4,477	4,616	4,760	4,909
Other	371	383	394	406	419	431	445	458	472	487	502	517	533	549	566	584	602	621	640	660	680
LPG (10 ³ tons)	443	457	470	485	500	515	530	547	563	581	599	617	636	656	676	697	718	741	764	787	812
Fuel wood (10 ³ tons)	172	177	182	188	194	200	206	212	219	225	232	239	247	254	262	270	279	287	296	305	315
Charcoal (10 ³ tons)	228	235	242	250	257	265	273	281	290	299	308	318	327	337	348	359	370	381	393	405	418

Table 12 Prediction of electricity consumption of the outside-municipal residential sub-sector classified by end-use activities of Scenario II, 2010-2030

Energy	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity																					
(GWh)																					
Total electricity	21,586	21,815	22,036	22,247	22,449	22,642	22,824	22,995	23,156	23,305	23,442	23,566	23,678	23,776	23,861	23,930	23,985	24,024	24,047	24,052	24,040
Lighting	3,294	3,277	3,258	3,237	3,214	3,190	3,164	3,135	3,105	3,073	3,038	3,001	2,962	2,920	2,875	2,828	2,778	2,725	2,669	2,610	2,548
Cooking	2,851	2,836	2,819	2,801	2,782	2,761	2,738	2,714	2,687	2,659	2,629	2,597	2,563	2,527	2,488	2,448	2,404	2,359	2,310	2,259	2,205
Entertainment	3,546	3,527	3,507	3,484	3,460	3,434	3,405	3,375	3,342	3,307	3,270	3,230	3,188	3,143	3,095	3,044	2,990	2,933	2,873	2,809	2,742
Air-conditioning	2,984	3,222	3,459	3,697	3,934	4,171	4,409	4,646	4,884	5,121	5,358	5,596	5,833	6,071	6,308	6,545	6,783	7,020	7,258	7,495	7,732
Electric hot water	902	988	1,074	1,160	1,245	1,331	1,417	1,503	1,589	1,675	1,761	1,847	1,933	2,019	2,104	2,190	2,276	2,362	2,448	2,534	2,620
Other	7,080	7,042	7,001	6,956	6,908	6,856	6,799	6,738	6,673	6,603	6,529	6,450	6,365	6,275	6,179	6,078	5,970	5,857	5,736	5,609	5,475
Other	928	923	918	912	906	899	892	884	875	866	856	846	835	823	810	797	783	768	752	736	718
LPG (10 ³ tons)	1,452	1,444	1,436	1,427	1,417	1,406	1,394	1,382	1,369	1,354	1,339	1,323	1,305	1,287	1,267	1,246	1,224	1,201	1,176	1,150	1,123
Fuel wood (10 ³ tons)	4,573	4,548	4,522	4,493	4,462	4,428	4,391	4,352	4,310	4,265	4,217	4,166	4,111	4,053	3,991	3,925	3,856	3,783	3,705	3,623	3,536
Charcoal (10 ³ tons)	5,224	5,197	5,166	5,133	5,097	5,059	5,017	4,972	4,924	4,873	4,818	4,759	4,697	4,630	4,560	4,485	4,406	4,322	4,233	4,139	4,040

Energy	Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	Total electricity	5,949	6,446	6,993	7,594	8,238	8,936	9,676	10,473	11,321	12,216	13,173	14,194	15,324	16,549	17,878	19,321	20,890	22,596	24,454	26,478	28,684
(GWh)	Lighting	638	692	753	822	897	979	1,068	1,164	1,267	1,378	1,496	1,624	1,767	1,924	2,095	2,282	2,487	2,711	2,956	3,225	3,519
	Cooking	391	425	462	504	550	601	655	714	777	845	918	996	1,084	1,180	1,285	1,399	1,525	1,662	1,813	1,978	2,158
	Entertainment	1,047	1,135	1,235	1,348	1,471	1,606	1,751	1,909	2,078	2,259	2,453	2,663	2,898	3,154	3,435	3,741	4,077	4,445	4,847	5,288	5,770
	Air-																					
	Amenity conditioning	1,408	1,520	1,632	1,744	1,856	1,968	2,080	2,192	2,304	2,416	2,528	2,640	2,752	2,864	2,976	3,088	3,201	3,313	3,425	3,537	3,649
	Other	1,995	2,164	2,355	2,570	2,803	3,061	3,337	3,638	3,961	4,305	4,676	5,075	5,523	6,012	6,546	7,131	7,771	8,471	9,238	10,078	10,998
	Other	470	510	555	605	660	721	786	857	933	1,014	1,101	1,195	1,301	1,416	1,542	1,679	1,830	1,995	2,175	2,373	2,590
LPG (10 ³ tons)	Cooking	164	178	193	211	230	251	274	299	325	353	384	417	453	493	537	585	638	695	758	827	903
Fuel wood (10 ³ tons)	Cooking	10	11	12	13	14	16	17	19	20	22	24	26	28	31	34	36	40	43	47	52	56
Charcoal (10 ³ tons)	Cooking	247	268	292	318	347	379	413	451	491	533	579	629	684	745	811	883	963	1,049	1,144	1,248	1,362

