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Achievable Potential Study: Long Term Analysis (Addendum 1 – Market Achievable Potential)

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1 Introduction

The achievable potential study i a requirement of a direction from Ontario's Minister of Energy and a condition of the Energy Conservation Agreement between the IESO and Ontario's local distribution companies (LDCs), which governs the *2015 - 2020 Conservation First Framework*. The IESO is require to coordinate, support and fund the delivery of conservation and demand management (CDM) programs by LDCs to achieve a total of 7 TWh of persisting reductions in electricity consumption between January 1, 2015 and December 31, 2020.

Nexant was retained by IESO to undertake the APS, and to deliver results and reports for two study periods: a short term period up to 2020 and a long term period up to 2035. These reports were completed during the middle of 2016. These reports contained achievable potential scenarios that modelled energy efficiency savings predicated on the continuation of existing incentive levels.

To provide additional information for the long term analysis, an additional achievable potential scenario was modelled that estimates a market achievable potential based on an incentive level of 100%. This addendum to the long term analysis report provides the results of ***this market achievable potential*** scenario.

2 Methodology

The methodology to estimate the achievable potential is described in the main report and this addendum only summarizes the additional methodology steps to estimate the market achievable potential.

To calculate the market achievable long term potential, a market delivery approach was assumed with all programs offering rebates covering 100% of the incremental cost of measures. With the additional rebate incentives, the increase in market adoption of measures was estimated using the customer price elasticity research that was conducted as part of the potential study.

The following steps were followed:

- First, the percentage increase from the base-case (or current incentive rates) to the hypothetical 100% incentive scenario for each program and technology type was calculated. For example, if the commercial archetype program was currently offering a 55% incentive rate for prescriptive lighting (base achievable scenario), a percentage increase of 81% in incentives for the market achievable scenario (difference between 100% and 55% incentive rates) was calculated.
- Next, an adoption rate adjustment factor for each program was calculated, using the researched price elasticity factors of 0.25 for residential programs and 0.46 for commercial programs. Continuing the commercial sector example for prescriptive lighting measures, an adoption rate adjustment factor of 1.37 (i.e. 1.37=1+[0.81*0.46]) was calculated.
- Base achievable savings values for each measure were scaled according to their program's adoption rate adjustment factor to estimate market achievable savings potential. Program costs (namely incentive costs) were also adjusted to account for the 100% incentive rates.

3 Results and Discussion

This section provides an update on the portfolio level results for the achievable potential scenarios, to include the market achievable scenario. The main report provides the detailed sector results for the unconstrained and budget-constrained achievable potential scenarios, and the results will not be repeated in this addendum.

3.1.1 Portfolio

The achievable potential in 2035 is estimated to be an annual persistent saving of 29,052GWh (or 20% of the total forecasted base case electricity use in 2035) for the market scenario, 17,918 GWh (or 12. % of the to al base case electricity use in 2035) for the unconstrained scenario, and 17,810 GWh (or 12.1% of the total base case electricity use in 2035) for the budget constrained scenario.

For the market scenario, the largest portion of the potential savings comes from the commercial sector, which accounts for 76% of the savings, while the residential sector accounts for 9%, and the industrial sector accounts for the remaining 15%. The absolute amount and relative proportion of savings by sector for each achievable potential scenario is illustrated in Figure 3-1.

Comparing the savings potential of the market achievable potential scenario with the other two achievable potential scenarios, the commercial sector has a significantly larger increase in savings than the residential sector. The main reasons for this relatively larger increase in commercial sector savings are:

- The commercial customers are more price sensitive (with an elasticity ratio of 0.46) than residential customers (with an elasticity ratio of 0.25). This means that for the same incremental increase in incentive, incrementally more adoption of measures occur in the commercial sector compared to the residential sector.
- The base-case incentive rate percentages for residential archetype programs are, on average, greater than for commercial archetype programs. This means that the incremental increase to go from the base-case incentive rate to 100% incentive rate is greater for the commercial sector, resulting in adoption of more measures when compared with the residential sector.

The portfolio cost effectiveness in terms of TRC and PAC by scenario is summarized in Table 3-1, while the acquisition cost analysis is summarized in Table 3-2. Comparing the TRC and PAC, the market achievable potential scenario follows a similar trend compared to the budget constrained achievable potential scenarios, where the commercial and industrial sectors are relatively more cost effective compared to the residential sector.

The total portfolio acquisition cost is estimated to be $ 515 / MWh for the market achievable potential scenario. In this scenario, the commercial sector has the lowest acquisition cost at $ 395 / MWH and the residential sector has the highest total cost at $ 1,369 / MWh.

