EB-2015-0029
EB-2015-0049

ONTARIO ENERGY BOARD

IN THE MATTER OF the *Ontario Energy Board Act 1998*, S.O.1998, c.15, (Schedule B);

AND IN THE MATTER OF applications for approval of 2015-2020 demand side management plans by Union Gas Limited and Enbridge Gas Distribution Inc.

ENVIRONMENTAL DEFENCE'S
DOCUMENT BOOK FOR ENBRIDGE CROSS-EXAMINATIONS

August 23, 2015

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Note: The above documents have been marked up by counsel. Most are excerpts of the relevant document.

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[i] www.eco.on.ca/uploads/Reports-GHG /2015/2015%20GHG.pdf
[ii] http://www.powerauthority.on.ca/sites/default/files/conservation/LDC-Target-and-Budget-Allocation-Methodology-Summary-v2%202014-12-16.pdf
[iii] http://www.eco.on.ca/uploads/Reports-Energy-Conservation/2014/2014%20Energy%20Conservation%20Report%20Final.pdf

Witnesses: R. Idenouye
S. Moffat
F. Oliver Glasford
B. Ott
R. Sigurdson

Table 1: 2016 TRC-Plus and PAC Analysis and Ratios

	2016 Total Resource Acquisition & Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Multi-Year TRC & PACT Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Resource Acquisition & Low Income	**27,582**	**$217,059,376**	**$59,697,663**	**$27,580,805**	**$8,652,012**	**$9,532,442**	**$77,882,117**	**$139,177,259**	**2.79**	**$45,765,260**	**$171,294,117**	**4.74**
Resource Acquisition	25,164	$199,710,338	$51,329,613	$20,327,865	$6,869,861	$7,095,334	$65,294,808	$134,415,530	3.06	$34,293,059	$165,417,278	5.82
Low Income	2,418	$17,349,039	$8,368,050	$7,252,941	$1,782,152	$2,437,108	$12,587,310	$4,761,729	1.38	$11,472,200	$5,876,839	1.51

	2016 Resource Acquisition						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Resource Acquisition TRC Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Large Customers												
Large Custom	727	$118,590,505	$33,514,579	$4,961,668	$1,213,962	$0	$34,728,541	$83,861,964	3.41	$6,175,630	$112,414,875	19.20
Large Prescriptive	4,165	$13,924,742	$624,575	$686,971	$541,225	$0	$1,165,800	$12,758,942	11.94	$1,228,195	$12,696,546	11.34
Small Customers												
Small Custom	112	$7,208,617	$5,145,084	$442,932	$402,102	$0	$5,547,187	$1,661,430	1.30	$845,034	$6,363,583	8.53
Small Prescriptive	1,959	$15,558,287	$293,721	$767,561	$201,196	$0	$494,916	$15,063,371	31.44	$968,757	$14,589,531	16.06
Small DI	1,679	$13,335,675	$251,760	$3,647,650	$1,307,771	$0	$1,559,531	$11,776,143	8.55	$4,955,421	$8,380,254	2.69
Residential Adaptive Thermostats	9,014	$5,373,101	$612,959	$676,058	$200,313	$0	$813,272	$4,559,828	6.61	$876,371	$4,496,729	6.13
Residential CER	7,508	$25,719,411	$10,886,935	$9,145,025	$3,003,292	$0	$13,890,227	$11,829,184	1.85	$12,148,317	$13,571,094	2.12
RA Overall TRC	**25,164**	**$199,710,338**	**$51,329,613**	**$20,327,865**	**$6,869,861**	**$7,095,334**	**$65,294,808**	**$134,415,530**	**3.06**	**$34,293,059**	**$165,417,278**	**5.82**

	2016 Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Low Income TRC Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Multi-Family Homes - Part 3	217	$10,953,060	$4,457,993	$2,426,481	$852,547	$0	$5,310,541	$5,642,519	2.06	$3,279,028	$7,674,032	3.34
Single Family Homes - Part 9	2,201	$6,395,979	$3,910,056	$4,826,460	$929,604	$0	$4,839,661	$1,556,318	1.32	$5,756,064	$639,915	1.11
LI Overall TRC	**2,418**	**$17,349,039**	**$8,368,050**	**$7,252,941**	**$1,782,152**	**$2,437,108**	**$12,587,310**	**$4,761,729**	**1.38**	**$11,472,200**	**$5,876,839**	**1.51**

Witnesses: R. Idenouye
S. Moffat
F. Oliver Glasford
B. Ott
R. Sigurdson

Table 2: 2017 TRC-Plus and PAC Analysis and Ratios

	2017 Total Resource Acquisition & Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Multi-Year TRC & PACT Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Resource Acquisition & Low Income	**34,545**	**$234,889,018**	**$57,478,860**	**$32,010,199**	**$8,812,072**	**$9,966,611**	**$76,257,543**	**$158,631,475**	**3.08**	**$50,788,882**	**$184,100,136**	**4.62**
Resource Acquisition	32,007	$216,669,714	$48,688,389	$24,248,549	$6,915,601	$7,602,524	$63,206,514	$153,463,200	3.43	$38,766,674	$177,903,040	5.59
Low Income	2,538	$18,219,304	$8,790,471	$7,761,650	$1,896,471	$2,364,087	$13,051,029	$5,168,275	1.40	$12,022,208	$6,197,096	1.52

	2017 Resource Acquisition						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Resource Acquisition TRC Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Large Customers												
Large Custom	723	$117,939,594	$33,330,627	$5,056,873	$1,237,255	$0	$34,567,882	$83,371,712	3.41	$6,294,128	$111,645,466	18.74
Large Prescriptive	4,142	$13,848,313	$621,147	$700,152	$551,610	$0	$1,172,757	$12,675,556	11.81	$1,251,762	$12,596,551	11.06
Small Customers												
Small Custom	113	$7,309,098	$5,216,802	$452,358	$410,659	$0	$5,627,461	$1,681,637	1.30	$863,017	$6,446,082	8.47
Small Prescriptive	1,986	$15,775,154	$297,815	$783,895	$205,477	$0	$503,292	$15,271,862	31.34	$989,372	$14,785,783	15.94
Small DI	1,702	$13,521,561	$255,270	$3,725,272	$1,335,600	$0	$1,590,870	$11,930,691	8.50	$5,060,872	$8,460,689	2.67
Residential Adaptive Thermostats	18,000	$10,729,388	$1,224,000	$1,350,000	$175,000	$0	$1,399,000	$9,330,388	7.67	$1,525,000	$9,204,388	7.04
Residential CER	5,340	$34,254,955	$7,742,729	$12,180,000	$3,000,000	$0	$10,742,729	$23,512,226	3.19	$15,180,000	$19,074,955	2.26
RA Overall TRC	**32,007**	**$216,669,714**	**$48,688,389**	**$24,248,549**	**$6,915,601**	**$7,602,524**	**$63,206,514**	**$153,463,200**	**3.43**	**$38,766,674**	**$177,903,040**	**5.59**

	2017 Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Low Income TRC Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Multi-Family Homes - Part 3	228	$11,507,228	$4,686,633	$2,529,410	$888,711	$0	$5,575,345	$5,931,883	2.06	$3,418,121	$8,089,107	3.37
Single Family Homes - Part 9	2,310	$6,712,076	$4,103,837	$5,232,240	$1,007,760	$0	$5,111,597	$1,600,479	1.31	$6,240,000	$472,076	1.08
LI Overall TRC	**2,538**	**$18,219,304**	**$8,790,471**	**$7,761,650**	**$1,896,471**	**$2,364,087**	**$13,051,029**	**$5,168,275**	**1.40**	**$12,022,208**	**$6,197,096**	**1.52**

Table 3: 2018 TRC-Plus and PAC Analysis and Ratios

	2018 Total Resource Acquisition & Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Multi-Year TRC & PACT Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Resource Acquisition & Low Income	**48,555**	**$251,201,450**	**$66,489,040**	**$36,353,379**	**$8,414,927**	**$10,334,976**	**$85,238,943**	**$165,962,507**	**2.95**	**$55,103,282**	**$196,098,168**	**4.56**
Resource Acquisition	45,988	$231,543,744	$57,102,463	$28,142,333	$6,385,477	$7,985,813	$71,473,753	$160,069,991	3.24	$42,513,623	$189,030,121	5.45
Low Income	2,567	$19,657,706	$9,386,577	$8,211,046	$2,029,450	$2,349,163	$13,765,190	$5,892,516	1.43	$12,589,659	$7,068,047	1.56

	2018 Resource Acquisition						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Resource Acquisition TRC Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Large Customers												
Large Custom	739	$120,544,190	$34,066,705	$5,262,555	$1,287,579	$0	$35,354,284	$85,189,905	3.41	$6,550,134	$113,994,056	18.40
Large Prescriptive	4,234	$14,154,141	$634,864	$728,630	$574,046	$0	$1,208,910	$12,945,231	11.71	$1,302,676	$12,851,465	10.87
Small Customers												
Small Custom	106	$6,872,172	$4,904,950	$425,317	$386,111	$0	$5,291,060	$1,581,112	1.30	$811,427	$6,060,745	8.47
Small Prescriptive	1,867	$14,832,141	$280,012	$737,035	$193,194	$0	$473,206	$14,358,935	31.34	$930,229	$13,901,912	15.94
Small DI	1,600	$12,713,263	$240,010	$3,502,583	$1,255,761	$0	$1,495,771	$11,217,492	8.50	$4,758,344	$7,954,920	2.67
Residential Adaptive Thermostats	27,000	$16,094,082	$1,836,000	$2,025,000	$150,000	$0	$1,986,000	$14,108,082	8.10	$2,175,000	$13,919,082	7.40
Residential CER	10,441	$42,290,068	$15,139,921	$15,461,213	$2,538,787	$0	$17,678,708	$24,611,360	2.39	$18,000,000	$24,290,068	2.35
RA Overall TRC	**45,988**	**$231,543,744**	**$57,102,463**	**$28,142,333**	**$6,385,477**	**$7,985,813**	**$71,473,753**	**$160,069,991**	**3.24**	**$42,513,623**	**$189,030,121**	**5.45**

	2018 Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Low Income TRC Scenarios	Participants or Units Installed	Total NPV Benefits	Total Incremental Costs	Total Variable Costs	Total Fixed Costs	Total Administrative Costs	TRC Total Costs	TRC Net Benefit	TRC Ratio	PACT Total Cost	PACT Net Benefit	PACT Ratio
Multi-Family Homes - Part 3	257	$12,945,630	$5,282,740	$2,821,839	$991,457	$0	$6,274,197	$6,671,434	2.06	$3,813,296	$9,132,334	3.39
Single Family Homes - Part 9	2,310	$6,712,076	$4,103,837	$5,389,207	$1,037,993	$0	$5,141,830	$1,570,246	1.31	$6,427,200	$284,876	1.04
LI Overall TRC	**2,567**	**$19,657,706**	**$9,386,577**	**$8,211,046**	**$2,029,450**	**$2,349,163**	**$13,765,190**	**$5,892,516**	**1.43**	**$12,589,659**	**$7,068,047**	**1.56**

Witnesses: R. Idenouye
S. Moffat
F. Oliver Glasford
B. Ott
R. Sigurdson

Table 4: 2019 TRC-Plus and PAC Analysis and Ratios

	2019 Total Resource Acquisition & Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Multi-Year TRC & PACT Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Resource Acquisition & Low Income	**52,248**	**$255,681,751**	**$70,276,315**	**$37,459,577**	**$8,204,095**	**$10,542,211**	**$89,022,621**	**$166,659,129**	**2.87**	**$56,205,884**	**$199,475,867**	**4.55**
Resource Acquisition	49,697	$235,754,398	$60,798,348	$29,084,310	$6,134,056	$8,146,065	$75,078,469	$160,675,929	3.14	$43,364,431	$192,389,967	5.44
Low Income	2,551	$19,927,353	$9,477,967	$8,375,267	$2,070,039	$2,396,147	$13,944,152	$5,983,200	1.43	$12,841,453	$7,085,900	1.55

	2019 Resource Acquisition						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Resource Acquisition TRC Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Large Customers												
Large Custom	741	$120,852,411	$34,153,811	$5,367,806	$1,313,331	$0	$35,467,142	$85,385,270	3.41	$6,681,137	$114,171,274	18.09
Large Prescriptive	4,244	$14,190,332	$636,488	$743,203	$585,527	$0	$1,222,014	$12,968,317	11.61	$1,328,729	$12,861,602	10.68
Small Customers												
Small Custom	109	$7,009,613	$5,003,047	$433,823	$393,833	$0	$5,396,880	$1,612,733	1.30	$827,656	$6,181,958	8.47
Small Prescriptive	1,905	$15,128,779	$285,612	$751,776	$197,058	$0	$482,670	$14,646,109	31.34	$948,834	$14,179,946	15.94
Small DI	1,632	$12,967,525	$244,810	$3,572,634	$1,280,876	$0	$1,525,686	$11,441,839	8.50	$4,853,511	$8,114,015	2.67
Residential Adaptive Thermostats	28,271	$16,851,785	$1,922,438	$2,120,336	$98,164	$0	$2,020,602	$14,831,183	8.34	$2,218,500	$14,633,285	7.60
Residential CER	12,795	$44,352,678	$18,552,141	$16,094,732	$2,265,268	$0	$20,817,410	$23,535,268	2.13	$18,360,000	$25,992,678	2.42
RA Overall TRC	**49,697**	**$235,754,398**	**$60,798,348**	**$29,084,310**	**$6,134,056**	**$8,146,065**	**$75,078,469**	**$160,675,929**	**3.14**	**$43,364,431**	**$192,389,967**	**5.44**

	2019 Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Low Income TRC Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Multi-Family Homes - Part 3	263	$13,280,443	$5,413,973	$2,878,276	$1,011,286	$0	$6,425,259	$6,855,184	2.07	$3,889,562	$9,390,881	3.41
Single Family Homes - Part 9	2,288	$6,646,910	$4,063,994	$5,496,991	$1,058,753	$0	$5,122,747	$1,524,163	1.30	$6,555,744	$91,166	1.01
LI Overall TRC	**2,551**	**$19,927,353**	**$9,477,967**	**$8,375,267**	**$2,070,039**	**$2,396,147**	**$13,944,152**	**$5,983,200**	**1.43**	**$12,841,453**	**$7,085,900**	**1.55**

Witnesses: R. Idenouye
S. Moffat
F. Oliver Glasford
B. Ott
R. Sigurdson

Table 5: 2020 TRC-Plus and PAC Analysis and Ratios

	2020 Total Resource Acquisition & Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Multi-Year TRC & PACT Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Resource Acquisition & Low Income	**50,352**	**$260,322,740**	**$66,612,468**	**$38,228,079**	**$8,348,867**	**$10,753,591**	**$85,714,926**	**$174,607,814**	**3.04**	**$57,330,537**	**$202,992,203**	**4.54**
Resource Acquisition	47,817	$240,117,830	$57,047,601	$29,685,307	$6,237,427	$8,309,522	$71,594,550	$168,523,280	3.35	$44,232,255	$195,885,574	5.43
Low Income	2,535	$20,204,910	$9,564,867	$8,542,773	$2,111,440	$2,444,070	$14,120,376	$6,084,534	1.43	$13,098,282	$7,106,629	1.54

	2020 Resource Acquisition						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Resource Acquisition TRC Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Large Customers												
Large Custom	744	$121,320,555	$34,286,112	$5,475,162	$1,339,597	$0	$35,625,709	$85,694,846	3.41	$6,814,760	$114,505,796	17.80
Large Prescriptive	4,261	$14,245,301	$638,953	$758,067	$597,237	$0	$1,236,190	$13,009,110	11.52	$1,355,304	$12,889,997	10.51
Small Customers												
Small Custom	111	$7,149,808	$5,103,110	$442,499	$401,710	$0	$5,504,819	$1,644,989	1.30	$844,209	$6,305,599	8.47
Small Prescriptive	1,943	$15,431,360	$291,324	$766,811	$200,999	$0	$492,323	$14,939,037	31.34	$967,810	$14,463,550	15.94
Small DI	1,665	$13,226,880	$249,707	$3,644,087	$1,306,494	$0	$1,556,200	$11,670,680	8.50	$4,950,581	$8,276,299	2.67
Residential Adaptive Thermostats	29,094	$17,342,293	$1,978,395	$2,182,053	$80,817	$0	$2,059,212	$15,283,081	8.42	$2,262,870	$15,079,423	7.66
Residential CER	10,000	$46,170,016	$14,500,000	$16,416,626	$2,310,574	$0	$16,810,574	$29,359,442	2.75	$18,727,200	$27,442,816	2.47
RA Overall TRC	**47,817**	**$240,117,830**	**$57,047,601**	**$29,685,307**	**$6,237,427**	**$8,309,522**	**$71,594,550**	**$168,523,280**	**3.35**	**$44,232,255**	**$195,885,574**	**5.43**

	2020 Low Income						TRC + 15% Societal Benefits			PACT + 15% Societal Benefits		
Low Income TRC Scenarios	**Participants or Units Installed**	**Total NPV Benefits**	**Total Incremental Costs**	**Total Variable Costs**	**Total Fixed Costs**	**Total Administrative Costs**	**TRC Total Costs**	**TRC Net Benefit**	**TRC Ratio**	**PACT Total Cost**	**PACT Net Benefit**	**PACT Ratio**
Multi-Family Homes - Part 3	270	$13,622,533	$5,540,329	$2,935,841	$1,031,512	$0	$6,571,841	$7,050,692	2.07	$3,967,353	$9,655,180	3.43
Single Family Homes - Part 9	2,265	$6,582,377	$4,024,538	$5,606,931	$1,079,928	$0	$5,104,466	$1,477,911	1.29	$6,686,859	-$104,482	0.98
LI Overall TRC	**2,535**	**$20,204,910**	**$9,564,867**	**$8,542,773**	**$2,111,440**	**$2,444,070**	**$14,120,376**	**$6,084,534**	**1.43**	**$13,098,282**	**$7,106,629**	**1.54**

RESPONSE

a) Enbridge's Net TRC Benefits, or the total net present value of all avoided gas, electricity, and water costs for each year of DSM less the cost of delivering DSM programs and the incremental costs borne by customers, from 1995 to 2014 are $2,483.9 million. In the Company's view this is the most appropriate representation of cumulative economic savings over the course of Enbridge's DSM experience.

b) Unfortunately Enbridge is unclear regarding the data requested by Environmental Defence in b) above. The above inquiry clearly indicates a desire to include all avoided costs, which would imply that the electricity, water and gas costs incorporated into the TRC calculation have been requested. However, these values are always represented over the entire measure life of DSM measures or activities. Representing only a single year of these savings creates a challenge given that they are compared against incremental costs to customers. The incremental cost of DSM to customers is a single year value, which in some instances would be greater than a single year's representation of TRC benefits. Further, the TRC calculation does not incorporate the cost of DSM incentives to customers, which ultimately drive rate impacts and thus can represent a cost of DSM depending on the analysis being undertaken.

c) Please see b) above.

d) Please see Enbridge's response to Environmental Defence Interrogatory #13, filed as Exhibit I.T3.EGDI.ED.13.

e) Please see Enbridge's response to Environmental Defence Interrogatory #13, filed as Exhibit I.T3.EGDI.ED.13.