Table 14 Prediction of electricity consumption of the outside-municipal small commercial sub-sector classified by end-use activities of Scenario II, 2010-2030

Energy	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	7,355	7,717	8,115	8,549	8,995	9,463	9,934	10,418	10,903	11,382	11,863	12,343	12,859	13,387	13,924	14,470	15,022	15,578	16,135	16,690	17,239
Total electricity	7,355	7,717	8,115	8,549	8,995	9,463	9,934	10,418	10,903	11,382	11,863	12,343	12,859	13,387	13,924	14,470	15,022	15,578	16,135	16,690	17,239
Lighting	655	686	720	758	796	837	879	921	964	1,006	1,048	1,090	1,136	1,182	1,230	1,278	1,327	1,376	1,426	1,475	1,524
Cooking	514	538	565	595	625	657	690	723	756	789	823	856	891	928	965	1,003	1,042	1,080	1,119	1,158	1,196
Entertainment	718	752	789	831	873	918	963	1,010	1,057	1,103	1,149	1,195	1,245	1,296	1,348	1,401	1,455	1,509	1,563	1,617	1,671
Air-conditioning	465	502	539	576	613	650	687	724	761	798	835	873	910	947	984	1,021	1,058	1,095	1,132	1,169	1,206
Other	3,840	4,021	4,222	4,443	4,671	4,911	5,153	5,402	5,652	5,898	6,146	6,393	6,660	6,933	7,212	7,495	7,782	8,072	8,361	8,650	8,935
Other	1,164	1,218	1,279	1,346	1,415	1,488	1,562	1,637	1,713	1,787	1,862	1,937	2,018	2,101	2,185	2,271	2,358	2,446	2,534	2,621	2,708
LPG (10 ³ tons)	301	315	331	349	366	385	404	424	443	463	482	502	522	544	566	588	611	633	656	679	701
Fuel wood (10 ³ tons)	231	242	255	268	282	296	311	326	341	356	371	385	401	418	435	452	469	487	504	521	539
Charcoal (10 ³ tons)	368	385	404	425	447	470	493	517	541	565	588	612	638	664	690	718	745	773	800	828	855

Table 15 Energy consumption of residential sector classified by end-use activities of EEP, 2010-2030

Energy	Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity	Total electricity	35,307	35,924	36,531	37,134	37,733	38,329	38,684	39,040	39,390	39,795	40,221	40,096	39,957	39,801	39,627	39,717	38,634	37,699	36,723	35,548	34,564
(GWh)	Lighting	4,582	4,468	4,344	4,217	4,090	3,959	3,808	3,660	3,508	3,413	3,341	3,187	3,034	2,881	2,724	2,849	2,621	2,583	2,544	2,503	2,460
	Cooking	4,000	4,020	4,039	4,059	4,077	4,096	4,114	4,131	4,148	4,165	4,181	4,197	4,212	4,227	4,241	4,254	4,267	4,279	4,290	4,301	4,310
	Entertainment	5,265	5,299	5,332	5,365	5,398	5,431	5,463	5,496	5,528	5,560	5,592	5,624	5,655	5,686	5,717	5,747	5,777	5,806	5,835	5,864	5,892
	Air-conditioning	8,123	8,557	8,991	9,425	9,859	10,293	10,585	10,877	11,169	11,461	11,753	11,761	11,769	11,776	11,784	11,792	11,627	11,461	11,295	10,973	10,119
	Amenity																					
	Electric hot water	2,277	2,472	2,667	2,862	3,057	3,253	3,372	3,491	3,610	3,730	3,849	3,786	3,710	3,621	3,519	3,404	2,644	1,848	1,014	143	0
	Other	9,759	9,803	9,845	9,887	9,928	9,968	10,006	10,043	10,079	10,114	10,147	10,179	10,209	10,238	10,265	10,290	10,313	10,334	10,353	10,369	10,384
	Other	1,300	1,306	1,312	1,318	1,324	1,330	1,336	1,342	1,347	1,353	1,358	1,363	1,368	1,372	1,377	1,381	1,385	1,389	1,392	1,395	1,398
LPG	Cooking	1,895	1,878	1,861	1,844	1,826	1,809	1,727	1,698	1,669	1,640	1,610	1,546	1,548	1,549	1,549	1,549	1,488	1,487	1,486	1,484	1,482
(10 ³ tons)																						
Fuel wood	Cooking	4,745	4,253	3,763	3,277	2,793	2,314	1,839	1,369	906	449	0	0	0	0	0	0	0	0	0	0	0
(10 ³ tons)																						
Charcoal	Cooking	5,453	5,470	5,442	5,405	5,357	5,299	5,392	5,481	5,565	5,644	5,717	5,662	5,602	5,539	5,472	5,400	5,323	5,242	5,155	5,064	4,967
(10 ³ tons)																						