Figure 3-1: Achievable Potential Persistent Savings by Sector in 2035

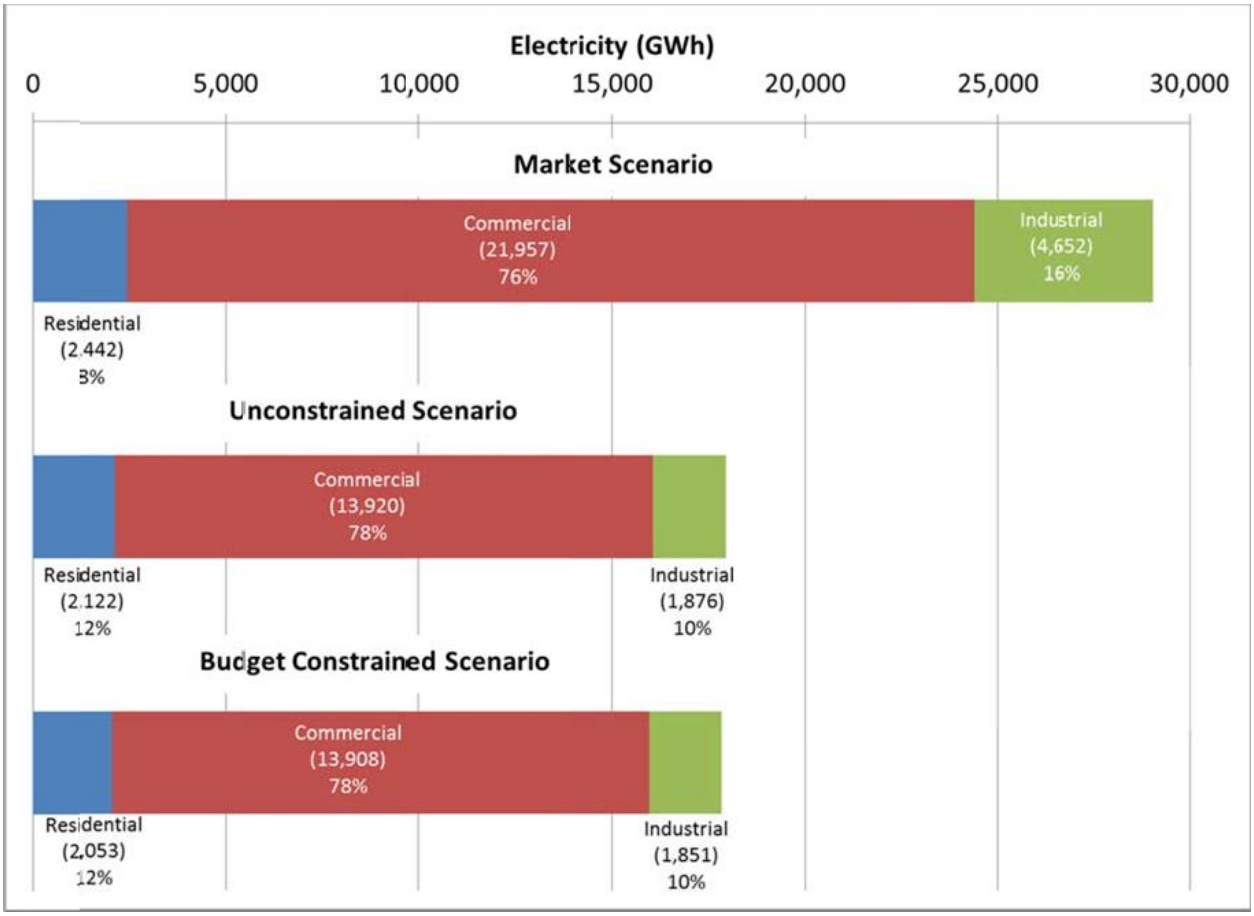


Table 3-1: TRC and PAC Cost-Effectiveness (2015-2035)[1]

Archetype Program	TRC				PAC			
	NPV Costs ($ mil.)	NPV Benefits ($ mil.)	NPV Net Benefits ($ mil.)	TRC BC Ratio	NPV Costs ($ mil.)	NPV Benefits ($ mil.)	NPV Net Benefits ($ mil.)	PAC BC Ratio
Portfolio								
Technical	$55,768	$3,896	-$51,872	0.1	$14,130	$3,388	-$10,743	0.2
Economic	$798	$2,235	$1,440	2.8	$422	$1,946	$1,524	4.6
Achievable: Market	$519	$1,568	$1,049	3.0	$425	$1,364	$939	3.2
Achievable: Unconstrained	$327	$984	$657	3.0	$197	$856	$659	4.4
Achievable: Budget Constrained	$325	$978	$653	3.0	$195	$851	$656	4.4
Residential								
Technical	$3,617	$1,412	-$2,205	0.4	$2,170	$1,228	-$942	0.6
Economic	$423	$721	$298	1.7	$276	$627	$350	2.3
Achievable: Market	$100	$172	$72	1.7	$100	$150	$50	1.5
Achievable: Unconstrained	$87	$151	$64	1.7	$59	$132	$72	2.2
Achievable: Budget Constrained	$86	$147	$61	1.7	$58	$128	$70	2.2
Commercial								
Technical	$50,499	$2,169	-$48,330	0.0	$11,538	$1,886	-$9,652	0.2
Economic	$295	$1,260	$965	4.3	$112	$1,095	$984	9.8
Achievable: Market	$336	$1,173	$837	3.5	$243	$1,020	$778	4.2
Achievable: Unconstrained	$207	$744	$537	3.6	$117	$647	$530	5.5
Achievable: Budget Constrained	$207	$743	$537	3.6	$117	$646	$530	5.5
Industrial								
Technical	$1,652	$315	-$1,337	0.2	$423	$274	-$149	0.6
Economic	$80	$254	$177	3.3	$33	$223	$188	6.7
Achievable: Market	$83	$223	$141	2.7	$82	$194	$112	2.4
Achievable: Unconstrained	$33	$89	$56	2.7	$21	$77	$57	3.7
Achievable: Budget Constrained	$33	$88	$55	2.7	$21	$77	$56	3.7