Witnesses: S. Mills
S. Moffat
F. Oliver-Glasford
B. Ott

ENVIRONMENTAL DEFENSE INTERROGATORY #5

INTERROGATORY

Issue 1: "Is the 2014 DSM Budget ($32.2M) reasonable and appropriate? Should the Board determine that the DSM budget for 2014 should be increased, what are the implications and required next steps."

Interrogatory No. 1-ED-5 Greenhouse Gas Emission Reductions

Reference: Ex. B, Tab 1, Schedule 2, page 1-3

Attached is a table containing a breakout of Ontario's energy-related greenhouse gas ("GHG") emissions in 2010 prepared for Environmental Defence and submitted in EB-2012-0337 (Exhibit K 1.5, Tab 4). In that proceeding, Union Gas agreed that the estimates in that table look reasonable.[1]

Also attached for your reference is a report from the Environmental Commissioner of Ontario which lists Ontario's GHG emission reduction targets as follows:

i) 6% below 1990 levels by 2014 (to approximately 165 megatonnes or Mt);
ii) 15% below 1990 levels by 2020 (to approximately 150 Mt); and
iii) 80% below 1990 levels by 2050 (to approximately 35 Mt).[2]

The Environmental Commissioner report states that "[the] government, itself, has projected a 30 Mt gap by 2020."[3]

a) Does Enbridge believe that the estimates in the attached table appear to be reasonable? If not, please provide alternative estimates.

b) According to the attached table, natural gas was responsible for 34.5 percent of Ontario's total energy-related GHG emissions in 2010. When the coal phase-out is complete and the Pickering nuclear station comes to an end of its life, is it more likely than not that the greenhouse gas emissions from natural gas-fired power plants will rise as a proportion of the total (all other things equal)?

---

[1] Transcript, EB 2012-0337, Vol. 1, January 31, 2013, p. 92, lns. 1-9.

[2] Environmental Commissioner of Ontario, *A Question of Commitment: Annual Greenhouse Gas Progress Report 2012*, http://www.eco.on.ca/uploads/ Reports-GHG2/20 I 2/Climate-Change-Report-20 I 2.pdf, page 12.

[3] *Ibid*. p. 14.

c) Is it reasonable to assume that a cost-effective strategy to achieve Ontario's 2020 GHG emission target will require a significant increase in the energy efficiency of Ontario's natural gas consumption'?

d) Are GHG emission reductions given a dollar value and factored into the TRC analysis for DSM programs?

RESPONSE

a) While Enbridge has not made any inquiries into the accuracy of the figures, the estimates in the attached table appear reasonable.

b) Yes (all other things being equal) the proposition seems reasonable. Enbridge is however neither qualified nor in a position to comment on the Provincial Governments overall long term plans for operating power generation plants. It therefore cannot comment on whether it is reasonable to assume that 'all other things' will be equal. When the coal phase-out is complete and the Pickering nuclear station comes to an end of its life, greenhouse gas emissions from natural gas-fired power plants will be determined by how often and which of the gas-fired power plants are dispatched in a new supply mix environment.

c) Natural gas energy efficiency contributes towards Ontario's pursuit of its GHG targets. Again, the Company is neither qualified nor in a position to comment on matters of overall Provincial Policy and Strategy as it pertains to Ontario's GHG emission target.

d) No value for CO_2 is included in the TRC equation.

Schedule A to Interrogatory No. 1-ED-5

Table of Ontario's Natural Gas-Related & Other Greenhouse Gas ("GHG") Emissions in 2010

Percent of Ontario's Total 2010 Energy-Related GHG Emissions from Certain Sources		
#	GHG Emission Source	Percent
1	Natural Gas Power Plants	8%
2	All Natural Gas Consumption	34.5%
3	Coal-Fired Power Plants	9%
4	Transportation	45.6%

Sources and Calculations

1. Ontario's total natural gas consumption in 2010 was 24,264.58 million cubic metres.[1]

2. Emission Factors for Natural Gas[2]:

   a) Carbon Dioxide: 1879 g/cubic metre
   b) Methane: 0.037 g/cubic metre
   c) Nitrous Oxide: 0.033 g/cubic metre

3. Natural Gas Consumption Emissions (m3 of gas multiplied by emission factors)

   a) Carbon Dioxide: 45,593,145.82 tonnes
   b) Methane: 897.79 tonnes
   c) Nitrous Oxide: 800.73 tonnes

4. IPCC Global Warming Potentials – 100 – Year Time Horizon (Second Assessment Report)[3]

   a) Carbon Dioxide: 1
   b) Methane: 21
   c) Nitrous Oxide: 310

5. Natural Gas Consumption GHG Emissions (Carbon Dioxide Equivalent)

   a) Carbon Dioxide: 45,593,145.82 tonnes
   b) Methane: 18,853.59 tonnes

[1] Statistics Canada, Catalogue 57-601, *Energy Statistics Handbook*, Tables 6.6 & 6.7, http://www.statcan.gc.ca/pub/57-601-x/2012001/tablelist-listetableaux6-eng.htm.
[2] Environment Canada, *GHG Emissions Quantification Guidance: Fuel Combustion*, http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=AC2B7641-1.
[3] Environment Canada, *Global Warming Potentials*, http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=CAD07259-1.

c) Nitrous Oxide: 248,226.3 tonnes
d) Total 45,860,225.71 tonnes

6. Ontario's Natural Gas Consumption GHG Emissions (45,860,225.71 tonnes) as a percent of Ontario's Total Energy-Related GHG Emissions (133,000,000 tonnes):

34.5%[4]

7. Ontario's transportation-related GHG emissions as a percent of Ontario's Total Energy-Related GHG Emissions in 2010:

45.6%[5]

8. Ontario's coal-fired electricity-related GHG emissions as a percent of Ontario's Total Energy-Related GHG emissions in 2010:

9%[6]

9. Ontario's natural gas-fired electricity-related GHG emissions as a percent of Ontario's Total Energy-Related GHG emissions in 2010:

8%[7]

These emissions are a sub-component of Ontario's total Natural Gas Consumption GHG emissions.

---

[4] Calculated as 45,860,225.71 divided by 133,000,000. Ontario's total energy-related GHG emissions in 2010 were 133,000,000 tonnes. Environment Canada, *National Inventory Report 1990-2010 Part 3*, Table A14-12.
[5] Environment Canada, National Inventory Report 1990-2010 Part 3, Table A14-12.
[6] Environment Canada, National Inventory Report 1990-2010 Part 3, Table A14-12; and Environmental Commissioner of Ontario, *A Question of Commitment: Annual Greenhouse Gas Progress Report 2012*, (December 2012), page 21.
[7] Environment Canada, National Inventory Report 1990-2010 Part 3, Table A14-12; and Environmental Commissioner of Ontario, *A Question of Commitment: Annual Greenhouse Gas Progress Report 2012*, (December 2012), page 21.

Related GHG Figures

Ontario's GHG Emission Reduction Targets[8]

1. 6% below 1990 levels by 2014 (to approximately 165 megatonnes or Mt);
2. 15% below 1990 levels by 2020 (to approximately 150 Mt); and
3. 80% below 1990 levels by 2050 (to approximately 35 Mt).

GHG Emissions Gap

According to the Government of Ontario, in the absence of additional policy action, Ontario's GHG emissions in 2020 will be 30 Mt greater than its target.[9]

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[8] Environmental Commissioner of Ontario, *A Question of Commitment: Annual Greenhouse Gas Progress Report 2012*, page 12.

[9] Environmental Commissioner of Ontario, *A Question of Commitment: Annual Greenhouse Gas Progress Report 2012*, page 14.

Schedule B to Interrogatory No. 1-ED-5

A QUESTION OF COMMITMENT

Review of the Ontario Government's Climate Change Action Plan Results

Annual Greenhouse Gas Progress Report 2012

Environmental Commissioner of Ontario

December 2012

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The long-term concentration of CO_2 in the atmosphere must be reduced to no more than 350 ppm if global climate conditions, similar to those in which our ecosystems and our civilization have evolved, are to be maintained.

Targets

In 2007, the government released Go Green: Ontario's Action Plan on Climate Change ("Climate Change Action Plan"), which established three GHG emissions reduction targets:[3]

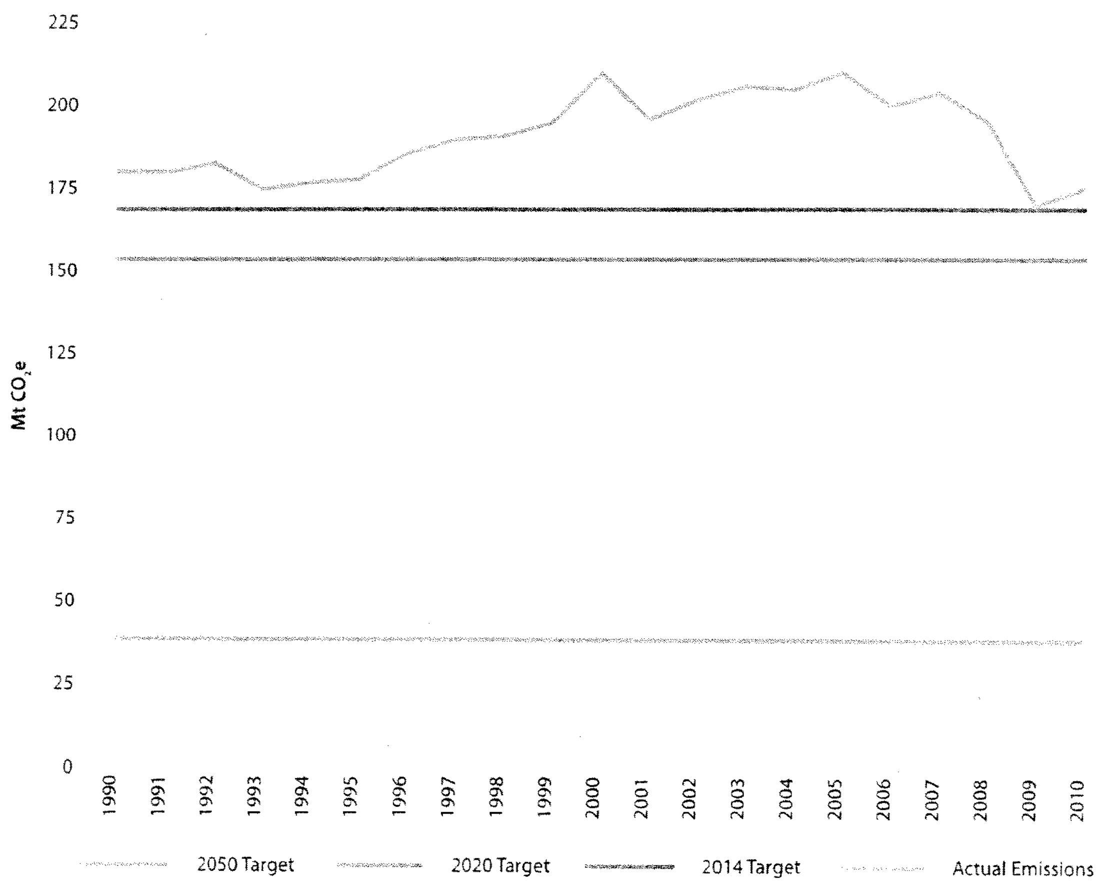
- 6 per cent below 1990 levels by 2014 (to approximately 165 megatonnes or Mt);
- 15 per cent below 1990 levels by 2020 (to approximately 150 Mt); and
- 80 per cent below 1990 levels by 2050 (to approximately 35 Mt).

These targets are based on the internationally agreed-upon goal of limiting the increase in global average temperatures to 2°C above pre-industrial levels. In order to have a reasonable chance of preventing temperatures from exceeding this amount, the Intergovernmental Panel on Climate Change recommended in 2007 that the concentration of GHGs in the atmosphere would have to be stabilized at, or below, 450 ppm. More recent analysis of paleoclimatic data has led James Hansen, head of the NASA Goddard Institute for Space Studies, to conclude that the long-term concentration of CO_2 in the atmosphere must be reduced to no more than 350 ppm if global climate conditions, similar to those in which our ecosystems and our civilization have evolved, are to be maintained. Unfortunately, the Ontario action plan and targets have not been adjusted to reflect this new understanding of the climate system.

Progress Toward the Targets

In 2010, Ontario's emissions of 171 Mt were 3 per cent below the 1990 base year level (176 Mt). Figure 1 tracks Ontario's emissions over the past 20 years against the targets in the Climate Change Action Plan.

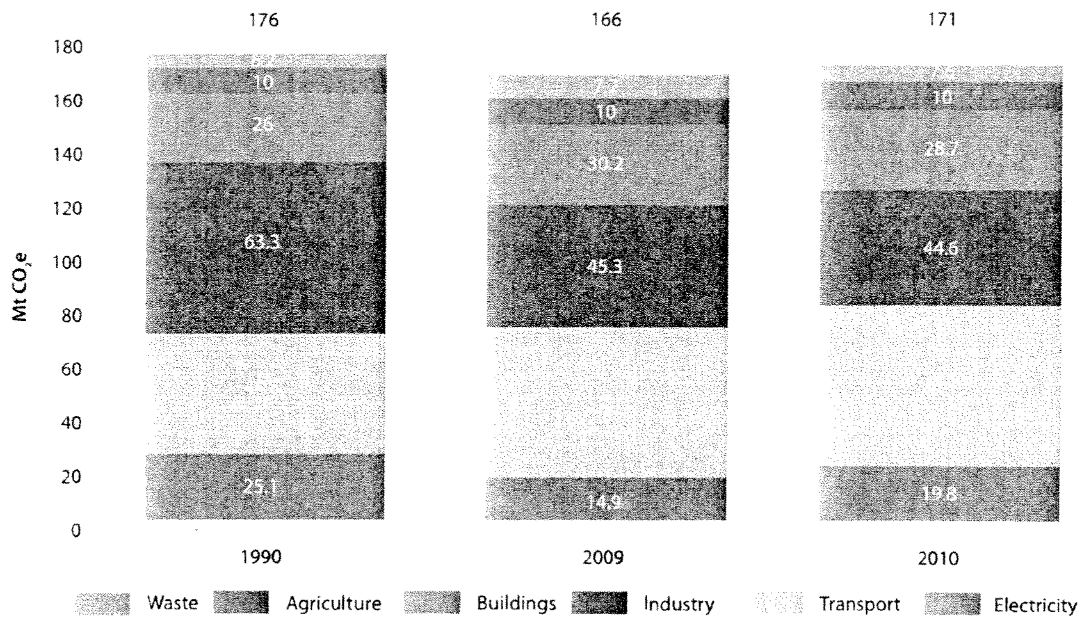
Figure 1: Actual Emissions versus Climate Change Action Plan Targets



Source: Environment Canada. (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61. Government of Ontario (2007). Go Green: Ontario's Action Plan on Climate Change.

While some sectors (such as electricity and industry) have experienced an overall decline since 1990, others (such as transportation) have witnessed an equally significant increase (Figure 2). In 2010, similar to previous years, the transportation sector was responsible for the largest volume of emissions, followed by industry and buildings.

Figure 2: Emissions by Sector, 1990, 2009 and 2010 in Megatonnes



Source: Environment Canada. (2012). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990–2010*. Part 3, p. 61.

The Ontario government indicates that progress has been made toward meeting the 2014 and 2020 targets, primarily by phasing out the use of coal for electricity generation. The coal phase-out is a significant commitment that, on its own, takes Ontario most of the way toward meeting the 2014 target and at least halfway toward the 2020 target. Unfortunately, the ambition displayed in the electricity sector has not been matched in other areas over the past year, and the Ontario government will not reach its 2020 emissions target without additional policy action. The government, itself, has projected a 30 Mt gap by 2020, an amount that is almost equal to what will have been achieved through coal phase-out.