Table 16 Energy consumption of small commercial sector classified by end-use activities of EEP, 2010-2030

Energy	Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity (GWh)	Total electricity	13,304	14,079	14,934	15,878	16,876	17,950	19,022	20,165	21,357	22,609	23,932	25,223	26,661	28,204	29,868	31,687	33,601	35,652	37,855	40,186	42,692
	Lighting	1,293	1,343	1,397	1,462	1,533	1,612	1,685	1,766	1,853	1,966	2,093	2,200	2,328	2,468	2,633	2,845	3,079	3,328	3,599	3,892	4,209
	Cooking	905	963	1,027	1,099	1,175	1,258	1,345	1,437	1,534	1,634	1,740	1,852	1,975	2,108	2,250	2,403	2,567	2,743	2,932	3,135	3,354
	Entertainment	1,764	1,887	2,025	2,179	2,344	2,524	2,714	2,919	3,135	3,361	3,602	3,858	4,143	4,450	4,783	5,143	5,532	5,954	6,410	6,905	7,441
	Air-conditioning	1,873	1,974	2,074	2,174	2,274	2,374	2,441	2,509	2,576	2,643	2,711	2,713	2,714	2,716	2,718	2,720	2,682	2,643	2,605	2,531	2,457
	Other	5,835	6,185	6,577	7,013	7,474	7,972	8,490	9,040	9,613	10,203	10,822	11,468	12,183	12,945	13,758	14,626	15,553	16,543	17,600	18,728	19,933
	Other	1,633	1,728	1,834	1,952	2,076	2,209	2,347	2,494	2,646	2,801	2,964	3,132	3,319	3,517	3,727	3,951	4,188	4,441	4,709	4,994	5,298
LPG (10 ³ tons)	Cooking	465	479	496	516	538	563	563	600	638	678	719	732	778	827	879	935	956	1,017	1,083	1,153	1,228
Fuel wood (10 ³ tons)	Cooking	242	4,253	3,763	3,277	2,793	2,314	1,839	1,369	906	449	0	0	0	0	0	0	0	0	0	0	0
Charcoal (10 ³ tons)	Cooking	615	648	680	715	750	786	848	914	983	1,055	1,131	1,200	1,275	1,357	1,443	1,536	1,635	1,741	1,854	1,976	2,105

Table 17 Energy labeling of high efficient fluorescence lamp campaign for residential sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference BAU consumption from lamps (GWh)		3234	3261	3293	3322	3353	3383	3413	3446	3460	3500	3540	3574	3605	3639	3672	3706	3741	3775	3810	3845
Required No. of lamps in given year (M)	Initial No. of lamps	117	118	119	120	122	123	124	125	125	127	128	130	131	132	133	134	136	137	138	139
No. of new of 30W lamps in year (M)		12	12	12	12	12	6	6	6	6	6	6									
Total No. of 36W lamps remaining in year (M)	117	106	95	84	73	62	43	25	6	0	0					5					
Total No. of 30W lamps remaining in year (M)	0	12	24	35	48	60	67	74	82	70	58	46	33	19	6	0	0				
No. of new of 28W lamps in year (M)							12	12	12	13	13	1	1	1	1	1	0	0			
Total No. of 28W lamps remaining in year (M)						0	12	25	37	56	69	70	71	72	74	68	56	43	31	18	6
No. of new of 25W lamps in year (M)											31	13	13	13	13	13	13	14	14	14	14
Total No. of 25W lamps remaining in year (M)											0	13	26	39	52	65	79	92	106	120	134
Total GWh from all lamps		3180	3153	3130	3104	3079	3000	2921	2843	2798	2812	2794	2770	2745	2720	2844	2702	2697	2692	2688	2683
Check total No. of lamps		117	118	119	120	122	123	124	125	125	127	128	130	131	132	138	134	136	137	138	139
Saving of lamp (GWh)		54	108	163	218	274	383	492	603	662	688	747	804	861	919	827	1005	1044	1083	1122	1162