[1] All cost values are based on net present v lue calculations

Table 3-2: Acquisition Cost (2015 - 2035)

Archetype Program	2015-2035 Program Costs ($ mil.)	2015-2035 Program Savings (MWh)	Acquisition Costs ($/MWh)
Portfolio			
Technical	$1,441,698	78,581,329	$18,347
Economic	$27,278	45,566,515	$599
Achievable: Market	$14,967	29,051,561	$515
Achievable: Unconstrained	$5,534	17,918,143	$309
Achievable: Budget Constrained	$5,479	17,810,563	$308
Residential			
Technical	$105,300	27,640,868	$3,810
Economic	$13,265	14,335,342	$925
Achievable: Market	$3,344	2,442,375	$1,369
Achievable: Unconstrained	$2,015	2,122,348	$949
Achievable: Budget Constrained	$1,972	2,052,641	$961
Commercial			
Technical	$1,293,046	43,483,765	$29,736
Economic	$10,957	25,199,525	$435
Achievable: Market	$8,667	21,956,889	$395
Achievable: Unconstrained	$2,905	13,920,292	$209
Achievable: Budget Constrained	$2,900	13,907,860	$208
Industrial			
Technical	$43,350	7,456,696	$5,814
Economic	$3,056	6,031,647	$507
Achievable: Market	$2,956	4,338,635	$635
Achievable: Unconstrained	$615	1,875,503	$328
Achievable: Budget Constrained	$607	1,850,061	$328

3.1.2 Residential Sector

Similar to the technical and economic potential scenarios, the largest market achievable potential in the residential sector is estimated to be for the single family subsector, which accounts for 72% of the residential persistent savings in 2035 (as illustrated in Figure 3-2). The largest proportion of estimated market persistent achievable potential savings in 2035 is from the lighting end use (55%), which is a relatively larger portion when compared to the economic potential scenario, where it accounted for only 27% of the residential savings.

Figure 3-2: Market Achievable Potential Persistent Savings by Residential Subsector in 2035