Feeling the Heat:

Greenhouse Gas Progress Report 2015

Environmental Commissioner of Ontario

2.2 Sector-Specific Emissions

Figure 2 shows Ontario's GHG emissions from each sector and how they have changed from 1990 to 2013. The electricity sector alone has seen a 58 per cent reduction in emissions over this time period, with the industrial sector contributing a further 26 per cent reduction, mostly due to reduced industrial production in the province.[46] The closure of the coal plants will not be fully reflected in Ontario's emissions profile until the 2015 emissions data becomes available.

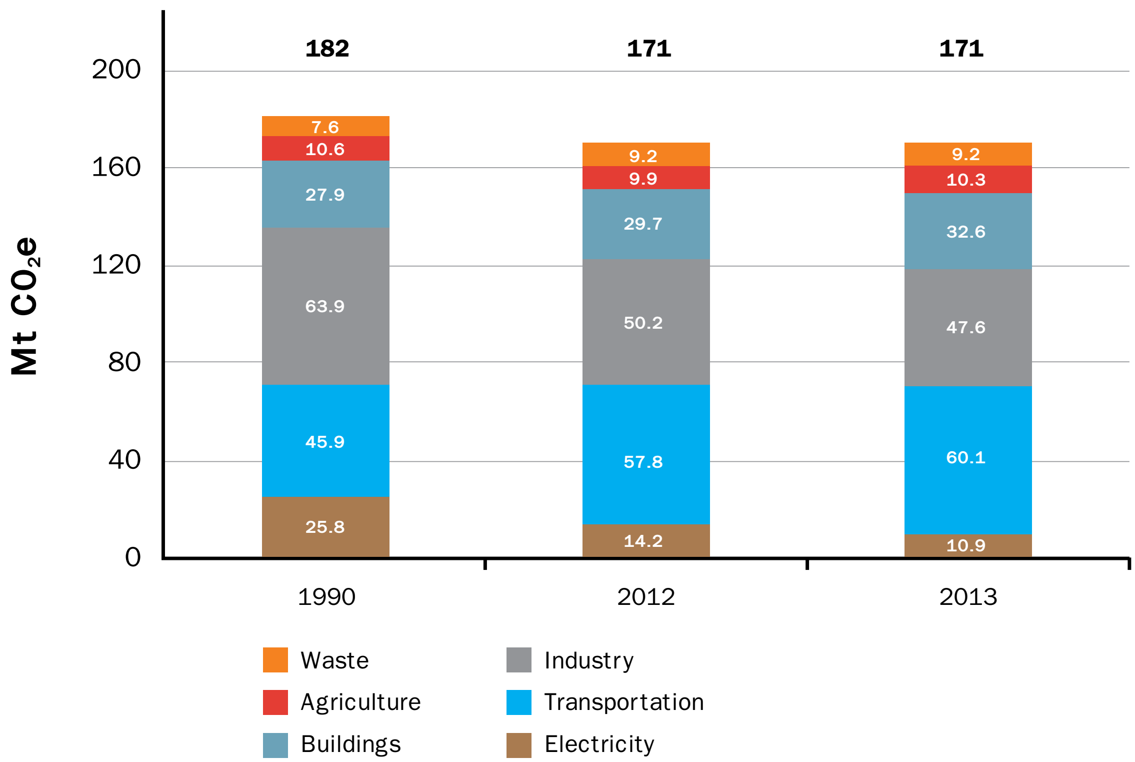


Figure 2. Ontario greenhouse gas emissions by sector for 1990, 2012 and 2013. (Source: Environment Canada. National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990-2013 (2015)).

Since 1990, emissions reductions in the electricity and industry sectors have been partially offset by the 31 per cent increase in emissions from the transportation sector. Emissions in the buildings and waste sectors have also risen (17 per cent and 20 per cent, respectively). The transportation sector remains the largest contributor to the overall provincial inventory, with emissions rising 4 per cent from 2012 to 2013. Although emissions intensities have fallen in many sectors, in some sectors these gains are at least partially offset by economic and population growth.[47]

A more detailed breakdown of sector emissions is provided in **Table 1**.

Table 1. Ontario's Greenhouse Gas Emissions 1990–2013 (Source: Environment Canada. National Inventory Report – Greenhouse Gas Sources and Sinks in Canada 1990-2013 (2015)).

Sources	Emissions ($Mt\ CO_2e$)		Change from 1990 - 2013		Percentage each sector contributes to 2013 total
	1990	2013	$Mt\ CO_2e$	%Δ	%
Electricity	25.8	10.9	-14.9	-58	6
Transportation	45.9	60.1	+14.2	+31	35
Road (passenger)	27.3	32.7	+5.4	+19.8	
Road (freight)	8	13.4	+5.4	+67.5	
Off-road (gasoline and diesel)	5.6	9.2	+3.6	+64.3	
Domestic Aviation	2.2	2.3	+0.1	+4.5	
Domestic Marine	1.0	1.2	+0.2	+20	
Rail	1.8	1.3	-0.5	-27.8	
Industry	63.9	47.6	-16.3	-25.5	28
Fossil fuel refining	6.1	6.1	0	0	
Manufacturing	22	16.1	-5.9	-26.8	
Mineral Production (cement, lime, mineral products)	4.1	3.6	-0.5	-12.2	
Chemical Industry	10	0	-10	-100	
Metal Production (iron and steel)	10.9	7.7	-3.2	-29.4	
Fugitive Sources	1.6	1.3	-0.3	-18.8	
Other[iv]	9.3	12.8	+3.5	+37.6	
Buildings	27.9	32.6	+4.7	+17	19
Commercial and Institutional	9.1	11.9	+2.8	+30.8	
Residential	18.8	20.7	+1.9	+10.1	
Agriculture	10.6	10.3	-0.3	-3	4
Enteric Fermentation	4.4	3.6	-0.8	-18.2	
Manure Management	2.1	1.9	-0.2	-9.5	
Agricultural Soils	3.9	4.6	+0.7	+17.9	
Waste	7.6	9	+1.4	+19	5
Solid Waste Disposal on Land	7.1	8.4	+1.3	+18.3	
Wastewater Handling	.2	.3	+0.1	+50	
Waste Incineration	.3	.3	0	0	
TOTAL	182	171	-11	-6	100

[iv] The "other" category includes emissions from stationary combustion in mining, construction, agriculture and forestry; emissions from pipelines; emissions associated with the production and consumption of halocarbons; and emissions from the use of petroleum fuels as feedstock for petrochemical products. Subsector figures do not exactly match sector totals due to rounding errors and the fact that this table does not list all minor subsectors. The ECO adds up the emissions subcategories to calculate the sector totals so they may not exactly match the rounded numbers presented in the NIR.

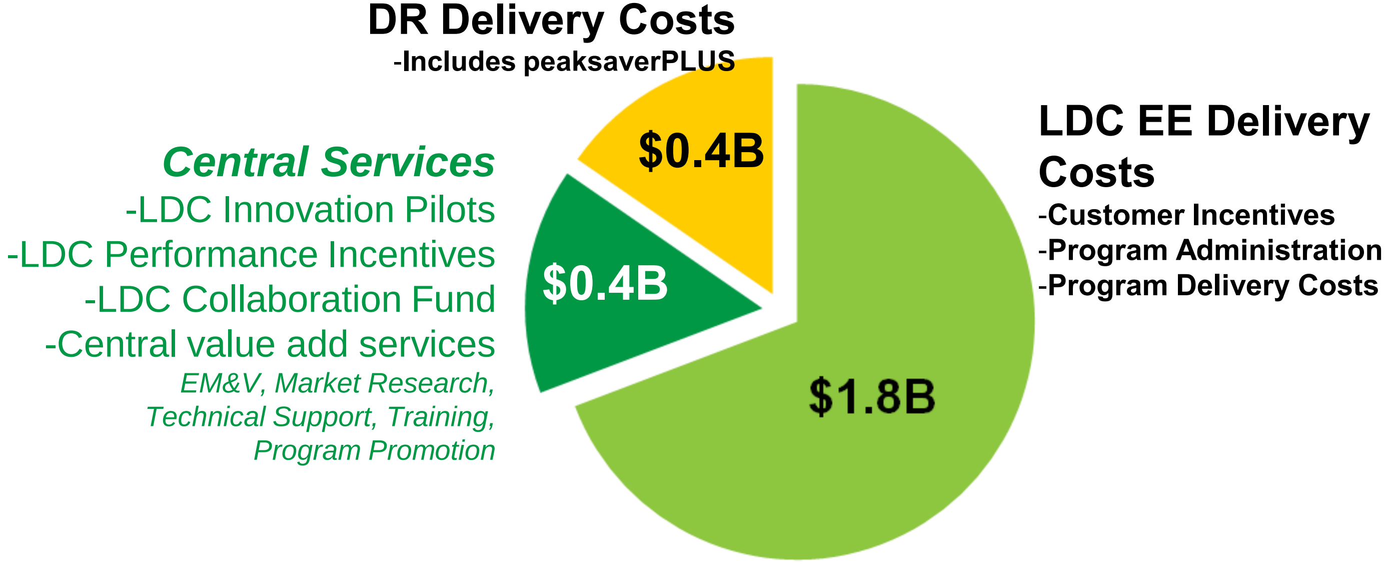
Target and Budget Allocation Methodology

Conservation First Framework LDC Tool Kit

Final v2
December 16, 2014

Global 2015-2020 CDM Budgets

- The Long-Term Energy Plan (LTEP) outlines $2.6B for 2015-2020 conservation costs
  - $2.2B for energy efficiency (EE), $0.4B for demand response (DR)
    - Derived from average portfolio cost assumptions of 3.5–4 ¢/kWh
    - Aligned with Achievable Potential Study costs which assumes cost of 2.5 - 3.7 ¢/kWh to procure lower / upper CDM potential



ONTARIO POWER AUTHORITY

LDC 2015-2020 CDM Plans

1. Could you please provide the IESO's total budget for the LDCs' 2015-2020 CDM programs.
The sum of all LDC budgets is $1,835,264,931. The central services budget (e.g. EM&V, LDC innovation pilots, province-wide marketing, market research, etc.) is $400 million.
These values are available online at

http://www.powerauthority.on.ca/sites/default/files/conservation/LDC%20CDM%20Targets%20and%20Budgets_10312014.pdf

2. Could you please provide a break-out of the 2020 7 TWh savings target by LDC.
See above.

3. Could you please provide your best estimate of the cumulative, life-time TWh savings that will be created by the LDCs' 2015-2020 CDM programs.
Until all CDM Plans are approved, the IESO is unable to provide an estimate of the cumulative, life-time savings from the programs.

4. Could you please provide the time horizon(s) that the LDCs are required to use when calculating the TRC benefits of their CDM programs.
The TRC benefits are calculated for 2015-2020, and benefits include the lifetime savings of the measures.

5. Could you please provide the annual avoided cost estimates that the IESO provides to the LDCs to calculate the TRC benefits of their CDM programs.
This is included in Appendix A, p. 58, of the CDM Cost Effectiveness Guide available online at
http://www.powerauthority.on.ca/sites/default/files/conservation/CDM%20EE%20Cost%20Effectiveness%20Test%20Guide%20Final%20v1_10312014.pdf

Could you please state when these avoided cost estimates were prepared.
2014.

Could you please provide a description of the IESO's avoided cost methodology and its key input assumptions.

The following is an overview of the IESO's avoided costs used in the evaluation of electricity conservation programs:

- Electricity conservation program avoided costs are used to support the design and prioritization of conservation programs
  - March 2014 CDM Framework Directive requires a positive benefit-cost result for each program
  - Update included in the cost-effectiveness tool released to LDCs on July 31, 2014
- The avoided costs are an output of the Long-Term Energy Plan (LTEP) and values reflect the electricity resource mix described in LTEP 2013
  - Does not change CDM program targets or budgets, to be used as a tool by LDCs for program cost-effectiveness screening
  - Targets are based on achievable potential (see IESO 2014 Achievable Potential Study posted on IESO website) and are expected to be achieved cost-effectively
  - Compared to the avoided costs last published, in 2010, updated Avoided Costs are lower in the near term (to 2020) driven by current supply/demand outlook (per LTEP), approach 2010 values in the long term (post 2020)

Cost assumptions are set out in the Cost Effectiveness guide, and include:

- Inflation rate 2%
- Discount rate 4%
- Base year 2014
- Average distribution system losses 4.20%
- Average transmission system losses 2.50%
- Non-energy benefits rate 15%
- Avoided energy and capacity values are set out at page 58 of the CDM Energy Efficiency Cost Effective Guide Final v.1

http://www.powerauthority.on.ca/sites/default/files/conservation/CDM%20EE%20Cost%20Effectiveness%20Test%20Guide%20Final%20v1_10312014.pdf

6. Could you please provide a copy of the IESO's generic contract with the LDCs with respect to their 2015-2020 CDM Programs' budgets and targets. In particular, I am interested in understanding the incentives that the IESO is providing to the LDCs' shareholders to meet and exceed their CDM targets and to underspend their CDM budgets.
The Energy Conservation Agreement is available online at
http://www.powerauthority.on.ca/sites/default/files/conservation/Energy-Conservation-Agreement.pdf

2015-2020 CDM Programs for Transmission-Connected Customers
1. Could you please state the IESO's budget to achieve its 1.7 TWh CDM savings target for transmission-connected customers by 2020.
$500 million

2. Please provide your best estimate of the cumulative, life-time TWh savings that will be created by your transmission-connected customers CDM programs, which will provide annual savings of 1.7 TWh in 2020.
The cumulative life-time TWh savings depend on the timing of when savings occur. There is a steady ramp up period of adoption of energy efficiency measures, to reach to goal of 1.7 TWh in 2020.
Using a ball-park assumption of a 20-year lifespan for persistence in efficiency measures (the precise values are based on the individual measures assumption list: http://www.powerauthority.on.ca/opa-conservation/conservation-information-hub/evaluation-measurement-verification/measures-assumptions-lists) one could assume that the measures that go in place for 2020 have a 20 year persistent savings of 1.7 TWh per year, and for planning purposes assume that the measures begin to ramp down in 2035.

3. Please provide your best estimate of the TRC benefits and costs of your CDM programs that will save 1.7 TWh in 2020.
The Board has approved a TRC of 1.4 and a LUEC of $40/MWh.

FW: CDM questions - part 1

1 message

Jack Gibbons <jack@cleanairalliance.org> Thu, Jul 23, 2015 at 3:08 PM
To: Kent Elson <kent.elson@klippensteins.ca>

Hi Kent,

This email and attachment are for our Union Gas Cross-Examination Document Book.

All the best,

Jack

From: Young, Terry [mailto:terry.young@ieso.ca]
Sent: July-13-15 4:54 PM
To: 'Jack Gibbons'
Subject: RE: CDM questions - part 1

Jack, I am doing this in two batches … here is the first one. The second will follow tomorrow. Appreciate your patience on this.

Terry

-

-----Original Message-----
From: Jack Gibbons [mailto:jack@cleanairalliance.org]
Sent: July 10, 2015 4:16 PM
To: Young, Terry
Subject: Re: CDM questions

Thanks Terry. Monday would be great - I don't want you to have to work this weekend!

All the best,

Jack

Sent from my iPad

> On Jul 10, 2015, at 4:06 PM, Young, Terry <terry.young@ieso.ca> wrote:

>

> Jack:

>

> I have most of the stuff together. I have a few links I need to check but will do that over the weekend and send you something Sunday or Monday.

>

> Have a good weekend.

>

> Terry

>

> -----Original Message-----

> From: Young, Terry

> Sent: July 07, 2015 10:12 AM

> To: Jack Gibbons

> Subject: Re: CDM questions

>

> Jack: Thanks for the reminder. Yes I should have something for you this week. Terry

>

> Sent from my BlackBerry 10 smartphone on the Bell network.

> Original Message

> From: Jack Gibbons

> Sent: Tuesday, July 7, 2015 9:31 AM

> To: Young, Terry

> Cc: Veeneman, Kimberly

> Subject: RE: CDM questions

>

>

> Hi Terry,

>

> I hope you are enjoying the warm weather.

>

> Just checking in to see if you will be able to give me a CDM progress report soon?

>

> All the best,

>

> Jack

>

> Jack Gibbons

> Chair, Ontario Clean Air Alliance

> 160 John St., #300

> Toronto M5V 2E5

>

> Tel: 416-260-2080 x 2

> Fax: 416-598-9520

> Email: jack@cleanairalliance.org

> www.cleanairalliance.org

>

>

>

> -----Original Message-----

> From: Young, Terry [mailto:terry.young@ieso.ca]

> Sent: June-15-15 5:08 PM

> To: Jack Gibbons

> Cc: Veeneman, Kimberly

> Subject: RE: CDM questions

>

> Jack: There is a lot here but we will get started on answering the questions. I will give you a progress report in a week. Terry

>

> -----Original Message-----

> From: Jack Gibbons [mailto:jack@cleanairalliance.org]

> Sent: June 15, 2015 1:37 PM

> To: Young, Terry

> Subject: CDM questions

>

> Hi Terry,

>

> I hope you are well.

>

> I have a number of CDM and integrated resource planning questions for the IESO which I am hoping that your staff can answer.

>

> My questions are attached.