Table 18 Energy labeling of high efficient fluorescence lamp campaign for small commercial sector, 2011-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference BAU consumption from lamps (GWh)		972	989	1007	1024	1043	1061	1079	1099	1111	1136	1160	1182	1204	1227	1250	1274	1298	1324	1350	1376
Required No. of lamps in given year (M)	Initial No. of lamps	24	25	25	26	26	27	27	28	28	29	29	30	30	31	31	32	33	33	34	35
No. of new of 30W lamps in year (M)		2	2	3	3	3	3	1	1	1	1	1									
Total No. of 36W lamps remaining in year (M)	24	22	20	18	16	14	10	5	1	0	0										
Total No. of 30W lamps remaining in year (M)	0	2	5	7	10	13	14	16	18	16	13	10	8	4	1	0	0				
No. of new of 28W lamps in year (M)						3	3	3	3	3	3	0	0	0	0	0	0	0			
Total No. of 28W lamps remaining in year (M)						3	5	8	12	15	16	16	17	17	17	16	14	11	8	6	3
No. of new of 25W lamps in year (M)										7	3	3	3	3	3	3	3	3	3	3	3
Total No. of 25W lamps remaining in year (M)											3	6	9	12	15	18	22	25	28	32	
Total GWh from all lamps		956	956	957	957	959	941	924	907	899	913	916	917	917	917	922	930	938	947	956	965
Check total No. of lamps		24	25	25	26	26	27	27	28	28	29	29	30	30	31	31	32	33	33	34	35
Saving of lamp (GWh)		16	33	49	67	84	119	155	192	212	223	244	266	287	309	328	344	360	377	394	411

Table 19 Energy labeling of electronic ballast campaign for residential sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference BAU consumption from ballasts (GWh)		988	996	1006	1015	1025	1034	1043	1053	1057	1069	1082	1092	1102	1112	1122	1133	1143	1154	1164	1175
Required No. of ballasts in given year (M)		117	118	119	120	122	123	124	125	125	127	128	130	131	132	133	134	136	137	138	139
No. of new electronic ballasts	Initial No. of Ballasts	6	6	6	6	6	6	6	6	6	6	6	13	13	13	13	8	1	1	1	1
No. of total electronic ballasts in year (M)		6	12	18	24	30	36	42	48	55	61	74	87	100	113	126	134	136	137	138	139
Total of magnetic ballasts remaining in year (M)	117	111	105	99	93	87	81	75	69	63	56	43	30	17	4	7					
Total GWh from all ballasts		943	898	852	806	759	712	665	617	569	520	422	323	223	122	154	103	104	105	106	107
Check total No. of ballasts (M)		117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	133	134	136	137	139
Saving of ballast (GWh)		45	99	154	209	265	321	378	436	488	549	660	769	879	990	968	1030	1039	1049	1058	1068

Table 20 Energy labeling of electronic ballast campaign for small commercial sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference BAU consumption from ballastss (GWh)		297	302	308	313	319	324	330	336	339	347	355	361	368	375	382	389	397	405	412	421
Required No. of ballasts in given year (M)		24	25	25	26	26	27	27	28	28	29	29	30	30	31	31	32	33	33	34	35
No. of new electronic ballasts	Initial No. of Ballasts	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3	4	1	1	1
No. of total electronic ballasts in year (M)		1	2	4	5	6	8	9	10	12	13	16	19	22	25	28	32	33	33	34	35
Total of magnetic ballasts remaining in year (M)	24	23	22	21	19	18	17	15	14	13	11	8	5	2	0	0					
Total GWh from all ballasts		284	270	256	242	227	212	197	182	167	151	119	86	52	28	31	35	36	37	37	38
Check total No. of ballasts (M)		24	24	24	24	24	24	24	24	24	24	24	24	24	24	25	28	32	33	33	34
Saving of ballast (GWh)		14	32	52	71	91	112	132	154	173	196	236	275	315	347	350	354	361	368	375	382

Table 21 Exchange incandescence lamp for CFL campaign of residential sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference BAU consumption from incandescence lamp (GWh)		226	228	230	232	234	236	238	240	243	244	247	249	252	254	256	259	261	263	266	268
Required No. of ballasts in given year (M)		1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total of incandescence lamp remaining in year (M)		5	4	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of total CFL in year (M)		0	1	2	3	5	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7
Total electricity in given year (GWh)		191	156	121	85	49	45	46	46	47	48	48	49	49	50	51	51	52	53	53	54
Saving of lamp (GWh)		37	74	111	149	187	193	195	196	197	199	201	203	205	206	208	210	212	213	215	217