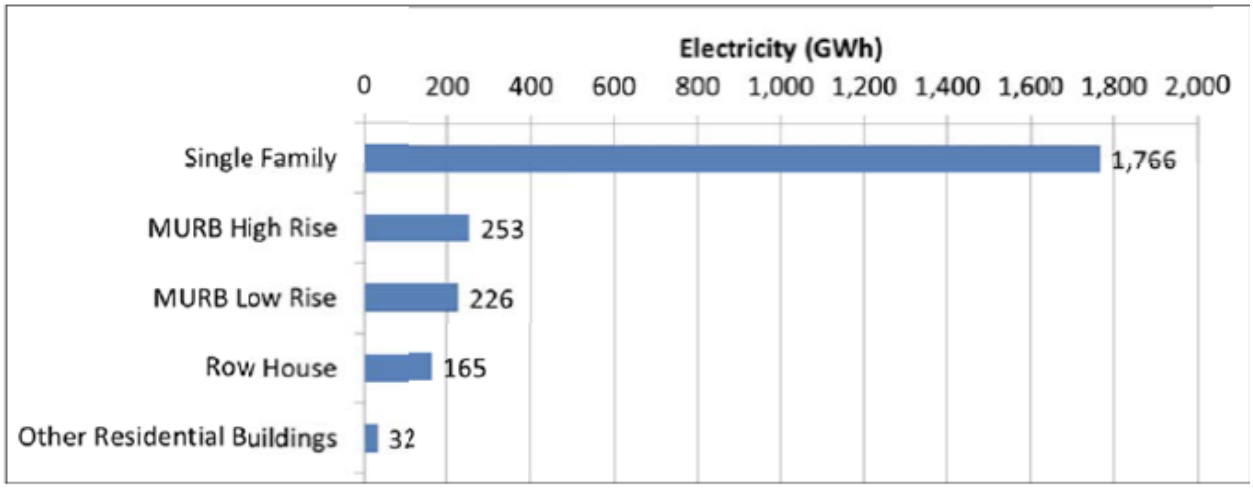
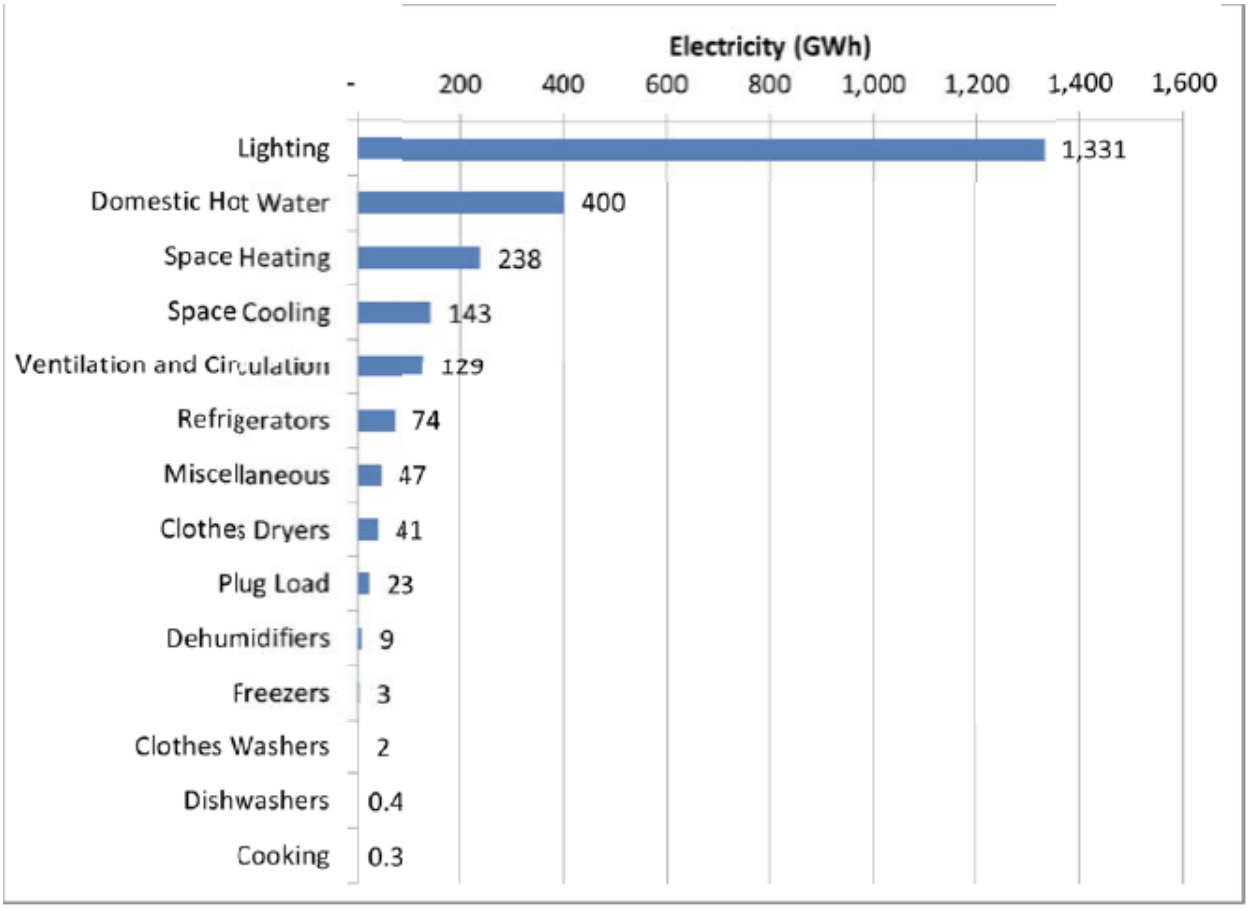


Figure 3-3: Market Achievable Potential Persistent Savings by Residential End Use in 2035



3.1.3 Commercial Sector

The same five subsectors that contributed to the largest portion of the persistent savings in 2035 in the commercial sector's technical and economic potential scenarios, also contribute the largest portion of savings in the market achievable potential scenarios: other commercial buildings (18%), small office (about 17%), large office (about 10%), TCU (9%), and multi-unit residential common areas (8%) (see Figure 3-4). The lighting interior general end use is estimated to result in close to 45% of the commercial sector's persistent market achievable savings in 2035, compared to 40% in the economic potential scenario, as illustrated in Figure 3-5.

Figure 3-4: Market Achievable Potential Persistent Savings by Commercial Subsector in 2035