>

> Thanks for your help.

>

> Jack

>

> Jack Gibbons

> Chair, Ontario Clean Air Alliance

> 160 John St., #300

> Toronto M5V 2E5

>

> Tel: 416-260-2080 x 2

> Fax: 416-598-9520

> Email: jack@cleanairalliance.org

> www.cleanairalliance.org

>

>

>

Response Jack Gibbons questionsJuly 2015 part 1.docx
26K

Home > Conservation > Conservation First Framework

Conservation First Framework

Ontarians have embraced conservation, and its role in meeting electricity demand is only growing. Conservation First is the guiding principle that now places conservation at the forefront of Ontario's energy planning and procurement processes, ensuring it is the first option to be considered in planning for electricity needs.

The new Conservation First Framework maps out Ontario's energy conservation goals over the next six years, emphasizing a coordinated effort within all stages of energy planning, as well as more effective teamwork among sector partners, particularly in support of local distribution companies (LDCs).

Also in this section

Conservation and Demand Management Plans

See also

saveonenergy.ca

Industrial Accelerator Program

The Framework

The goal of the framework is a total reduction of 8.7 TWh of electricity consumption in Ontario by December, 2020 — 1.7 TWh to be achieved through conservation projects with transmission-connected customers, and 7 TWh from conservation programs delivered by LDCs to residential and business customers across the province.

Greater Autonomy for Distributors

The framework gives a much larger role to the province's distributors, each being assigned a share of the 7 TWh target that they can pursue individually or in partnership with other LDCs.

The IESO is providing tools, support and guidance to LDCs to help them meet their targets through the development of a six-year Conservation and Demand Management (CDM) Plan. The plan allows LDCs to design their own program offerings, giving them greater flexibility to align conservation programs to local needs, and give customers more choice. It will also ensure long-term, stable funding to give LDCs the certainty they need to implement and deliver their programs. In addition, new administrative requirements now mean the IESO has sole approval over plans and program offerings, ensuring oversight while still streamlining processes. More on CDM plans »

Collaboration and Partnerships

Collaboration, to maximize efficiencies and reduce costs, is a key focus in the new Framework. The IESO is working closely with LDCs, who are in turn encouraged to partner with other utilities to meet energy reduction targets. Examples of how teamwork is encouraged include:

- A simplified approval process for combined CDM plans of two or more LDCs;
- The provision of a specialized template and materials to help utilities adopt a regional approach to resourcing;
- The encouragement of partnerships, where appropriate, with natural gas distributors, for cooperating in areas such as marketing and customer engagement where they share customers or program goals with LDCs;
- Additional financial support through the IESO, above and beyond CDM Plan budgets, for groups of collaborating LDCs that partner within their respective regions or with utilities that share similar opportunities and challenges.

Regional and Community Planning Integration

With an eye to ensuring coordination within the sector, LDCs are required to describe how their conservation programs consider needs and investments identified in other stages of energy planning, including Integrated Regional Resource Planning, distribution system plans, and community energy plans.

By sharing CDM plans and associated activities, LDCs give other planners information on program commitments and projected savings, and in turn can better identify areas for focusing resources and partnering with other utilities. LDCs can, for example, target programs and marketing to customers in areas with greater energy requirements.

Contributing to and benefiting from these initiatives could ultimately help achieve local reliability at a lower cost to ratepayers.

Although CDM plans focus on 2015-2020 period, the work they do may lay the groundwork for achieving savings that address the longer-term needs identified through regional planning.

Read more about regional planning in Ontario.

Transmission-Connected Customer Targets

The 1.7 TWh reduction target will be delivered through the Industrial Accelerator Program, which offers financial incentives to industrial, commercial and institutional customers directly connected to the electricity grid. Incentives encourage the implementation of major energy conservation projects, such as process changes and equipment retrofits.

In response to stakeholder feedback, the IESO is currently refining the program design to improve the customer experience and streamline administration. More on the Enhancements to the IAP »

Innovative Program Design Elements

- The new Framework promotes innovation and the adoption of new technologies through the LDC Program Innovation Stream. The Stream provides additional funding for LDC-led program design and market testing of small-scale pilot programs, which refine program delivery at less risk to the ratepayer.
- The IESO will begin to formally include benefits not directly related to energy savings when weighing the total costs and benefits of proposed conservation programs. These include environmental, economic and social benefits, like increased comfort, reductions in carbon emissions, and better air or water quality, and highlight the advantages of conservation to society as a whole.
- Energy managers are professionals trained to identify areas for energy efficiency and improvement, often with specific expertise within a sector or an area like lighting. The IESO is working with LDCs to develop a complimentary layer of support to ensure the availability of this service throughout the province, particularly for smaller LDCs.

Contact Us »
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Ontario Energy Board

EB-2014-0134

Report of the Board

Demand Side Management Framework for Natural Gas Distributors (2015-2020)

December 22, 2014

Overall, many stakeholders were of the view that annual DSM spending was likely to increase in order to achieve a greater level of natural gas savings, although there were some stakeholders who cautioned that increased spending must be supported by evidence that clearly displayed the incremental benefits the additional expenditures will produce.

4.2 Board Conclusions

The Board's objectives with respect to natural gas include the requirement to protect the interests of consumers with respect to prices, reliability and quality of gas service. The Board also has an objective to promote energy conservation and energy efficiency, but doing so having regard to the consumer's economic circumstances. In approving any budget amount, it is necessary for the Board to consider the rate impacts, or overall cost impacts, to customers, as all DSM costs are recovered through distribution rates. As noted earlier, since all customers share the total cost of DSM activities undertaken by the gas utilities, the Board must be mindful of the cost impacts to the non-participating customers. Many customers in all rate classes will likely not participate in a DSM program over the course of the new DSM framework. This is due to a number of reasons, including the inherent limits of DSM programs, primarily driven by the lack of opportunities a customer has to upgrade space or water heating systems. Although non-participating customers will enjoy some of the non-energy benefits that result from the program, including environmental benefits, the Board is centrally concerned with two factors that must be balanced: ensuring the gas utilities have sufficient funding available to pursue all cost-effective natural gas savings in their franchise areas and that the costs to undertake such efforts are reasonable for those customers who will not participate in a program.

Therefore, the Board has determined that for DSM activities between 2015 and 2020, the gas utilities' annual DSM budgets should be guided by the simple principle that DSM costs (inclusive of both DSM budget amounts and shareholder incentive amounts[15]) for a typical residential customer of each gas utility should be no greater than approximately $2.00/month. The current bill impact for a typical residential customer is just under $1.00/month. The budget guidance for the new multi-year DSM plans is in the order of double the cost impacts to residential customers from the 2012 to 2014 DSM period. Based on a $2.00/month cost impact to a typical residential customer and considering the general historic program mix and the relative size of each utility, the Board has estimated total annual DSM amounts of $85M for Enbridge and $70M for

[15] Shareholder Incentives are further discussed in Section 5 below.

Union (these amounts are inclusive of the maximum annual shareholder incentive[16]). The Board is therefore establishing this as the maximum budget guideline for the new framework. NRG is encouraged to prepare and file a DSM plan with Board. Given that this is a new activity for NRG, the Board concludes that it should start initially with a DSM budget lower than a budget based on NRG's relative size to EGD and Union, and a bill impact for residential customers more in line with EGD and Union's from the previous framework.[17] This can be reviewed at the time of the mid-term review.

To reach the annual budget levels of $75M for EGD and $60M for Union (exclusive of maximum annual shareholder incentive), utilities will need to propose cost-effective DSM plans with results in gas savings, benefits to customers, program participation and implementation of key priorities (outlined in Section 6.2 below) commensurate with the proposed spending. The Board expects that the multi-year DSM plan applications will propose a plan to phase in increases to the annual budget amounts. While the program mix going forward has not been prescribed, the Board is of the view that a bill impact of $2.00/month for a typical residential customer, combined with the total budget amounts discussed above, provides a reasonable guideline for the gas utilities to prepare their DSM plans. The Board notes that this is a guideline, and the utilities can propose alternative budgets for approval by the Board, appropriately supported by evidence.

The budget amounts outlined above assume a general program mix where 40% of ratepayer funding for DSM activities is dedicated to the residential class. The gas utilities should ensure that overall cost increases to all other rate classes are generally proportional with the guidance outlined relative to residential customers, and that any proposed increases are reasonable and supported by significant benefits, including both natural gas savings and prospective bill reductions for customers. The gas utilities should include a forecast of the number of participants (customers, not measures installed) for each proposed program in each year. For each program proposed by the gas utilities, they should also include anticipated overall cost impacts (budget and shareholder incentive) for a typical customer in each rate class, and projected monthly and annual bill reductions for a typical participant and the overall costs borne by a typical non-participating customer.

[16] This is made up of maximum annual budgets of $74.5M for EGD and $59.5M for Union with maximum annual incentives equal to $10.45M for EGD and Union.

[17] The Board does not have historic DSM information for NRG. A budget based on NRG's relative size to both EGD and Union would be $0.35M, and therefore the budget for NRG would be expected to be lower than this. NRG will be expected to fully support any application for rate funding to support DSM activities similar to that which is expected of both EGD and Union.

Environmental Commissioner of Ontario

2014
ANNUAL ENERGY CONSERVATION PROGRESS REPORT

Planning to ~~Build~~ Conserve

Many new residential customers signed up for the *peaksaver* PLUS initiative, which reduces strain on the electricity system on very hot days by briefly cycling down residential appliances that have a high electricity demand, such as air conditioners and electric water heaters. Participants in this program receive an in-home energy display to track and control their electricity use. An analysis conducted by the OPA found that the in-home energy displays have not had a measurable impact in reducing electricity use, although they did make a contribution by convincing many customers to enroll in *peaksaver* PLUS. Incentives for high-efficiency light-emitting diode (LED) lighting were added in 2013, and proved to be popular both among residential customers (purchased through coupons and retailer events) and small business customers (through the Direct Install Lighting initiative).

The Home Assistance Program, which upgrades the electrical efficiency of low-income households at no cost to participants, saw a fivefold increase in participation, reaching almost 27,000 homes in 2013. The OPA also began offering a similar program (the Aboriginal Conservation Program) to selected First Nation communities in 2013.

As in previous years, the Business Program for commercial and institutional customers accounted for most of the overall energy savings from electricity conservation programs. Participation in the Retrofit initiative, which provides incentives for energy efficiency improvements (particularly lighting upgrades) in existing commercial and institutional buildings, increased by more than 40 per cent. The addition of LED technologies and higher incentive levels helped the Direct Install Lighting initiative continue to reach new customers, despite previous concerns from LDCs that the market for this initiative was close to being saturated. The New Construction initiative, targeting higher-efficiency new commercial buildings, saw little uptake among builders, which was also the case for its program counterpart in the residential sector.

In the industrial sector, 2013 saw encouraging growth in savings achieved by energy managers. Energy managers can either be dedicated to a single facility or employed by an LDC and deployed across the LDC's service territory. Energy managers help companies deliver savings through identifying energy efficiency capital improvements for which incentive funding is available, and by educating businesses to implement low-cost operational improvements that don't require incentives. In contrast to the success of the Energy Manager initiative, only three projects were completed in 2013 under the Process and Systems Upgrade initiative, which offers incentives for energy efficiency investments to distribution-connected industrial customers. While this is an improvement over 2012, when not a single project was completed, it is still disappointing.

Program Spending and Cost-Effectiveness

Spending on province-wide electricity conservation programs is shown in Table 12, and totalled $290.9 million in 2013, a large increase from 2012 ($177.1 million). The majority of the spending increase ($100 million of the $114 million increase) flowed directly to participants in conservation programs – particularly businesses – in the form of incentives and related support, with the remainder going to increased administration costs. Spending on conservation programs is recovered from all electricity ratepayers through a relatively small portion (about 3 per cent) of the Global Adjustment charge.[184]

Table 12: 2013 Province-Wide Conservation Program Spending

Program	Central Program Services (OPA) ($)	Customer Incentives, Participant Based Funding, and Capability Building ($)	LDC Administration Costs (Program Administration Budget) ($)	Total Actual Charges ($)
Consumer Program	7,088,654	72,249,999	24,076,180	103,414,833
Business Program	2,169,213	98,104,239	28,733,641	129,007,093
Industrial Program	14,474,019	21,626,996	5,447,101	41,548,117
Home Assistance Program	174,011	12,176,153	4,000,076	16,350,239
Aboriginal Program	529,268	87,651	0	616,919
Total – All Province-Wide Programs	**24,435,165**	**204,245,038**	**62,256,997**	**290,937,200**

Note: Central Program Services include: program delivery services, evaluation, measurement & verification, marketing, awareness campaigns, IT support, call centre, technical review services, settlement services.

Source: Ontario Power Authority

The cost effectiveness of province-wide conservation programs from 2011 to 2013 is shown in Table 13. Two cost-effectiveness tests are used. Both tests compare the lifetime program benefits (primarily from cost savings due to reduced electricity consumption) and costs, but from different perspectives. The Total Resource Cost test considers the impact on all parties, including ratepayers and program participants. The Program Administrator Cost test considers the costs and benefits from the perspective of the program administrator (the OPA). For both tests, a ratio of greater than one indicates that the conservation program benefits exceed the costs. The portfolio of province-wide conservation programs has been cost-effective using either test, which is a requirement of the conservation framework. However, the cost-effectiveness of programs for different sectors varies widely. The OPA expects that the cost-effectiveness of industrial programs will improve as more conservation projects are completed in future years. These cost-benefit analyses were done prior to the Minister's October 2014 direction that the Total Resource Cost test should be modified to include a value for the non-energy benefits of conservation (e.g., environmental benefits). If the new methodology was used, the Total Resource Cost test ratios shown in Table 13 would be slightly higher.

The levelized delivery cost of conservation is also shown in Table 13. For energy efficiency programs, this is the cost (from the program administrator's perspective) of saving a unit of electricity through conservation programs, which allows comparison with the cost of generating the same unit of power. For demand response programs, the levelized cost is the cost of reducing a unit of peak demand, which can be compared with the cost of building a new generating plant to meet peak demand. The levelized cost of energy efficiency programs from 2011 to 2013 was 3.7 cents per kilowatt-hour, which is much lower than any new form of electricity generation.

Table 13: Cost-Effectiveness of 2011-2013 Province-Wide Conservation Programs

Program	Total Resource Cost Test Benefit: Cost Ratio	Program Administrator Cost Test Benefit: Cost Ratio	Levelized Delivery Cost	
			Energy Efficiency (¢/kWh)	Demand Response ($/MW-month)
Consumer	1.1	1.5	5.5	14,745 (*peaksaver* PLUS)
Business	1.3	2.8	3.0	Not Applicable
Industrial	0.8	1.0	11.0	9,776 (Demand Response 3)
Low Income	0.6	0.6	11.5	Not Applicable
Total - All Province-Wide Programs	**1.2**	**2.1**	**3.7**	**13,469**

Notes:

Consumer program results also include commercial participants in Residential Demand Response initiative; Business program results also include industrial participants in Retrofit initiative; Industrial program results also include commercial participants in Demand Response 3 initiative. Levelized delivery cost is calculated from the program administrator's perspective, and excludes incremental customer costs of conservation measures.

Source: Ontario Power Authority

3.3.3 PROGRESS ON 2014 TARGETS

Conservation results from 2011, 2012, and 2013 programs (as well as 2014 programs, for which results are not yet available) are counted towards the 2014 targets. The aggregate province-wide targets for all LDCs are cumulative energy savings of 6,000 GWh (about 1 per cent of expected total electricity consumption over the four years) and a reduction in provincial peak demand of 1,330 MW (approximately 5 percent of Ontario's system peak). Progress towards these targets is shown in Figure 19 and Figure 20.