Table 22 Exchange incandescence lamp for CFL campaign of small commercial sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference BAU consumption from incandescence lamp (GWh)		34	35	35	36	37	37	38	39	40	41	41	42	43	44	45	45	46	47	48	49
Required No. of ballasts in given year (M)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total of incandescence lamp remaining in year (M)		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of total CFL in year (M)		0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total electricity in given year (GWh)		29	24	19	13	8	7	7	7	7	8	8	8	8	8	8	8	9	9	9	9
Saving of lamp (GWh)		6	11	17	23	29	31	31	32	32	33	34	34	35	36	36	37	38	38	39	40

Table 23 Energy labeling of high efficient gas stove campaign of the within-municipal residential sub-sector, 2010-2030

		1,000 tons																			
2010		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference LPG Consumption	443	457	470	485	500	515	530	547	563	581	599	617	636	656	676	697	718	741	764	787	812
49% Stove		399	355	310	266	222	177	133	89	44	-	-	-	-	-	-	-	-	-	-	-
Stove Lot (2011-2015)		51	103	154	207	259	244	244	244	244	244	188	141	95	47	-	-	-	-	-	-
Stove Lot (2016-2020)		-	-	-	-	-	50	100	151	202	254	243	243	243	243	243	188	142	95	48	-
Stove Lot (2021-2025)		-	-	-	-	-	-	-	-	-	-	61	122	185	248	312	300	300	300	300	300
Stove Lot (2025-2030)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63	126	190	256	322
Program		450	457	465	473	481	471	477	483	490	497	492	507	523	539	555	550	567	585	603	622
Saving of LPG (1,000 tons)		7	13	20	27	34	60	70	80	91	101	125	129	133	137	141	168	173	179	184	190

Table 24 Energy labeling of high efficient gas stove campaign of the outside-municipal residential sub-sector, 2010-2030

		1,000 tons																				
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference LPG Consumption	1,452	1,444	1,436	1,427	1,417	1,406	1,394	1,382	1,369	1,354	1,339	1,323	1,305	1,287	1,267	1,246	1,224	1,201	1,176	1,150	1,123	
49% Stove		1,307	1,162	1,016	871	726	581	436	290	145	-	-	-	-	-	-	-	-	-	-	-	-
Stove Lot (2011-2015)		122	243	363	483	602	565	565	565	565	565	432	323	215	107	-	-	-	-	-	-	-
Stove Lot (2016-2020)		-	-	-	-	-	111	221	331	440	547	525	525	525	525	525	402	301	200	99	-	-
Stove Lot (2021-2025)		-	-	-	-	-	-	-	-	-	-	97	192	286	378	468	450	450	450	450	450	450
Stove Lot (2025-2030)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	85	169	251	332	410	-
Program		1,428	1,404	1,379	1,379	1,354	1,328	1,257	1,222	1,186	1,150	1,112	1,054	1,041	1,026	1,010	994	938	920	901	881	860
Saving of LPG (1,000 tons)		16	32	47	63	78	138	160	182	205	227	268	268	265	261	257	253	287	281	276	269	263

Table 25 Energy labeling of high efficient gas stove campaign of the within-municipal small commercial sub-sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference LPG Consumption	164	178	193	211	230	251	274	299	325	353	384	417	453	493	537	585	638	695	758	827	903
49% Stove	131	98	84	65	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stove Lot (2011-2015)	41	84	129	175	222	270	170	130	88	45	-	-	-	-	-	-	-	-	-	-	-
Stove Lot (2016-2020)	-	-	-	-	-	-	58	118	182	249	319	251	192	131	67	-	-	-	-	-	-
Stove Lot (2021-2025)	-	-	-	-	-	-	-	-	-	-	-	81	169	262	361	467	370	286	196	101	-
Stove Lot (2025-2030)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	118	246	384	532	691
Program	172	182	194	207	227	222	227	248	270	293	319	332	361	393	428	467	488	532	581	633	691
Saving of LPG (1,000 tons)	5	11	17	23	29	29	46	51	55	60	65	84	92	100	109	119	149	163	178	194	211

Table 26 Energy labeling of high efficient gas stove campaign of the outside-municipal small commercial sub-sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference LPG Consumption	301	315	331	349	366	385	404	424	443	463	482	502	522	544	566	588	611	633	656	679	701
49% Stove	241	181	120	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stove Lot (2011-2015)	66	133	202	271	341	341	258	195	131	66	-	-	-	-	-	-	-	-	-	-	-
Stove Lot (2016-2020)	-	-	-	-	-	-	78	157	238	319	401	310	234	156	79	-	-	-	-	-	-
Stove Lot (2021-2025)	-	-	-	-	-	-	-	-	-	-	-	90	183	277	373	469	364	275	184	92	-
Stove Lot (2025-2030)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104	210	319	427	537
Program	307	314	322	331	331	341	336	352	368	384	401	400	417	434	451	469	468	485	502	520	537
Saving of LPG (1,000 tons)	9	17	26	35	44	44	68	72	75	78	82	102	106	110	115	119	143	148	154	159	164