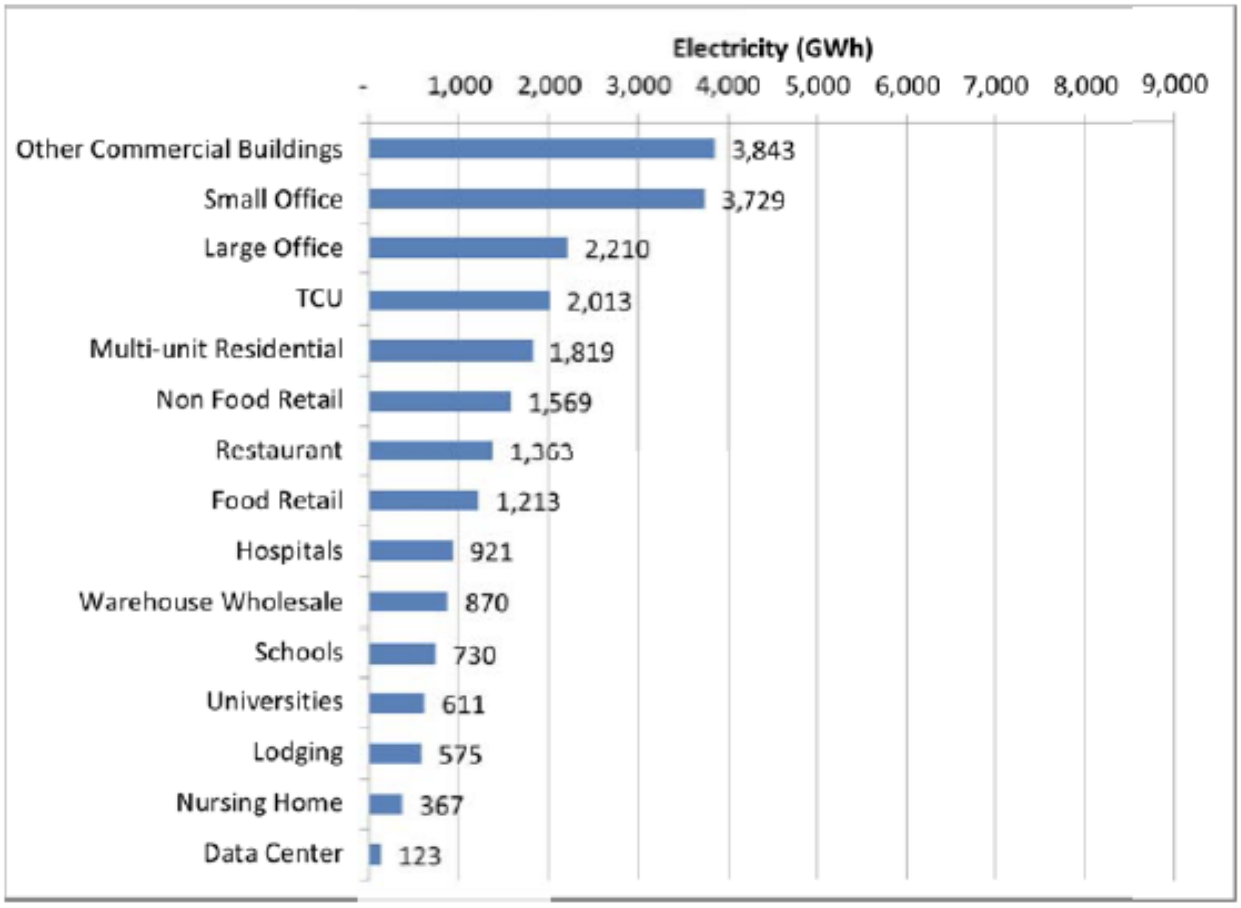
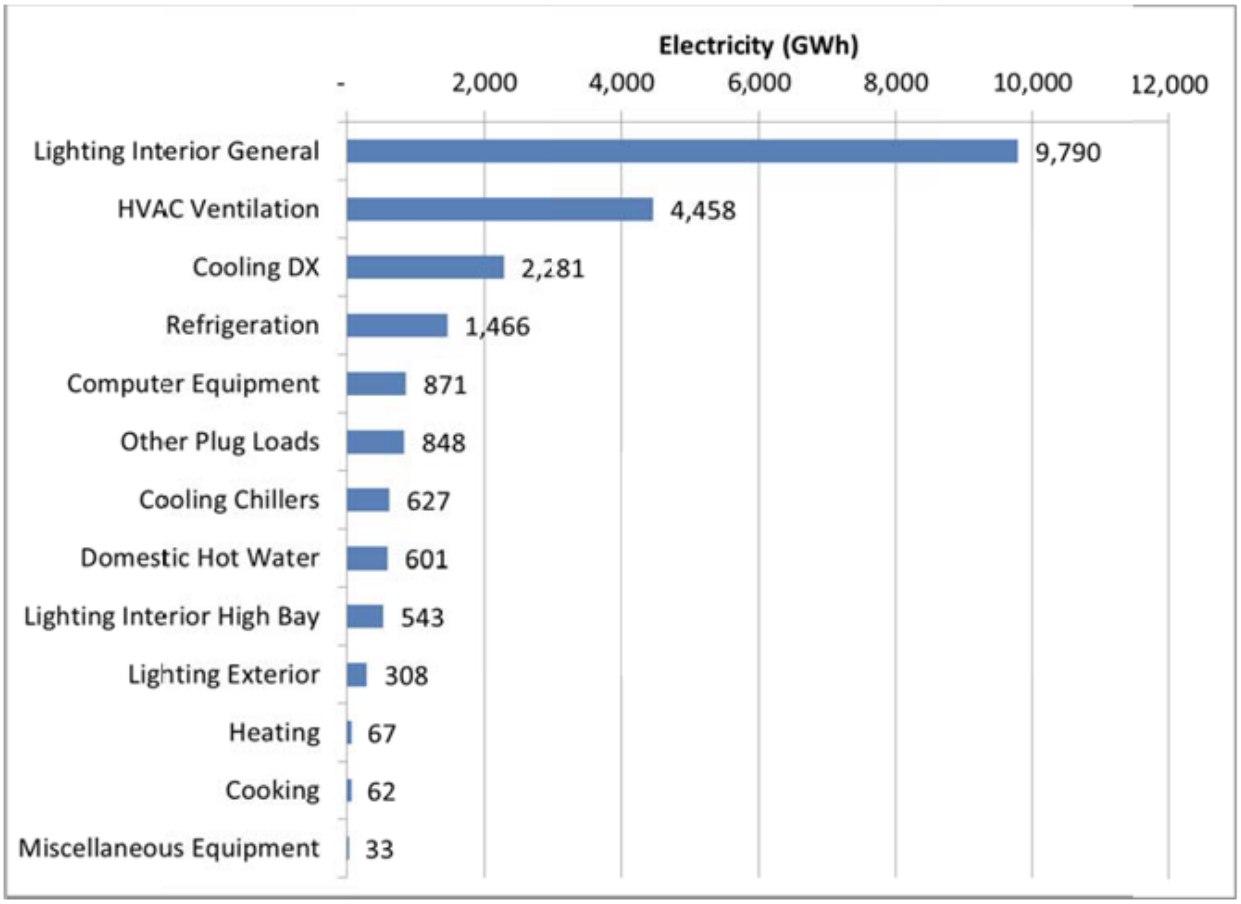