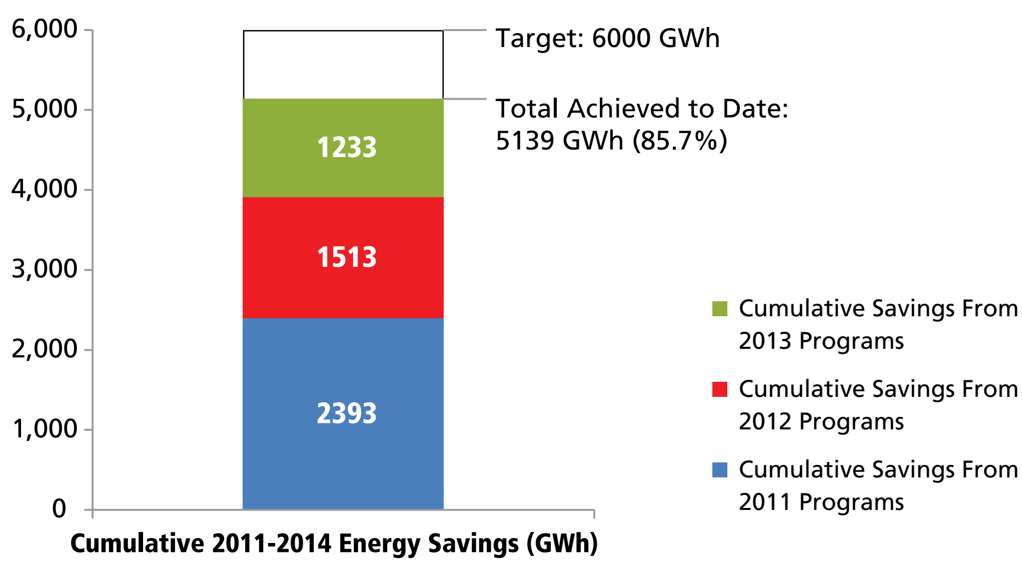


Figure 19: Province-Wide Progress To 2014 Energy Target

Note: Results for 2012 and 2013 include minor adjustments to previous years' verified results

Source: Ontario Power Authority

2013

DEMAND SIDE MANAGEMENT ANNUAL REPORT

September 24, 2014

ENBRIDGE®

Appendix E. TRC Screening Summary

Table 52. TRC Screening Summary

Sector/Program	NPV Total TRC Benefits	Total TRC Costs	TRC Net Benefit	TRC Ratio
Residential				
Community Energy Retrofit	5,760,075	5,360,352	399,722	1.07
All Residential Total	**5,760,075**	**5,360,352**	**399,722**	**1.07**
Commercial				
Commercial Custom	75,418,033	30,724,126	44,693,907	2.45
Commercial Prescriptive	19,716,920	4,469,445	15,247,474	4.41
Run It Right	1,733,797	1,466,887	266,910	1.18
All Commercial	**96,868,750**	**36,660,459**	**60,208,292**	**2.64**
Industrial				
Industrial Custom	31,382,118	8,050,681	23,331,437	3.90
Industrial Prescriptive	113,537	29,631	83,906	3.83
All Industrial	**31,495,655**	**8,080,312**	**23,415,342**	**3.90**
Overheads		5,091,220	-5,091,220	
Overall Resource Acquisition	**134,124,480**	**55,192,344**	**78,932,136**	**2.43**
Low Income				
Single Family (Part 9)	4,460,516	3,996,932	463,584	1.12
Multi-Residential (Part 3)	4,108,057	1,029,300	3,078,757	3.99
Overheads		586,981	-586,981	
Overall Low Income	**8,568,573**	**5,613,214**	**2,955,359**	**1.53**
Combined RA/Low Income *	**142,693,052**	**60,805,557**	**81,887,495**	**2.35**

***This summary does not include TRC calcuations for the Market Transformation Program.**

All values are provided for illustrative purposes only.

FINAL
Demand Side Management
2013 Annual Report

November 4, 2014

uniongas
A Spectra Energy Company

3. Overall 2013 DSM Program Results

With spending in the amount of $32,838,926, Union's DSM program generated 2,820,834,405 cumulative m³ in natural gas savings for customers. As illustrated in Figure 3.0, the Large Volume program delivered the largest portion of savings in 2013, followed by the Commercial/Industrial, Low-Income and Residential programs respectively.

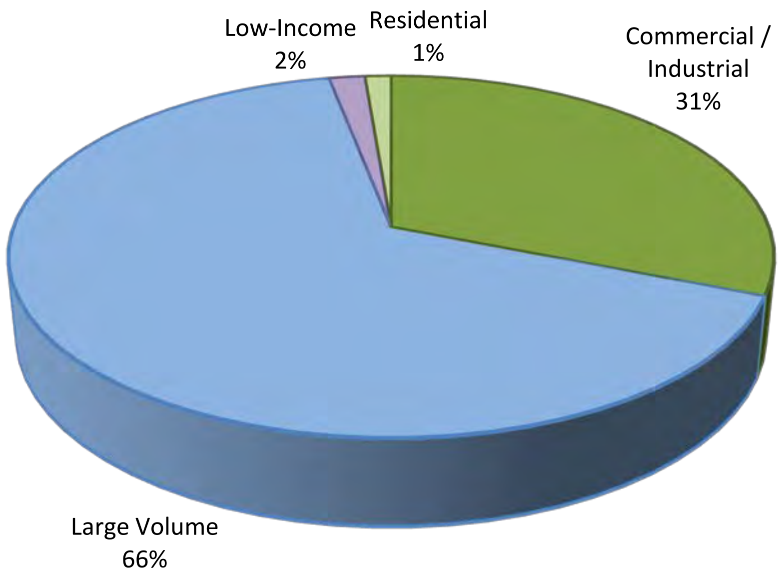


Figure 3.0, 2013 Cumulative Gas Savings by Program (Percentage)

Table 3.0 summarizes Union's DSM results by program for 2013, including annual and cumulative natural gas savings, number of units, expenditures, and the associated net TRC and TRC ratio. Figure 3.1 shows the total Union incentive achieved broken down by scorecard.

Table 3.0 – 2013 Program Results

Program	Annual Net Gas Savings (m^3)	Cumulative Net Gas Savings (m^3)	Units	Expenditures	Net TRC	TRC Ratio
Residential	3,162,690	35,725,799	43,285	$3,372,157	$12,832,397	4.40
Commercial / Industrial	51,833,431	885,049,151	7,056	$12,587,008	$66,604,696	2.01
Low-Income	2,551,934	55,504,533	12,303	$8,042,873	-$2,305,267	0.77
Large Volume	122,418,509	1,844,554,921	484	$4,738,953	$252,262,463	8.74
Optimum Home	0	0	0	$944,661	$0	NA
Program Total	**179,966,564**	**2,820,834,405**	**63,128**	**$29,685,652**	**$329,394,289**	**3.93**
Portfolio Costs				**$3,153,274**		
Total 2013 Spend				**$32,838,926**	**$326,341,359**	**3.83**

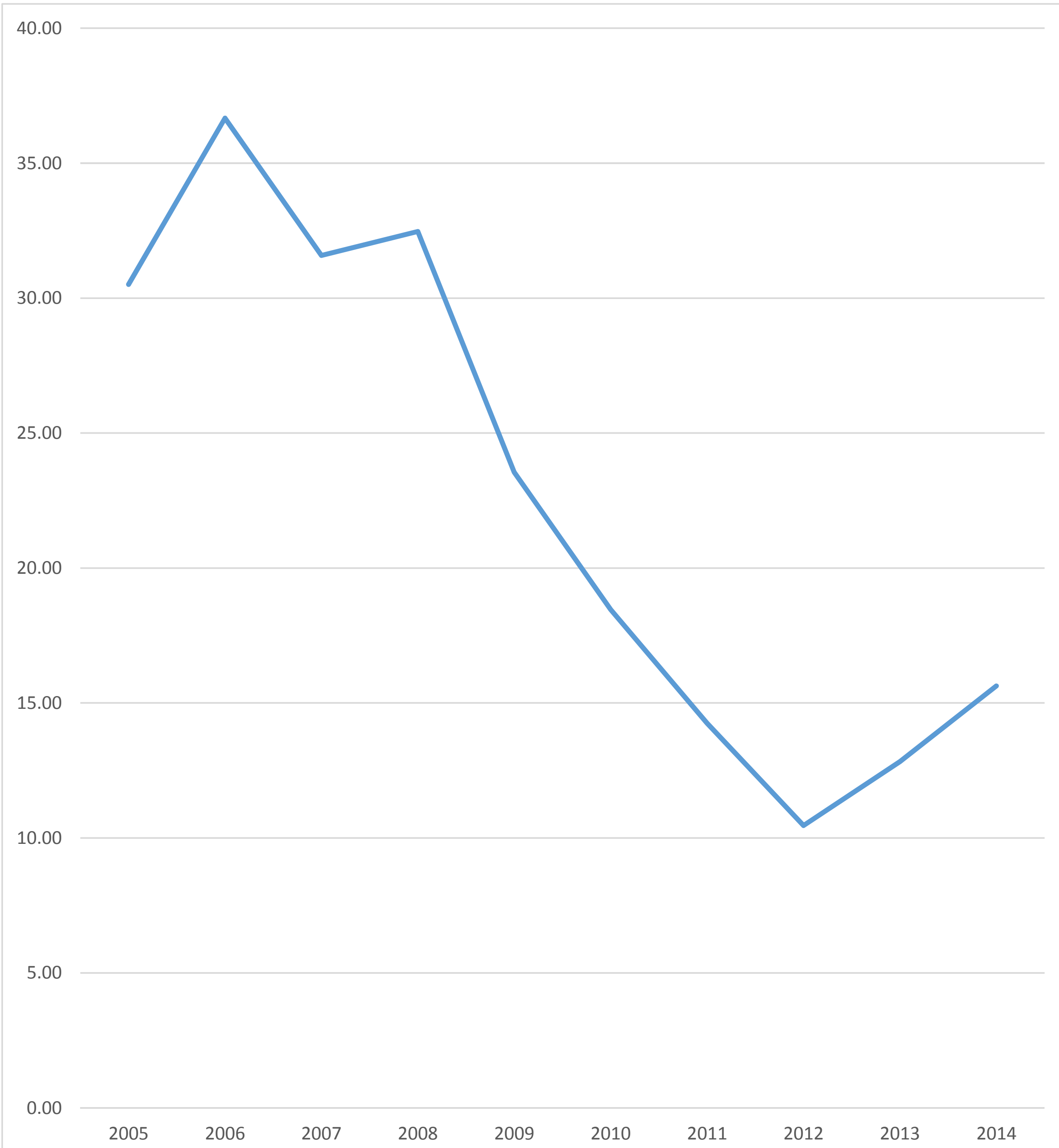
Table 4: 2016 System Characteristics and Bill Impacts

2016 System Characteristics and Bill Impact - Forecasted Rate Allocation								
Rate Class	**Number of Customers**	**Gas Consumption/ Throughput ($10^6 m^3$)**	**Annual Volume for Typical Customer (m3)**	**Average Annual Effective Rate ($/m3)**	**Annual Bill for Typical Customer**	**Average Annual Bill Impact of DSM per Customer**	**Average Monthly Bill Impact of DSM per Customer***	**Average Annual Bill Impact per Customer %**
Rate 1	1,968,960	4,709	2,400	$0.0080	$1,018	$19.29	$1.61	1.9%
Rate 6	162,517	4,660	22,606	$0.0056	$6,382	$126.57	$10.55	2.0%
Rate 9	8	1	-	-	-	-	-	-
Rate 110	191	620	598,568	$0.0020	$128,349	$1,168.93	$97.41	0.9%
Rate 115	27	472	4,471,609	$0.0025	$873,021	$11,132.02	$927.67	1.3%
Rate 125	5	0	-	-	-	-	-	-
Rate 135	41	56	598,567	$0.0051	$112,451	$3,051.13	$254.26	2.7%
Rate 145	101	163	598,568	$0.0030	$122,931	$1,784.52	$148.71	1.5%
Rate 170	34	453	9,976,120	$0.0010	$1,764,592	$10,462.16	$871.85	0.6%
Rate 200	1	186	-	-	-	-	-	-
Rate 300	2	30	-	-	-	-	-	-

*The average monthly bill impact of DSM for Rate 1 customers inclusive of the maximum potential shareholder incentive is forecasted to be $1.76.

Witnesses: R. Idenouye
S. Moffat
F. Oliver-Glasford
B. Ott
R. Sigurdson

Enbridge's Average Annual Gas Supply Charge (¢/m³)



Source: EB-2015-0049, Exhibit I.T3.EGDI.ED.11

ENVIRONMENTAL DEFENCE INTERROGATORY #11

INTERROGATORY

Topic 3 – DSM Budgets

Reference: Ex. B, Tab 2, Schedule 4, Page 5

(a) Please provide a table showing the average annual natural gas price (Henry Hub) over the past ten years (2005 to 2014 inclusive).

(b) Please provide Enbridge's average effective rate for natural gas (i.e. commodity costs) for residential customers over the past ten years (2005 to 2014 inclusive). Please provide the data in two tables, one with annual averages and the other quarterly.

RESPONSE

a) Please see the requested table below:

Henry Hub Spot Price											
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Henry Hub	$USD/mmBTU	8.69	6.73	6.97	8.86	3.94	4.37	4.00	2.75	3.73	4.39

Source: U.S. Energy Information Administration

b) Please see below Enbridge's average gas supply charge (i.e. commodity costs) for residential customers from 2005 to 2014, represented on an annual and quarterly basis.

Average Gas Supply Charge (Annual)											
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gas Supply Charge	cents/m^3	30.51	36.67	31.58	32.47	23.55	18.46	14.25	10.46	12.83	15.63

Gas Supply Charge	
Date	cents/m^3
2005 Q1	27.80
2005 Q2	27.80
2005 Q3	31.10
2005 Q4	35.33
2006 Q1	43.12
2006 Q2	35.40
2006 Q3	34.07
2006 Q4	34.07
2007 Q1	31.48
2007 Q2	32.86
2007 Q3	32.86
2007 Q4	29.10
2008 Q1	26.76
2008 Q2	30.36
2008 Q3	39.01
2008 Q4	33.76
2009 Q1	30.37
2009 Q2	23.54
2009 Q3	20.44
2009 Q4	19.86
2010 Q1	19.97
2010 Q2	21.16
2010 Q3	17.30
2010 Q4	15.42
2011 Q1	14.42
2011 Q2	13.98
2011 Q3	14.93
2011 Q4	13.69
2012 Q1	11.85
2012 Q2	9.42
2012 Q3	9.85
2012 Q4	10.72
2013 Q1	12.85
2013 Q2	12.15
2013 Q3	14.00
2013 Q4	12.30
2014 Q1	12.68
2014 Q2	17.60
2014 Q3	17.60
2014 Q4	14.62

UNDERTAKING JT1.33

UNDERTAKING

Technical Conference TR, page 132

Enbridge to provide answers to the questions posted by Environmental Defence on July 2nd, 2015

RESPONSE

Environmental Defence Question #1

Re Exhibit I.T3.EGDI.ED.3: This interrogatory requested the following: "Please re-calculate the rate allocation of the Large C/I Resource Acquisition Program's for each year from 2016 to 2020 inclusive assuming that the Program's expenditures are rate based and amortized over the expected lives of their lifetime cubic metre savings." Enbridge indicated that it was unable to provide a response. However, Union was able to make appropriate assumptions and provide a response (see Exhibit B.T3.Union.ED.5). Environmental Defence asks that Enbridge provide a similar analysis as did Union.

Enbridge provides the following response:

Further to Enbridge's original response (Exhibit I.T3.EGDI.ED.3), a re-calculation of rate allocation of Large C/I Resource Acquisition programs required Enbridge to make a series of untested assumptions with respect to accounting treatment and tax implications in the revenue requirement calculation. In sharing the following hypothetical accounting treatment (for illustrative purposes only), Enbridge does not endorse the notion of rate-basing DSM expenditures.

Witnesses: K. Mark
R. Small

ILLUSTRATIVE RATE BASE TREATMENT OF LARGE C/I RESOURCE ACQUISITION PROGRAM COSTS

($000's)

Line No.		2016	2017	2018	2019	2020
	Cost of capital					
1.	Rate base	948.2	8,284.1	15,371.7	22,291.4	28,818.7
2.	Required rate of return	6.52%	6.52%	6.52%	6.52%	6.52%
3.	Cost of capital	61.8	540.1	1,002.2	1,453.4	1,879.0
	Cost of service					
4.	Gas costs	-	-	-	-	-
5.	Operation and Maintenance	-	-	-	-	-
6.	Depreciation and amortization	42.2	550.1	1,076.6	1,627.2	2,237.6
7.	Municipal and other taxes	-	-	-	-	-
8.	Cost of service	42.2	550.1	1,076.6	1,627.2	2,237.6
	Misc. & Non-Op. Rev					
9.	Other operating revenue	-	-	-	-	-
10.	Other income	-	-	-	-	-
11.	Misc, & Non-operating Rev.	-	-	-	-	-
	Income taxes on earnings					
12.	Excluding tax shield	(2,014.0)	(2,080.3)	(2,186.3)	(2,231.3)	(2,276.4)
13.	Tax shield provided by interest expense	(7.9)	(68.7)	(127.5)	(184.9)	(239.0)
14.	Income taxes on earnings	(2,021.9)	(2,149.0)	(2,313.8)	(2,416.2)	(2,515.4)
	Taxes on (def) / suff.					
15.	Gross (def.) / suff.	2,609.4	1,440.4	320.0	(903.8)	(2,180.0)
16.	Net (def.) / suff.	1,917.9	1,058.7	235.2	(664.3)	(1,602.3)
17.	Taxes on (def.) / suff.	(691.5)	(381.7)	(84.8)	239.5	577.7
18.	Revenue requirement	(2,609.4)	(1,440.5)	(319.8)	903.9	2,178.9

Notes / Assumptions:

(1) Annual expenditures of $7.60M in 2016, $7.85M in 2017, $8.25M in 2018, $8.42M in 2019, and $8.59M in 2020 are assumed to close into service in November each year.

(2) The required rate of return assumed in this analysis is EGD's 2015 Approved rate from EB-2014-0276.

(3) Depreciation expense is calculated based on a useful life of 15 years (annual depreciation rate of 6.67%).

(4) Taxes are calculated using an assumed tax rate of 26.5%.

(5) For tax purposes, annual expenditures ($7.60M in 2016, $7.85M in 2017, $8.25M in 2018, $8.42M in 2019, and $8.59M in 2020) are assumed to be immediately deductible in the year of spend.