Table 27 Energy labeling of high efficient charcoal stove campaign of the within-municipal residential sub-sector, 2011-2030

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference Charcoal (1,000 tons)	242	255	269	283	298	314	330	347	365	384	396	408	420	433	447	461	475	490	505	521
Useful Heat from 25% Stove Ref. (MMJ)	1,368	1,443	1,520	1,601	1,686	1,775	1,867	1,963	2,064	2,169	2,236	2,305	2,376	2,449	2,525	2,603	2,684	2,768	2,854	2,943
Useful Heat from 30% Stove Ref. (MMJ)	456	481	507	534	562	592	622	654	688	723	745	768	792	816	842	868	895	923	951	981
Useful Heat from 25% Stove Remaining (MMJ)	1,095	866	608	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Useful Heat from 30% stove Remaining (MMJ)	730	1,058	1,419	1,815	2,248	2,366	2,489	2,618	2,752	2,892	2,981	3,073	3,168	3,266	3,367	3,471	3,579	3,690	3,805	3,924
Charcoal from 25% Stove (1,000 tons)	152	120	84	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Charcoal from 30% Stove (1,000 tons)	84	122	164	209	259	273	287	302	318	334	344	355	366	377	389	401	413	426	439	453
Saving of Charcoal (1,000 tons)	6	13	21	30	39	41	43	45	48	50	52	53	55	57	58	60	62	64	66	68

Table 28 Energy labeling of high efficient charcoal stove campaign of the outside-municipal residential sub-sector, 2011-2030

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference Charcoal (1,000 tons)	5374	5486	5594	5697	5795	5887	5973	6053	6125	6190	6115	6035	5949	5859	5763	5661	5553	5439	5318	5191
Useful Heat from 25% Stove Ref. (MMJ)	30,365	31,001	31,611	32,193	32,745	33,265	33,751	34,200	34,610	34,978	34,553	34,099	33,617	33,105	32,562	31,986	31,376	30,732	30,051	29,332
Useful Heat from 30% Stove Ref. (MMJ)	10,122	10,334	10,537	10,731	10,915	11,088	11,250	11,400	11,537	11,659	11,518	11,366	11,206	11,035	10,854	10,662	10,459	10,244	10,017	9,777
Useful Heat from 25% Stove Remaining (MMJ)	24,292	18,601	12,644	6,439	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Useful Heat from 30% stove Remaining (MMJ)	16,195	22,734	29,504	36,486	43,660	44,354	45,002	45,600	46,147	46,638	46,070	45,465	44,823	44,140	43,415	42,648	41,835	40,976	40,068	39,109
Charcoal from 25% Stove (1,000 tons)	3,365	2,576	1,751	892	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Charcoal from 30% Stove (1,000 tons)	1,869	2,624	3,405	4,211	5,039	5,119	5,194	5,263	5,326	5,383	5,317	5,248	5,173	5,095	5,011	4,922	4,829	4,729	4,625	4,514
Saving of Charcoal (1,000 tons)	140	286	438	595	756	768	779	789	799	807	798	787	776	764	752	738	724	709	694	677



Table 29 Energy labeling of high efficient charcoal stove campaign of the within-municipal small commercial sub-sector, 2011-2030

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference Charcoal (1,000 tons)	270	294	322	351	384	419	458	499	543	591	641	697	759	827	901	981	1070	1167	1273	1389
Useful Heat from 25% Stove Ref. (MMJ)	1,526	1,663	1,817	1,985	2,170	2,369	2,586	2,819	3,068	3,337	3,621	3,941	4,289	4,671	5,088	5,545	6,045	6,592	7,191	7,847
Useful Heat from 30% Stove Ref. (MMJ)	509	554	606	662	723	790	862	940	1,023	1,112	1,207	1,314	1,430	1,557	1,696	1,848	2,015	2,197	2,397	2,616
Useful Heat from 25% Stove Remaining (MMJ)	1,221	998	727	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Useful Heat from 30% Stove Remaining (MMJ)	814	1,219	1,696	2,249	2,893	3,158	3,448	3,759	4,090	4,449	4,829	5,254	5,719	6,228	6,784	7,393	8,059	8,789	9,588	10,463
Charcoal from 25% Stove (1,000 tons)	169	138	101	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Charcoal from 30% Stove (1,000 tons)	94	141	196	260	334	365	398	434	472	513	557	606	660	719	783	853	930	1,014	1,107	1,208
Saving of Charcoal (1,000 tons)	7	15	25	37	50	55	60	65	71	77	84	91	99	108	117	128	140	152	166	181