Figure 3-5: Market Achievable Potential Persistent Savings by Commercial End Use in 2035



3.1.4 Industrial Sector

Similar to the findings in the economic potential scenario, four subsectors each account for more than 10% of the persistent market achievable potential savings in 2035: mining (14%), chemical manufacturing (12%), auto parts manufacturing (11%) and primary metals (10%) (see Figure 3-6). The largest portion of savings by end use is accounted for by HVAC (22%) and lighting (20%) end uses (see Figure 3-7). These two end uses also account for the largest savings under technical and economic potential scenarios.

Figure 3-6: Market Achievable Potential Persistent Savings by Industrial Subsector in 2035

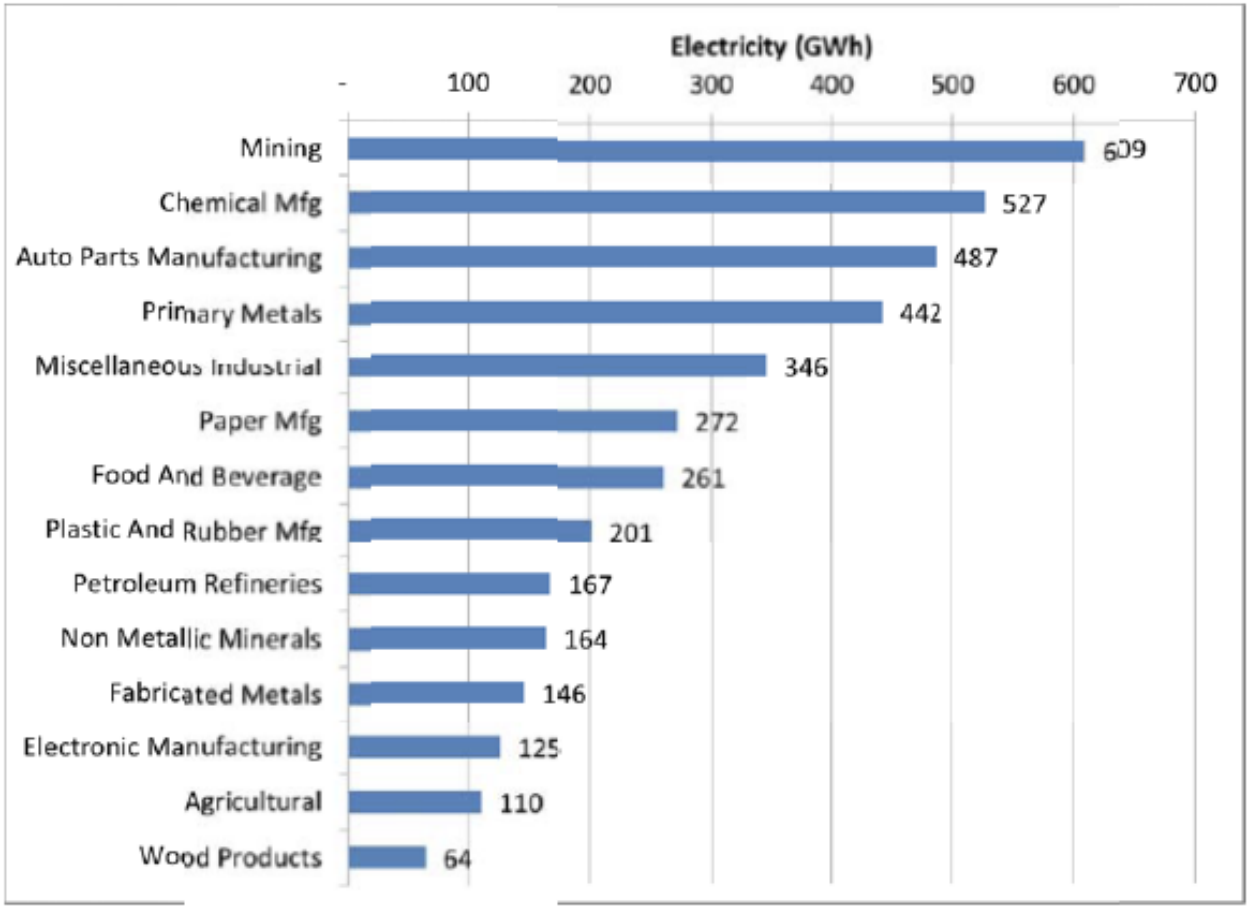
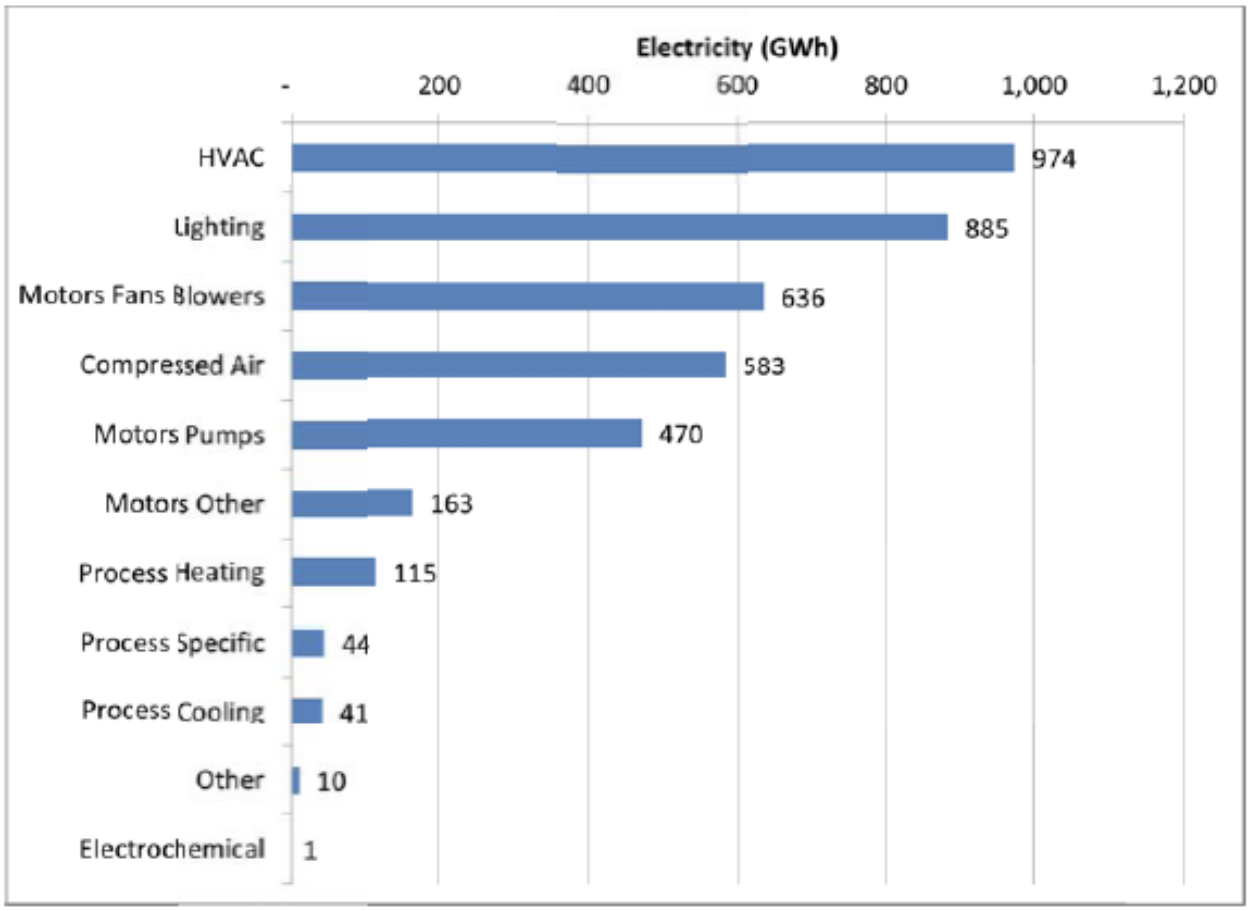


Figure 3-7: Market Achievable Potential Persistent Savings by Industrial End Use in 2035



4 Additional Analysis

The main report presents and discusses the estimated potential savings for four scenarios: technical, economic, unconstrained achievable and budget constrained achievable potential scenarios. These scenarios were compared to the base case and reference case. This addendum provides an update to include the market achievable potential in the analysis comparing the savings potential scenarios with the baseline and reference case forecast.

The comparison of the technical, economic and achievable potential scenarios with the baseline and reference case forecast is illustrated in Figure 4-1 and the electricity load values are summarized in Table 4-1. The persistent savings in 2035 range from 53% for the technical potential to 12% for the budget constrained achievable potential when compared to the reference case forecast. The market achievable potential is 29,052 GWh in 2035 as summarized in Table 4-2.