Witnesses: K. Mark
R. Small

ILLUSTRATIVE RATE BASE TREATMENT OF LARGE C/I RESOURCE ACQUISITION PROGRAM COSTS (50% BUDGET INCREASE)

($000's)

Line No.		2016	2017	2018	2019	2020
	Cost of capital					
1.	Rate base	1,423.2	12,430.6	23,057.1	33,439.9	43,226.8
2.	Required rate of return	6.52%	6.52%	6.52%	6.52%	6.52%
3.	Cost of capital	92.8	810.5	1,503.3	2,180.3	2,818.4
	Cost of service					
4.	Gas costs	-	-	-	-	-
5.	Operation and Maintenance	-	-	-	-	-
6.	Depreciation and amortization	63.4	826.2	1,614.4	2,441.4	3,356.8
7.	Municipal and other taxes	-	-	-	-	-
8.	Cost of service	63.4	826.2	1,614.4	2,441.4	3,356.8
	Misc. & Non-Op. Rev					
9.	Other operating revenue	-	-	-	-	-
10.	Other income	-	-	-	-	-
11.	Misc, & Non-operating Rev.	-	-	-	-	-
	Income taxes on earnings					
12.	Excluding tax shield	(3,022.6)	(3,118.8)	(3,280.5)	(3,346.2)	(3,413.0)
13.	Tax shield provided by interest expense	(11.8)	(103.1)	(191.3)	(277.4)	(358.5)
14.	Income taxes on earnings	(3,034.4)	(3,221.9)	(3,471.8)	(3,623.6)	(3,771.5)
	Taxes on (def) / suff.					
15.	Gross (def.) / suff.	3,915.8	2,156.3	483.1	(1,355.8)	(3,269.9)
16.	Net (def.) / suff.	2,878.1	1,584.9	355.1	(996.5)	(2,403.4)
17.	Taxes on (def.) / suff.	(1,037.7)	(571.4)	(128.0)	359.3	866.5
18.	Revenue requirement	(3,915.9)	(2,156.6)	(482.1)	1,357.4	3,270.2

Notes / Assumptions:

(1) Annual expenditures of $11.41M in 2016, $11.77M in 2017, $12.38M in 2018, $12.63M in 2019, and $12.88M in 2020 are assumed to close into service in November each year.

(2) The required rate of return assumed in this analysis is EGD's 2015 Approved rate from EB-2014-0276.

(3) Depreciation expense is calculated based on a useful life of 15 years (annual depreciation rate of 6.67%).

(4) Taxes are calculated using an assumed tax rate of 26.5%.

(5) For tax purposes, annual expenditures ($11.41M in 2016, $11.77M in 2017, $12.38M in 2018, $12.63M in 2019, and $12.88M in 2020) are assumed to be immediately deductible in the year of spend.

Witnesses: K. Mark
R. Small

ILLUSTRATIVE RATE BASE TREATMENT OF LARGE C/I RESOURCE ACQUISITION PROGRAM COSTS (100% BUDGET INCREASE)

($000's)

Line No.		2016	2017	2018	2019	2020
	Cost of capital					
1.	Rate base	1,897.5	16,574.4	30,742.9	44,586.5	57,635.3
2.	Required rate of return	6.52%	6.52%	6.52%	6.52%	6.52%
3.	Cost of capital	123.7	1,080.7	2,004.4	2,907.0	3,757.8
	Cost of service					
4.	Gas costs	-	-	-	-	-
5.	Operation and Maintenance	-	-	-	-	-
6.	Depreciation and amortization	84.5	1,101.3	2,153.3	3,255.6	4,476.0
7.	Municipal and other taxes	-	-	-	-	-
8.	Cost of service	84.5	1,101.3	2,153.3	3,255.6	4,476.0
	Misc. & Non-Op. Rev					
9.	Other operating revenue	-	-	-	-	-
10.	Other income	-	-	-	-	-
11.	Misc, & Non-operating Rev.	-	-	-	-	-
	Income taxes on earnings					
12.	Excluding tax shield	(4,030.1)	(4,158.4)	(4,374.1)	(4,461.5)	(4,550.6)
13.	Tax shield provided by interest expense	(15.7)	(137.5)	(255.0)	(369.8)	(478.1)
14.	Income taxes on earnings	(4,045.8)	(4,295.9)	(4,629.1)	(4,831.3)	(5,028.7)
	Taxes on (def) / suff.					
15.	Gross (def.) / suff.	5,221.1	2,875.1	640.0	(1,813.7)	(4,359.9)
16.	Net (def.) / suff.	3,837.5	2,113.2	470.4	(1,333.1)	(3,204.5)
17.	Taxes on (def.) / suff.	(1,383.6)	(761.9)	(169.6)	480.6	1,155.4
18.	Revenue requirement	(5,221.2)	(2,875.8)	(641.0)	1,811.9	4,360.5

Notes / Assumptions:

(1) Annual expenditures of $15.21M in 2016, $15.69M in 2017, $16.51M in 2018, $16.84M in 2019, and $17.17M in 2020 are assumed to close into service in November each year.

(2) The required rate of return assumed in this analysis is EGD's 2015 Approved rate from EB-2014-0276.

(3) Depreciation expense is calculated based on a useful life of 15 years (annual depreciation rate of 6.67%).

(4) Taxes are calculated using an assumed tax rate of 26.5%.

(5) For tax purposes, annual expenditures ($15.21M in 2016, $15.69M in 2017, $16.51M in 2018, $16.84M in 2019, and

ENVIRONMENTAL DEFENSE INTERROGATORY #6

INTERROGATORY

Issue 1: "Is the 2014 DSM Budget ($32.2M) reasonable and appropriate? Should the Board determine that the DSM budget for 2014 should be increased, what are the implications and required next steps."

Interrogatory No. 1-ED-6 DSM Benefits: Protection from Energy Price Fluctuations, etc.

Reference: Ex. B, Tab 1, Schedule 2, page 3

A report by the Canadian Council of Chief Executives concluded as follows:

> Fundamentally, however, Canada needs to begin with a renewed commitment to energy conservation. We must use existing and future energy supplies as efficiently as possible, embracing the maxim that the cheapest form of energy is the unit that is not used. Better conservation practices will help to insulate Canadians from volatile energy prices, reduce costs for public institutions such as hospitals, and improve the international competitiveness of Canadian companies.

...

> The bottom line is that governments must resist the temptation to shield Canadians from higher energy prices. By any reasonable measure, energy remains a comparative bargain for Canadians.[1]

The relevant excerpts are attached for your reference.

a) Does Enbridge agree with the Council of Chief Executives that "[b]etter conservation practices will help to insulate Canadians from volatile energy prices, reduce costs for public institutions such as hospitals, and improve the international competitiveness of Canadian companies"? If no, why not?

b) Please explain how better conservation practices will help to insulate Canadians from volatile energy prices.

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[1] Canadian Council of Chief Executives, *Energy- Wise Canada, Building a Culture of Energy Conservation*, December 2011, http://www.ceocouncil.ca/wp-content/uploads/2011/12/Energy-Conservation-Paper-FINAL-December-20111.pdf, pp. 2 & 4.

c) Please explain how better conservation practices will improve the international competitiveness of Canadian companies.

d) Is the protection from volatile energy prices resulting from conservation given a dollar value and factored into the TRC analysis for DSM programs?

RESPONSE

a), b), c) & d)

Enbridge generally accepts that a sustained focus on energy efficiency assists with the long-term environmental sustainability and economic competitiveness of the Province. While energy efficiency helps customers lower their overall energy usage which in turn reduces one input cost for businesses, it does not directly address energy price volatility. Price volatility is outside the scope of conservation programming. Customers wishing to insulate themselves from price volatility could do so through fixed price commodity contracts.

Schedule A to Interrogatory No. 1-ED-6

CANADIAN COUNCIL of **CHIEF EXECUTIVES**

CONSEIL CANADIEN des **CHEFS D'ENTREPRIS**

ENERGY-WISE CANADA
BUILDING A CULTURE OF ENERGY CONSERVATION

December 2011

ENERGY-WISE CANADA
BUILDING A CULTURE OF ENERGY CONSERVATION
Canadian Council of Chief Executives
December, 2011

Executive Summary

A key driver of Canada's future prosperity, and a source of comparative advantage for the country, is our diverse array of energy resources. By combining smart government policy with private sector commitment and innovation, Canada can demonstrate to the world that it can be a reliable and environmentally responsible energy supplier and partner.

In previous papers, the Canadian Council of Chief Executives has advocated a multi-pronged strategy, aimed at bringing on a larger and varied supply of energy to meet growing domestic and international demand. This includes investing in advanced energy technologies that can create new business and employment opportunities and position Canada to compete successfully in a world of rising energy prices.

Fundamentally, however, Canada needs to begin with a renewed commitment to energy conservation. We must use existing and future energy supplies as efficiently as possible, embracing the maxim that the cheapest form of energy is the unit that is not used. Better conservation practices will help to insulate Canadians from volatile energy prices, reduce costs for public institutions such as schools and hospitals, and improve the international competitiveness of Canadian companies.

Cutting our energy use would bring other benefits to society as well. Reduced use of carbon-based fuels would make urban air more breathable. Smart transportation choices would diminish traffic congestion and improve workplace productivity. And better urban design would make cities more livable and help Canadians achieve a better work-life balance.

Few of us deliberately waste energy. Yet the choices we make cause energy waste that cascades through the system. For instance, because of inefficiencies and losses at nearly every stage in production, transmission and end use, the amount of energy actually delivered to a light bulb in our home or to a fuel tank in our car is usually at least 50 percent, and sometimes as much as 90 percent, less than the energy content at source.

There are some signs of progress in our quest for energy efficiency. The overall energy intensity of our economy – the amount of energy consumed per unit of GDP – improved 22 percent between 1990 and 2008. The manufacturing sector overall used 8 percent less energy and produced 25 percent more output in 2008 compared to 1995. In the agriculture sector, energy intensity has declined steadily over the past 20 years. Some

municipal governments are ahead of the curve and are embracing sustainability in urban design and transportation planning. And programs such as LEED (Leadership in Energy and Environmental Design) are re-defining how new commercial and public buildings are designed for overall energy and environmental coherence.

In too many instances, however, such gains are outweighed by trends toward greater energy consumption. New building codes and better construction materials are helping to make Canadian homes more energy-efficient, yet the number of houses continues to grow with immigration and shifting demographics. Moreover, the average size of a house is larger and the percentage of homes with air conditioning has doubled since 1990, to 45 percent. Today's televisions and computers are more efficient than those manufactured as recently as five years ago, but many homes now have more than one of each, operating for many more hours. Vehicle fuel efficiency is set to increase significantly with the new North American standards recently announced, but overall passenger-kilometres travelled continues to increase. As well, there has been a significant shift to trucks as the mode of choice for freight transportation and to airlines for passenger travel.

This paper analyzes energy consumption trends and conservation initiatives in each of the major segments of Canadian society: industry, residential, commercial and institutional, transportation, municipalities and agriculture. Needless to say, there is scope for significant improvement in all of these areas.

A review of these trends leads us to two main conclusions. First, governments, industry and public-spirited groups should work together to improve Canadians' energy literacy. We do not underestimate the challenge of changing consumers' behaviour. After all, governments have been preaching the merits of energy conservation and efficiency since the first oil-price shocks of the mid-1970s, with limited success. Nevertheless, Canadians need to understand the energy choices that the country faces so that they can make informed decisions based on realistic assessments of their respective costs and benefits.

A second, closely related, conclusion is that the most effective means of promoting energy conservation is to allow energy prices to rise. It seems clear that higher prices will influence Canadians' behaviour in a way that public exhortation and appeals to the greater good have not. That is why the CCCE has previously stated its support for a broad-based carbon pricing scheme in Canada. Canadians – as business owners, farmers, building managers and individual consumers – need to see the everyday cost of inefficient use of energy and be motivated to change their energy consumption patterns and investment decisions. To be sure, carbon pricing would have to be introduced gradually, both to allow businesses and consumers time to adjust and to avoid any disproportionate impact on Canada's competitive position. (For Canadians on fixed incomes, the impact could be offset through other social or fiscal policies.)

The bottom line is that governments must resist the temptation to shield Canadians from higher energy prices. By any reasonable measure, energy remains a comparative bargain for Canadians. Electricity in particular is cheaper today on an inflation-adjusted basis than it was 20 years ago. In most provinces the regulated electricity rates paid by households and some industries do not even cover the cost of producing and delivering it, but ultimately these costs will have to be recouped through the broader tax base.

Canada's vast array of natural resources, our growing population, our climate and geography push us towards above-average energy consumption. But the present trend is unsustainable. It is time for Canadians to get serious about energy conservation, for the health of our economy as well as the environment.

ENVIRONMENTAL DEFENSE INTERROGATORY #7

INTERROGATORY

Issue 1: "Is the 2014 DSM Budget ($32.2M) reasonable and appropriate? Should the Board determine that the DSM budget for 2014 should be increased, what are the implications and required next steps."

Interrogatory No. 1-ED-7 DSM Benefits: Increased Productivity, GDP, etc.

Reference: Ex. B, Tab 1, Schedule 2, page 3

In 2011, the former Governor of the Bank of Canada, Mark Carney, gave a speech to the Empire and Canadian Clubs and stated that:

> In a world where deleveraging holds back demand in our traditional foreign markets, the imperative is for Canadian companies to invest in improving their productivity and to access fast-growing emerging markets.
>
> This would be good for Canadian companies and good for Canada. Indeed, it is the only sustainable option available. A virtuous circle of increased investment and increased productivity would increase the debt-carrying capacity of all, through higher wages, greater profits and higher government revenues. This should be our common focus.[1]

The relevant excerpts are attached for your reference.

A report by Dr. Ernie Stokes of the Centre for Spatial Economics, which quantifies the economic benefits of energy efficiency investments which reduce Ontario's natural gas consumption, found that a 16.1% reduction in Ontario's natural gas consumption in 2021 would increase Ontario's GDP by $5.5 billion, increase employment by 33,800 jobs, raise corporate profits by $446 million and reduce the provincial deficit by $479 million.[2] The relevant excerpts are attached for your reference.

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[1] Mark Carney, *Growth in the Age of Deleveraging, speech to Empire Club of Canada & Canadian Club of Toronto*, December 12, 2011, http://www.bankofcanada.ca/wp-content/uploads/2011/12/speech-121211.pdf, p. 11.
[2] Centre for Spatial Economics, *The Economic Impacts of Reducing Natural Gas Use in Ontario*, April 2011, http://www.cleanairalliance.org/files/cse.pdf, p. 7.

a) Does Enbridge agree with Mark Carney that Ontario would benefit if its industries increased their investment and productivity? Does Enbridge agree that this could lead to higher wages, profits, and government revenues?

b) When a business participates in one of Enbridge's resource acquisition DSM programs, is that an investment that increases productivity? Please explain.

c) Generally speaking, will Enbridge's DSM programs increase productivity and GDP? If not, why not?

d) Are the economy-wide benefits of conservation spending, such those resulting from increased productivity, given a dollar value and factored into the TRC analysis for DSM programs?

RESPONSE

a), b), c) & d)

Mark Carney's remarks that increased investment results in increased productivity appear reasonable. It is the understanding of the Company that pervasive economic theory does suggest that higher productivity may lead to higher wages, profits and government revenues. Enbridge believes that when a business participates in DSM programs and invests in energy efficiency upgrades, all other things being equal, it may see increases in productivity. While Enbridge cannot specifically predict the future impacts of DSM on overall productivity and GDP, it believes that DSM initiatives can be a factor in elevated productivity and thus, GDP. These productivity gains – which may be difficult if not impossible to predict with any certainty – are not factored into the TRC analysis for DSM programs.

Schedule A to Interrogatory No. 1-ED-7

BANK OF CANADA
BANQUE DU CANADA

Remarks by Mark Carney
Governor of the Bank of Canada
Empire Club of Canada / Canadian Club of Toronto
12 December 2011
Toronto, Ontario

Growth in the Age of Deleveraging

Introduction

These are trying times.

In our largest trading partner, households are undergoing a long process of balance-sheet repair. Partly as a consequence, American demand for Canadian exports is $30 billion lower than normal.

In Europe, a renewed crisis is underway. An increasing number of countries are being forced to pay unsustainable rates on their borrowings. With a vicious deleveraging process taking hold in its banking sector, the euro area is sinking into recession. Given ties of trade, finance and confidence, the rest of the world is beginning to feel the effects.

Most fundamentally, current events mark a rupture. Advanced economies have steadily increased leverage for decades. That era is now decisively over. The direction may be clear, but the magnitude and abruptness of the process are not. It could be long and orderly or it could be sharp and chaotic. How we manage it will do much to determine our relative prosperity.

This is my subject today: how Canada can grow in this environment of global deleveraging.

How We Got Here: The Debt Super Cycle

First, it is important to get a sense of the scale of the challenge.

Accumulating the mountain of debt now weighing on advanced economies has been the work of a generation. Across G-7 countries, total non-financial debt has doubled since 1980 to 300 per cent of GDP. Global public debt to global GDP is almost at 80 per cent, equivalent to levels that have historically been associated with widespread sovereign defaults.[1]

The debt super cycle has manifested itself in different ways in different countries. In Japan and Italy, for example, increases in government borrowing have led the way. In the United States and United Kingdom, increases in household debt have been more significant, at least until recently. For the most part, increases in non-financial corporate debt have been modest to negative over the past thirty years.

In general, the more that households and governments drive leverage, the less the productive capacity of the economy expands, and, the less sustainable the overall debt burden ultimately is.