Table 30 Energy labeling of high efficient charcoal stove campaign of the outside-municipal small commercial sub-sector, 2011-2030

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Reference Charcoal (1,000 tons)	395	423	454	486	520	556	593	631	670	710	739	769	801	833	866	899	932	966	999	1032
Useful Heat from 25% Stove Ref. (MMJ)	2,232	2,390	2,563	2,745	2,940	3,140	3,351	3,567	3,786	4,012	4,173	4,347	4,526	4,708	4,893	5,080	5,269	5,458	5,646	5,833
Useful Heat from 30% Stove Ref. (MMJ)	744	797	854	915	980	1,047	1,117	1,189	1,262	1,337	1,391	1,449	1,509	1,569	1,631	1,693	1,756	1,819	1,882	1,944
Useful Heat from 25% Stove Remaining (MMJ)	1,786	1,434	1,025	549	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Useful Heat from 30% Stove Remaining (MMJ)	1,191	1,752	2,392	3,111	3,920	4,187	4,468	4,756	5,048	5,349	5,564	5,796	6,034	6,277	6,523	6,773	7,025	7,277	7,529	7,777
Charcoal from 25% Stove (1,000 tons)	247	199	142	76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Charcoal from 30% Stove (1,000 tons)	137	202	276	359	452	483	516	549	583	617	642	669	696	724	753	782	811	840	869	898
Saving of Charcoal (1,000 tons)	10	22	35	51	68	72	77	82	87	93	96	100	104	109	113	117	122	126	130	135

Table 31 MEPs and HEPs of air conditioner campaign (new air conditioner) for residential sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Air Conditioner (BAU II)	8,123	8,769	9,415	10,061	10,707	11,354	14,585	15,231	15,877	16,523	17,169	17,815	18,462	19,108	19,754	20,400	21,046
BAU (EER 10) of annual new A/C		646	646	646	646	646	646	646	646	646	646	646	646	646	646	646	646
BAU A/C consumption in given year		646	1,292	1,939	2,585	3,231	6,462	7,108	7,754	8,400	9,047	9,693	10,339	10,985	11,631	12,277	12,924
MEPS		587	587	587	587	587	517	462	462	462	462	462	380	380	380	380	380
HEPS		517	517	517	517	517	462	380	380	380	380	380	349	349	349	349	349
Program new A/C in given year		552	552	552	552	552	489	205	205	205	205	205	94	94	94	94	94
Program A/C consumption in given year		552	1,104	1,657	2,209	2,761	5,207	5,413	5,618	5,823	6,028	6,234	6,328	6,422	6,517	6,611	6,705
Savings in given year		94	188	282	376	470	1,255	1,695	2,136	2,577	3,018	3,459	4,011	4,563	5,115	5,667	6,219

Table 32 MEPs and HEPs of air conditioner campaign (new air conditioner) for small commercial sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Air Conditioner (BAU II)	1,873	2,023	2,172	2,321	2,470	2,619	3,364	3,513	3,662	3,811	3,960	4,109	4,258	4,407	4,556	4,705	4,854
BAU (EER 10) of annual new A/C		149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149
BAU A/C consumption in given year		149	298	447	596	745	1,490	1,639	1,788	1,938	2,087	2,236	2,385	2,534	2,683	2,832	2,981
MEPS		135	135	135	135	135	119	106	106	106	106	106	88	88	88	88	88
HEPS		119	119	119	119	119	106	88	88	88	88	88	81	81	81	81	81
Program new A/C in given year		127	127	127	127	127	113	47	47	47	47	47	22	22	22	22	22
Program A/C consumption in given year		127	255	382	509	637	1,201	1,248	1,296	1,343	1,390	1,438	1,460	1,481	1,503	1,525	1,547
Savings in given year		22	43	65	87	108	289	391	493	594	696	798	925	1,052	1,180	1,307	1,434