Figure 4-1: Potential Scenarios Compared with Baseline and Reference Case

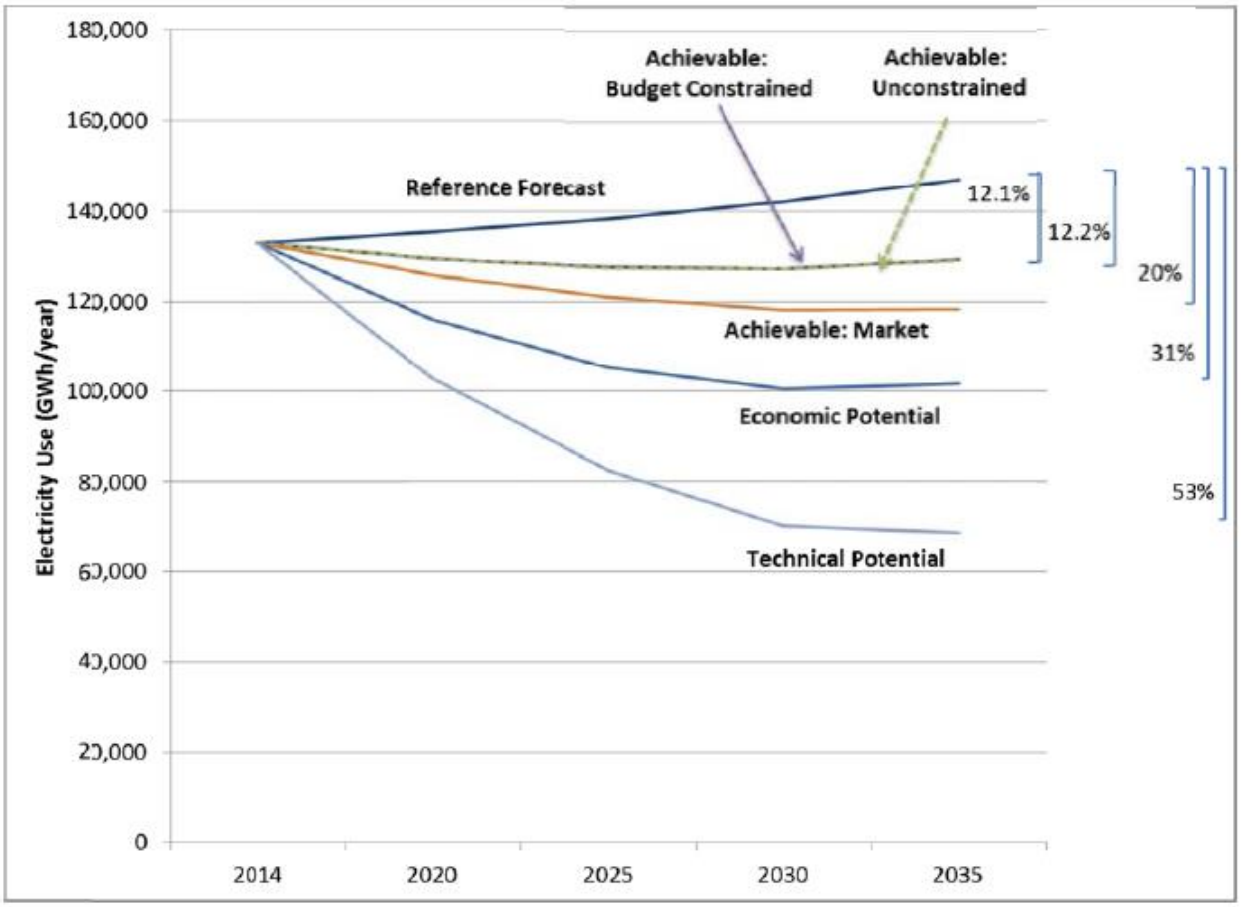


Table 4-1: Annual Electricity Use by Scenario for 2014 to 2035 (GWh/year)

Scenario	2014	2015	2020	2025	2030	2035
Base Year and Reference Case	133,022	130,329	135,562	138,328	142,129	147,147
Achievable Potential: Budget Constrained	133,022	129,708	129,575	127,523	127,282	129,336
Achievable Potential: Unconstrained	133,022	129,696	129,516	127,436	127,181	129,229
Achievable Potential: Market	133,022	129,373	125,968	121,000	118,271	118,409
Economic Potential	133,022	126,983	116,081	105,338	100,451	101,633
Technical Potential	133,022	124,609	102,816	82,530	70,185	68,565

Table 4-2: Persistent Savings by Scenario in for 2015 - 2035 (GWh/year)

Scenario	2015	2020	2025	2030	2035
Technical Potential	5,720	32,746	55,798	71,943	78,581
Economic Potential	3,395	19,501	33,027	41,728	45,566
Achievable Potential: Market	959	9,681	17,500	24,110	29,051
Achievable Potential: Unconstrained	633	6,045	10,892	14,947	17,918
Achievable Potential: Budget Constrained	621	5,987	10,805	14,846	17,810

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