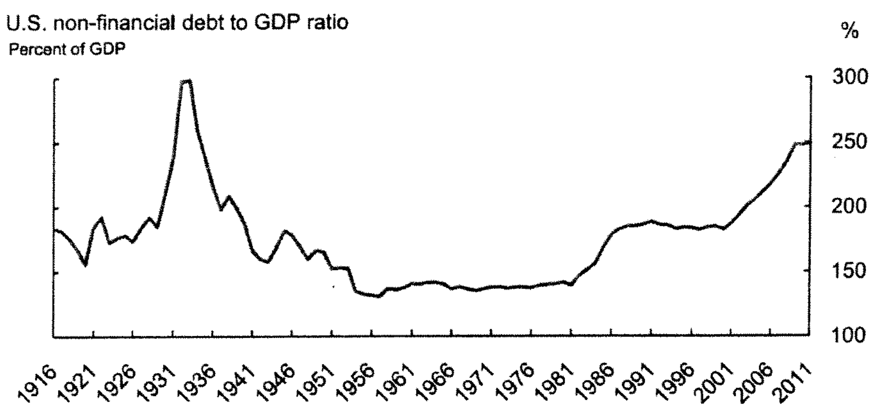
Not for publication before 12 December 2011
12:55 Eastern Time

Another general lesson is that excessive private debts usually end up in the public sector one way or another. Private defaults often mean public rescues of banking sectors; recessions fed by deleveraging usually prompt expansionary fiscal policies. This means that the public debt of most advanced economies can be expected to rise above the 90 per cent threshold historically associated with slower economic growth.[2]

The cases of Europe and the United States are instructive.

Today, American aggregate non-financial debt is at levels similar to those last seen in the midst of the Great Depression. At 250 per cent of GDP, that debt burden is equivalent to almost US$120,000 for every American (**Chart 1**).[3]

Chart 1: U.S. non-financial debt near levels of the Great Depression



Sources: U.S. Census Bureau data from 1916 to 1953,
U.S. Flow of Funds data from 1954 to 2011, Bureau of Economic Analysis

Last observation: 2011Q3

Several factors drove a massive increase in American household leverage. Demographics have played a role, with the shape of the debt cycle tracking the progression of baby boomers through the workforce.

The stagnation of middle-class real wages (itself the product of technology and globalisation) meant households had to borrow if they wanted to maintain consumption growth.[4]

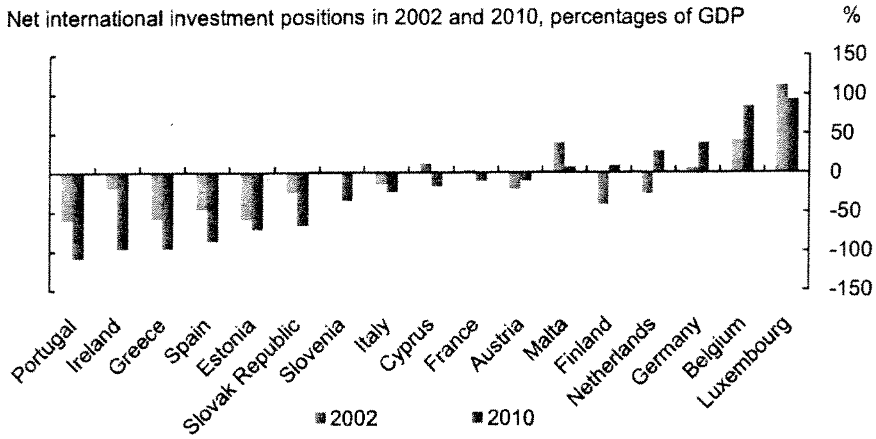
Financial innovation made it easier to do so. And the ready supply of foreign capital from the global savings glut made it cheaper.

Most importantly, complacency among individuals and institutions, fed by a long period of macroeconomic stability and rising asset prices, made this remorseless borrowing seem sensible.

From an aggregate perspective, the euro area's debt metrics do not look as daunting. Its aggregate public debt burden is lower than that of the United States and Japan. The euro area's current account with the rest of the world is roughly balanced, as it has been for some time. But these aggregate measures mask large internal imbalances. As so often with debt, distribution matters (**Chart 2**).

Chart 2: Euro-area imbalances have widened

Net international investment positions in 2002 and 2010, percentages of GDP



Sources: International Monetary Fund International Financial Statistics, International Monetary Fund World Economic Outlook

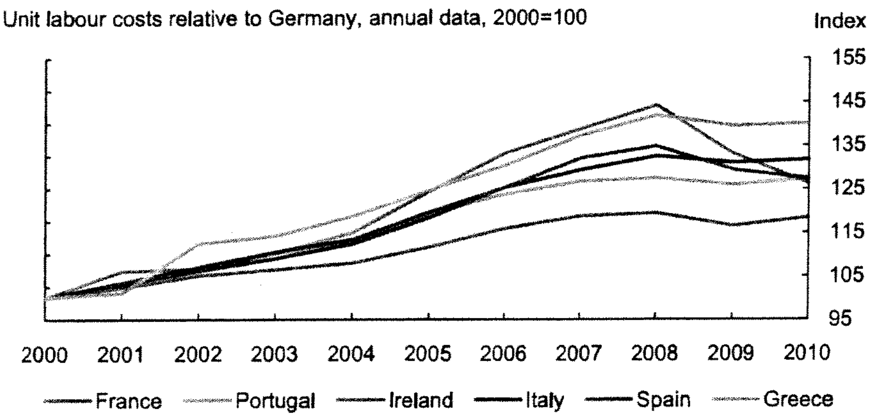
Last observation: 2010

Europe's problems are partly a product of the initial success of the single currency. After its launch, cross-border lending exploded. Easy money fed booms, which flattered government fiscal positions and supported bank balance sheets.

Over time, competitiveness eroded. Euro-wide price stability masked large differences in national inflation rates. Unit labour costs in peripheral countries shot up relative to the core economies, particularly Germany. The resulting deterioration in competitiveness has made the continuation of past trends unsustainable (**Chart 3**). Growth models across Europe must radically change.

Chart 3: Unit labour costs in peripheral countries up, relative to core

Unit labour costs relative to Germany, annual data, 2000=100



Sources: Deutsche Bundesbank, national statistics agencies

Last observation: 2010

It's the Balance of Payments, Stupid!

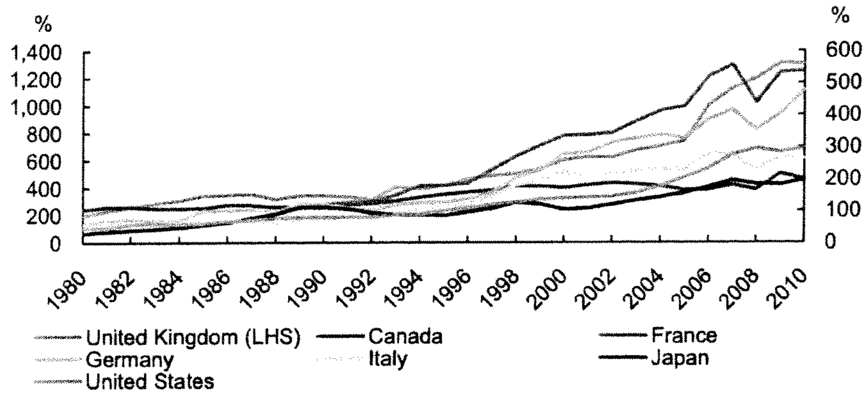
For years, central bankers have talked of surplus and deficit countries, of creditors and debtors. We were usually ignored. Indeed, during a boom, the debtor economy usually feels more vibrant and robust than its creditors. In an era of freely flowing capital, some even thought current account deficits did not matter, particularly if they were the product of private choices rather than public profligacy.

When the leverage cycle turns, the meaning and implications of these labels become tangible. Creditors examine more closely how their loans were spent. Foreign financing constraints suddenly bind. And to repay, debtors must quickly restore competitiveness.[5]

Financial globalisation has provided even greater scope for external imbalances to build (**Chart 4**). And its continuation could permit larger debt burdens to persist for longer than historically was the case. However, experience teaches that sustained large cross-border flows usually presage liquidity crunches.[6]

Chart 4: Capital flows have expanded rapidly

Gross foreign assets and liabilities as percentages of GDP, annual data



Source: International Monetary Fund International Financial Statistics, International Monetary Fund World Economic Outlook

Last observation: 2010

The Global Minsky Moment Has Arrived

Debt tolerance has decisively turned. The initially well-founded optimism that launched the decades-long credit boom has given way to a belated pessimism that seeks to reverse it.

Excesses of leverage are dangerous, in part because debt is a particularly inflexible form of financing. Unlike equity, it is unforgiving of miscalculations or shocks. It must be repaid on time and in full.

While debt can fuel asset bubbles, it endures long after they have popped. It has to be rolled over, although markets are not always there. It can be spun into webs within the financial sector, to be unravelled during panics by their thinnest threads. In short, the central relationship between debt and financial stability means that too much of the former can result abruptly in too little of the latter.

Hard experience has made it clear that financial markets are inherently subject to cycles of boom and bust and cannot always be relied upon to get debt levels right.[7] This is part of the rationale for micro- and macroprudential regulation.

It follows that backsliding on financial reform is not a solution to current problems. The challenge for the crisis economies is the paucity of credit demand rather than the scarcity of its supply. Relaxing prudential regulations would run the risk of maintaining dangerously high leverage—the situation that got us into this mess in the first place.

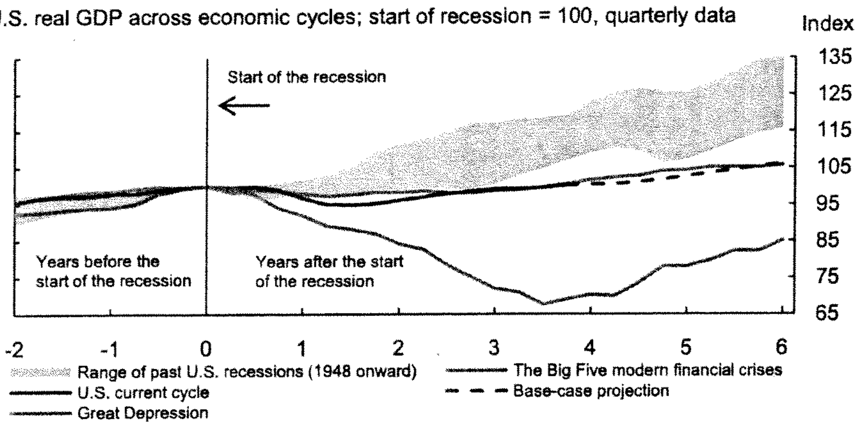
The Implications of Deleveraging

As a result of deleveraging, the global economy risks entering a prolonged period of deficient demand. If mishandled, it could lead to debt deflation and disorderly defaults, potentially triggering large transfers of wealth and social unrest.

History suggests that recessions involving financial crises tend to be deeper and have recoveries that take twice as long.[8] The current U.S. recovery is proving no exception (**Chart 5**). Indeed, it is only with justified comparisons to the Great Depression that the success of the U.S. policy response is apparent.

Chart 5: Weakest U.S. recovery since Great Depression

U.S. real GDP across economic cycles; start of recession = 100, quarterly data



Note: The Big Five modern financial crises include Spain (1977), Norway (1987), Finland (1991), Sweden (1991) and Japan (1992).
Sources: U.S. Bureau of Economic Analysis and Organisation for Economic Co-Operation and Development

Such counterfactuals—it could have been worse—are of cold comfort to American households. Their net worth has fallen from 6 ½ times income pre-crisis to about 5 at present (**Chart 6**). These losses can only be recovered through a combination of increased savings and, eventually, rising prices for houses and financial assets. Each will clearly take time.

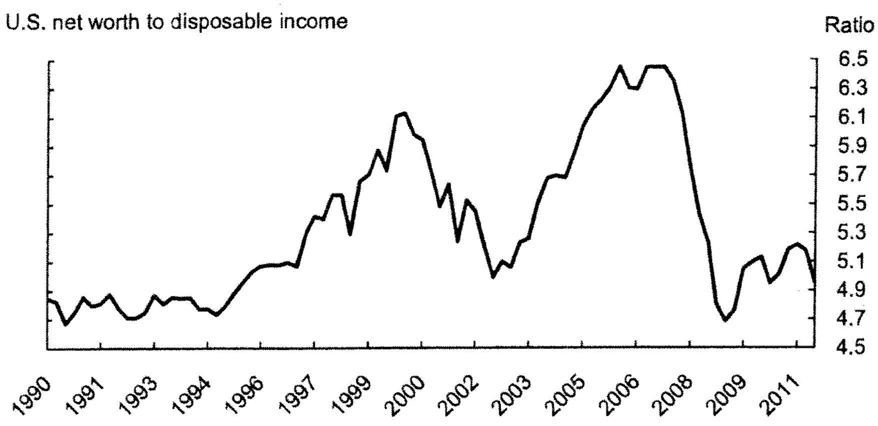
In Europe, a tough combination of necessary fiscal austerity and structural adjustment will mean falling wages, high unemployment and tight credit conditions for firms. Europe is unlikely to return to its pre-crisis level of GDP until a full five years after the start of its *last* recession (**Chart 7**).

Managing the Deleveraging Process

Austerity is a necessary condition for rebalancing, but it is seldom sufficient. There are really only three options to reduce debt: restructuring, inflation and growth.

Whether we like it or not, debt restructuring may happen. If it is to be done, it is best done quickly. Policy-makers need to be careful about delaying the inevitable and merely funding the private exit. Historically, as an alternative to restructuring,

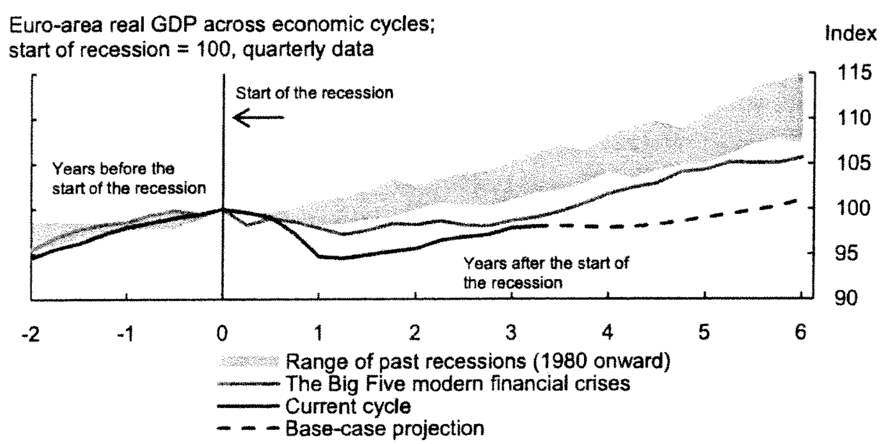
Chart 6: Large drop in U.S. household wealth



Sources: U.S. Federal Reserve, Bureau of Economic Analysis, and Bank of Canada calculations

Last observation: 2011Q3

Chart 7: Euro-area recovery was weak, is over



Note: The Big Five modern financial crises include Spain (1977), Norway (1987), Finland (1991), Sweden (1991) and Japan (1992)
Sources: Eurostat and Organisation for Economic Co-Operation and Development

financial repression has been used to achieve negative real interest rates and gradual sovereign deleveraging.

Some have suggested that higher inflation may be a way out from the burden of excessive debt.[9]

This is a siren call. Moving opportunistically to a higher inflation target would risk unmooring inflation expectations and destroying the hard-won gains of price stability. Similarly, strategies such as nominal GDP level targeting would fail unless they are well understood by the public and the central bank is highly credible.[10, 11]

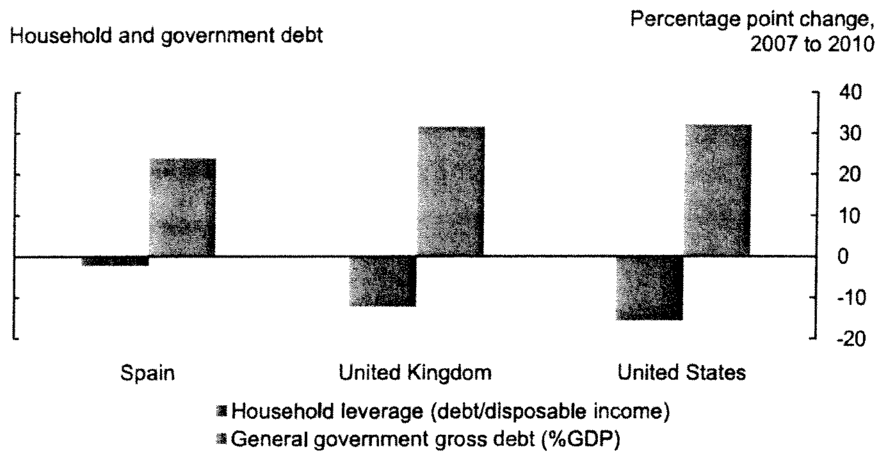
With no easy way out, the basic challenge for central banks is to maintain price stability in order to help sustain nominal aggregate demand during the period of real adjustment. In the Bank's view, that is best accomplished through a flexible inflation-targeting framework, applied symmetrically, to guard against both higher inflation and the possibility of deflation.

The most palatable strategy to reduce debt is to increase growth. In today's reality, the hurdles are significant.

Once leverage is high in one sector or region, it is very hard to reduce it without at least temporarily increasing it elsewhere.

In recent years, large fiscal expansions in the crisis economies have helped to sustain aggregate demand in the face of private deleveraging (**Chart 8**). However, the window for such Augustinian policy is rapidly closing. Few except the United States, by dint of its reserve currency status, can maintain it for much longer.