Table 33 MEPs and HEPs of air conditioner campaign (existing air conditioner) for residential sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Air Conditioner (BAU II)	8,123	8,769	9,415	10,061	10,707	11,354	14,585	15,231	15,877	16,523	17,169	17,815	18,462	19,108	19,754	20,400	21,046
Annual existing BAU (EER 10) to be replaced		812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812
BAU consumption of existing A/C in given year		7,310	6,498	5,686	4,874	4,061	0	0	0	0	0	0	0	0	0	0	0
MEPS		738	738	738	738	738	650	580	580	580	580	580	478	478	478	478	478
HEPS		650	650	650	650	650	580	478	478	478	478	478	439	439	439	439	439
Program new A/C replacement in given year		694	694	694	694	694	615	529	529	529	529	529	458	458	458	302	302
Program A/C consumption in given year		8,005	7,886	7,768	7,650	7,532	6,546	6,381	6,215	6,050	5,885	5,720	5,563	5,407	5,250	4,937	4,624
Savings in given year		118	236	354	473	591	1,577	1,742	1,907	2,072	2,238	2,403	2,559	2,716	2,872	3,186	3,499

Table 34 MEPs and HEPs of air conditioner campaign (existing air conditioner) for small commercial sector, 2010-2030

	2010	2011	2012	2013	2014	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Air Conditioner (BAU II)	1,873	2,023	2,172	2,321	2,470	2,619	3,364	3,513	3,662	3,811	3,960	4,109	4,258	4,407	4,556	4,705	4,854
Annual existing BAU (EER 10) to be replaced		187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187
BAU consumption of existing A/C in given year		1,686	1,499	1,311	1,124	937	0	0	0	0	0	0	0	0	0	0	187
MEPS		170	170	170	170	170	150	134	134	134	134	134	110	110	110	110	110
HEPS		150	150	150	150	150	134	110	110	110	110	110	101	101	101	101	101
Program new A/C replacement in given year		160	160	160	160	160	142	122	122	122	122	122	106	106	106	70	70
Program A/C consumption in given year		1,846	1,819	1,792	1,764	1,737	1,510	1,472	1,434	1,395	1,357	1,319	1,283	1,247	1,211	1,139	1,067
Savings in given year		27	55	82	109	136	364	402	440	478	516	554	590	626	663	735	807

Table 35 Hybrid cooling system and solar cooling system air conditioning campaign for residential sector, 2021-2030

	2010	2011	2012	2013	2014	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Air Conditioner (BAU II)	8,123	8,769	9,415	10,061	10,707	11,354	14,585	15,231	15,877	16,523	17,169	17,815	18,462	19,108	19,754	20,400	21,046
Fraction of new BAU A/C (EER 10) in given year								65	65	65	65	65	129	129	129	129	646
Fraction of BAU A/C consumption in given year								65	129	194	258	323	452	582	711	840	1,486
Hybrid Cooling System								32	32	32	32	32	16	16	16	16	81
Solar Cooling System													10	10	10	10	48
Program new A/C in given year								32	32	32	32	32	26	26	26	26	11
Program A/C consumption in given year								32	65	97	129	162	187	213	239	265	276
Savings in given year								32	65	97	129	162	265	368	472	575	1,210

Table 36 Hybrid cooling system and solar cooling system air conditioning campaign for small commercial sector, 2021-2030

	2010	2011	2012	2013	2014	2015	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Air Conditioner (BAU II)	1,873	2,023	2,172	2,321	2,470	2,619	3,364	3,513	3,662	3,811	3,960	4,109	4,258	4,407	4,556	4,705	4,854
Fraction of new BAU A/C (EER 10) in given year								15	15	15	15	15	30	30	30	30	30
Fraction of BAU A/C consumption in given year								15	30	45	60	75	104	134	164	194	224
Hybrid Cooling System								7	7	7	7	7	4	4	4	4	4
Solar Cooling System													2	2	2	2	2
Program new A/C in given year								7	7	7	7	7	6	6	6	6	6
Program A/C consumption in given year								7	15	22	30	37	43	49	55	61	67
Savings in given year								7	15	22	30	37	61	85	109	133	156

Table 37 Promotion for air conditioner which produces hot water campaign, 2010-2030

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electricity demand of electric water heater (BAU II)	2,277	2,494	2,710	2,927	3,144	3,361	3,578	3,795	4,012	4,228	4,445	4,662	4,879	5,096	5,313	5,529	5,746	5,963	6,180	6,397	6,614
Annual electricity demand of new electric water heater	217	217	217	217	217	217	217	217	217	217	217	-	-	-	-	-	-	-	-	-	-
Electricity demand of existing electric water heater	2,472	2,667	2,862	3,057	3,253	3,372	3,491	3,610	3,730	3,960	4,008	4,044	4,066	4,066	4,075	4,071	3,422	2,737	2,014	1,255	-
Saving in each year	22	22	22	22	22	22	98	98	98	98	98	280	293	306	319	332	977	1,014	1,051	1,087	360
Saving in given year	22	43	65	87	108	206	304	401	499	596	876	1,169	1,475	1,793	2,125	3,102	4,116	5,166	6,254	6,614	6,614