Chart 8: Private deleveraging, public leveraging



Sources: Bank for International Settlements, IMF World Economic Outlook September 2011

In most of Europe today, further stimulus is no longer an option, with the bond markets demanding the contrary.

There are no effective mechanisms that can produce the needed adjustment in the short term. Devaluation is impossible within the single-currency area; fiscal transfers and labour mobility are currently insufficient; and structural reforms will take time.

Actions by central banks, the International Monetary Fund and the European Financial Stability Facility can only create time for adjustment. They are not substitutes for it.

To repay the creditors in the core, the debtors of the periphery must regain competitiveness. This will not be easy. Most members of the euro area cannot depreciate against their major trading partners since they are also part of the euro.

Large shifts in relative inflation rates between debtor and creditor countries could result in real exchange rate depreciations between euro-area countries. However, it is not clear that ongoing deflation in the periphery and higher inflation in the core would prove any more tolerable than it did between the United

Kingdom and the United States under the postwar gold standard of the 1920s and 1930s.

The route to restoring competitiveness is through fiscal and structural reforms. These real adjustments are the responsibility of citizens, firms and governments within the affected countries, not central banks. A sustained process of relative wage adjustment will be necessary, implying large declines in living standards for a period in up to one-third of the euro area.

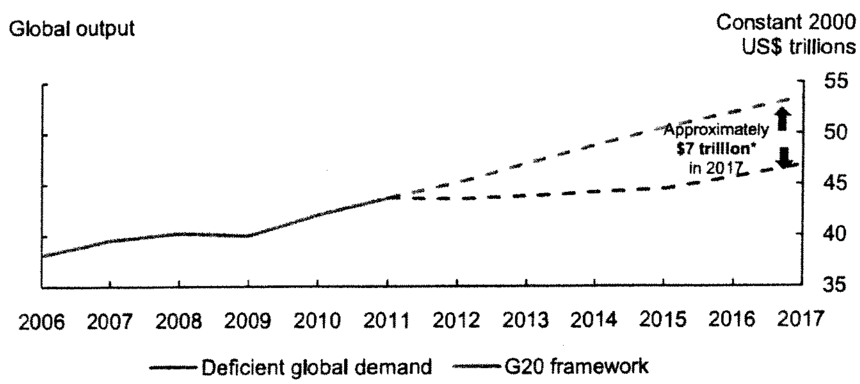
We welcome the measures announced last week by European authorities, which go some way to addressing these issues.

With deleveraging economies under pressure, global growth will require global rebalancing. Creditor nations, mainly emerging markets that have benefited from the debt-fuelled demand boom in advanced economies, must now pick up the baton.

This will be hard to accomplish without co-operation. Major advanced economies with deficient demand cannot consolidate their fiscal positions and boost household savings without support from increased foreign demand. Meanwhile, emerging markets, seeing their growth decelerate because of sagging demand in advanced countries, are reluctant to abandon a strategy that has served them so well in the past, and are refusing to let their exchange rates materially adjust.

Both sides are doubling down on losing strategies. As the Bank has outlined before, relative to a co-operative solution embodied in the G-20's Action Plan, the foregone output could be enormous: lower world GDP by more than US$7 trillion within five years (**Chart 9**). Canada has a big stake in avoiding this outcome.

Chart 9: The $7-trillion question



*This estimate is a rough approximation. Depending on the assumptions, it could range from $6 trillion to $9 trillion.
Sources: Bank of Canada, World Bank

To Summarize Thus Far

The market cannot be solely relied upon to discipline leverage.

It is not just the stock of debt that matters, but rather, who holds it. Heavy reliance on cross-border flows, particularly when they fund consumption, usually proves unsustainable.

As a consequence of these errors, advanced economies are entering a prolonged period of deleveraging.

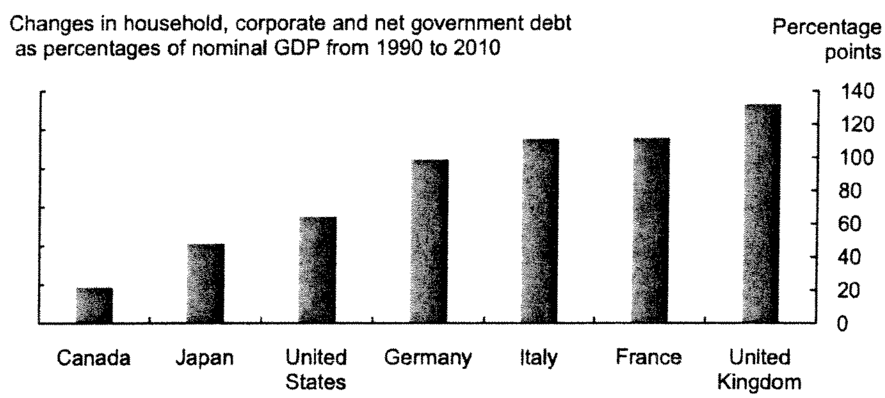
Central bank policy should be guided by a symmetric commitment to the inflation target. Central banks can only bridge real adjustments; they can't make the adjustments themselves.

Rebalancing global growth is the best option to smooth deleveraging, but its prospects seem distant.

What It Means for Canada

Canada has distinguished itself through the debt super cycle (**Chart 10**), though there are some recent trends that bear watching. Over the past twenty years, our non-financial debt increased less than any other G-7 country. In particular, government indebtedness fell sharply, and corporate leverage is currently at a record low (**Chart 11**).

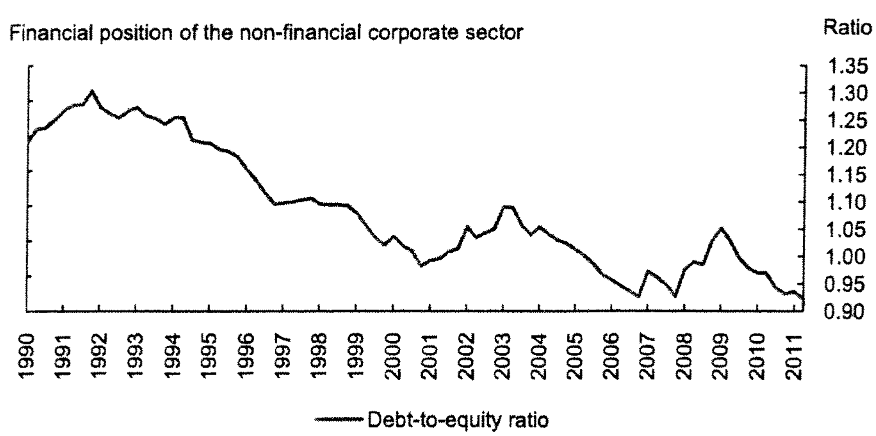
Chart 10: Canadian debt has risen less than its G-7 peers



Note: German data prior to 1991 reflects West Germany.
Sources: Cecchetti, Mohanty and Zampolli 2011, Organisation for Economic Co-operation and Development, and Bank of Canada calculations

Last observation: 2010

Chart 11: Corporate leverage at a record low



Source: Statistics Canada, Quarterly Financial Statistics for Enterprises

Last observation: 2011Q3

In the run-up to the crisis, Canada's historically large reliance on foreign financing was also reduced to such an extent that our net external indebtedness was virtually eliminated.

Over the same period, Canadian households increased their borrowing significantly. Canadians have now collectively run a net financial deficit for more than a decade, in effect, demanding funds from the rest of the economy, rather than providing them, as had been the case since the Leafs last won the Cup.

Developments since 2008 have reduced our margin of manoeuvre. In an environment of low interest rates and a well functioning financial system, household debt has risen by another 13 percentage points, relative to income. Canadians are now more indebted than the Americans or the British. Our current account has also returned to deficit, meaning that foreign debt has begun to creep back up.

The funding for these current account deficits has been coming largely from foreign purchases of Canadian portfolio securities, particularly bonds. Moreover, much of the proceeds of these capital inflows seem to be largely, on net, going to fund Canadian household expenditures, rather than to build productive capacity in the real economy. If we can take one lesson from the crisis, it is the reminder that channelling cheap and easy capital into unsustainable increases in consumption is at best unwise.

Canada's relative virtue throughout the debt super cycle affords us a privileged position now that the cycle has turned. Unlike many others, we still have a risk-free rate and a well-functioning financial system to support our economy. It is imperative that we maintain these advantages. Fortunately, this means largely doing what we have been doing—individuals and institutions acting responsibly and policy-makers executing against sound fiscal, monetary and regulatory frameworks.

It cannot entirely be business as usual. Our strong position gives us a window of opportunity to make the adjustments needed to continue to prosper in a deleveraging world. But opportunities are only valuable if seized.

First and foremost, that means reducing our economy's reliance on debt-fuelled household expenditures. To this end, since 2008, the federal government has taken a series of prudent and timely measures to tighten mortgage insurance requirements in order to support the long-term stability of the Canadian housing market. Banks are also raising capital to comply with new regulations. Canadian authorities are co-operating closely and will continue to monitor the financial situation of the household sector.

To eliminate the household sector's net financial deficit would leave a noticeable gap in the economy. Canadian households would need to reduce their net financing needs by about $37 billion per year, in aggregate. To compensate for such a reduction over two years could require an additional 3 percentage points of export growth, 4 percentage points of government spending growth or 7 percentage points of business investment growth.

Any of these, in isolation, would be a tall order. Export markets will remain challenging. Government cannot be expected to fill the gap on a sustained basis.

But Canadian companies, with their balance sheets in historically rude health, have the means to act—and the incentives. Canadian firms should recognize four realities: they are not as productive as they could be; they are under-exposed to fast-growing emerging markets; those in the commodity sector can expect relatively elevated prices for some time; and they can all benefit from one of the most resilient financial systems in the world. In a world where deleveraging holds back demand in our traditional foreign markets, the imperative is for Canadian companies to invest in improving their productivity and to access fast-growing emerging markets.

This would be good for Canadian companies and good for Canada. Indeed, it is the only sustainable option available. A virtuous circle of increased investment and increased productivity would increase the debt-carrying capacity of all, through higher wages, greater profits and higher government revenues. This should be our common focus.

The Bank of Canada is doing its part by fulfilling its mandate to keep inflation low, stable and predictable so that Canadian households and firms can invest and plan for the future with confidence. It is also assisting the federal government in ensuring that Canada's world-leading financial system will be there for Canadians in bad times as well as good and in pushing the G-20 Action Plan because it is in Canada's interests.

Conclusion

It makes sense to step back and consider current challenges through the longer arc of financial history. Today's venue is an appropriate place to do so. A century ago, when the Empire Club and the Canadian Club of Toronto would meet, the first great leveraging of the Canadian economy was well under way. During the three decades before the First World War, Canada ran current account deficits averaging 7 per cent of GDP. These deficits were largely for investment and were principally financed by long-term debt and foreign direct investment.

On the eve of the Great War, our net foreign liabilities reached 140 per cent of GDP, but our productive capacity built over the decades helped to pay them off over time. Our obligations would again swell in the Great Depression. But in the ensuing boom, we were again able to shrink our net liabilities.

When we found ourselves in fiscal trouble in the 1990s, Canadians made tough decisions, so that on the eve of Lehman's demise, Canada was in the best fiscal shape in the G-7.

We must be careful, however, not to take too much comfort from these experiences. Past is not always prologue. In the past, demographics and productivity trends were more favourable than they are today. In the past, we deleveraged during times of strong global growth. In the past, our exchange rate acted as a valuable shock absorber, helping to smooth the rebuilding of competitiveness that can only sustainably be attained through productivity growth.

Today, our demographics have turned, our productivity growth has slowed and the world is undergoing a competitive deleveraging.

We might appear to prosper for a while by consuming beyond our means. Markets may let us do so for longer than we should. But if we yield to this temptation, eventually we, too, will face painful adjustments.

It is better to rebalance now from a position of strength; to build the competitiveness and prosperity worthy of our nation.

Endnotes

[1] C. M. Reinhart and K. S. Rogoff, "A Decade of Debt," National Bureau of Economic Research Working Paper No. 16827, Cambridge, 2011.

[2] C. M. Reinhart and K. S. Rogoff, "Growth in a Time of Debt," *American Economic Review* 100, no. 2 (May 2010): 573–78.

[3] These figures, daunting as they are, actually understate the extent of the problem. They do not include the liabilities stemming from the pension and health care promises made by governments but not yet funded, which some estimate to be even larger than the current explicit stock of debt.

[4] R. G. Rajan, *Fault Lines: How Hidden Fractures Still Threaten the World Economy* (Princeton: Princeton University Press, 2010).

[5] Japan illustrates the importance of whether one's creditors are domestic or foreign. The public and total non-financial debt burdens in Japan have risen well beyond levels that have proved unsustainable in other countries, owing largely to the fact that the preponderance of that debt is owed domestically. From an external perspective, Japan is the largest net creditor in the world.

[6] See M. Carney, "Global Liquidity," a speech delivered to the Canada-United Kingdom Chamber of Commerce in London, United Kingdom, 8 November 2011.

[7] See A. Turner, "Debt and Deleveraging: Long Term and Short Term Challenges," a speech delivered to the Centre for Financial Studies, Frankfurt, Germany, 21 November 2011. Turner argues, in fact, that the current situation is the result of "decades of cumulative, massive policy errors," particularly the over reliance on free markets, (p.6).

[8] See C. M. Reinhart and V. R. Reinhart, "After the Fall," *Macroeconomic Challenges: The Decade Ahead*, Federal Reserve Bank of Kansas City 2010 Economic Policy Symposium. Available at: <http://www.kansascityfed.org/publicat/sympos/2010/reinhart-paper.pdf>.

[9] K. Rogoff, "Inflation Is Now the Lesser Evil," *Project Syndicate*, December 2008.

[10] See J. Hatzius, Z. Pandl, A. Phillips, and S. J. Stehn, A. Tilton, S. Wu, and M. Acosta-Cruz, "The Case for a Nominal GDP Level Target," *US Economics Analyst*, No: 11/41; Goldman Sachs Global ECS Research, 2011; and C. Romer, "Dear Ben: It's Time for Your Volcker Moment," *New York Times*, 29 October 2011.

[11] Indeed, if inflation is both higher and more uncertain, a higher inflation risk premium might result, prompting an increase in real interest rates that would exacerbate unfavourable debt dynamics.

Schedule B to Interrogatory No. 1-ED-7

THE CENTRE FOR SPATIAL ECONOMICS

The Economic Impacts of Reducing Natural Gas Use in Ontario

Prepared for
Ontario Clean Air Alliance
and
Ontario Clean Air Alliance Research Inc.

The Ontario Clean Air Alliance and Ontario Clean Air Alliance Research Inc. thank the following for their financial support:
The EJLB Foundation, The Toronto Atmospheric Fund and
The Taylor Irwin Family Fund at the Toronto Community Foundation

TORONTO Atmospheric Fund

TORONTO COMMUNITY FOUNDATION

April 2011

INTRODUCTION

The Ontario Clean Air Alliance and the Ontario Clean Air Alliance Research Inc. requested the Centre for Spatial Economics (C_4SE) to undertake a study that looks at the economic impacts of reducing the use of natural gas in Ontario. The possibility of achieving a significant reduction in the use of natural gas has been shown in a study undertaken for Enbridge Gas Distribution that estimated possible reductions in natural gas use on the part of its customers. The current study examines the economic impacts of reducing natural gas in the province by creating a projection for the future economic performance of the Ontario economy that contains a reduction in the use of natural gas that is similar in nature to that shown in the Enbridge Gas Distribution analysis and compares the results of this scenario against a projection that does not contain this reduction.

The next section provides a description of the approach adopted to estimate the impacts of reducing the use of natural gas and the assumptions behind the approach. The third section discusses the expected impacts of reducing the use of natural gas on the economy from a qualitative point of view. The fourth section then presents the quantitative estimates of the impacts found using the assumptions for the reduction in natural gas considered.

STUDY APPROACH AND ASSUMPTIONS

Enbridge Gas Distribution commissioned a study regarding the possibility of reducing the use of natural gas by its customers in Ontario using a Demand Side Management (DSM) approach (Marbek Resource Consultants Ltd. "Natural Gas Energy Efficiency Potential: Update 2008, Residential, Commercial and Industrial Sectors Synthesis Report," September 2009). The results of the study suggest estimates of possible reductions in natural gas use for industrial, commercial, and residential customers under different assumptions regarding DSM costs. Under its Economic Potential Forecast, for example, reductions in residential, commercial, and industrial, natural gas usage over a 10-year period are estimated at 18, 29, and 34 percent, respectively. These reductions are to be realized (Marbek, op. cit. page 4):

> ".. if all equipment and building envelopes were upgraded to the level that is cost-effective from Enbridge's perspective. All the energy efficiency technologies and measures that have a positive measure TRC.. (net benefits that result from an investment in an efficiency technology or measure).. are incorporated into the Economic Potential Forecast. These technologies and measures are applied at either natural stock turnover rates or at designated years for immediate application."

The Ontario Clean Air Alliance is interested in estimating the impact on the Ontario economy if a reduction in natural gas use could be achieved in the province as a whole. The assumptions adopted for the reduction in natural gas use found in the Enbridge study serve as a starting point for those used in this study. The reduction is assumed to take place over the 10-year time period 2012 to 2021.

The approach adopted to estimate the economic impacts on Ontario of reducing the use of natural gas employs the C_4SE macroeconomic model of the Ontario economy. This model is used to prepare two economic projections for the future performance of the economy. The first projection shows the performance of the economy without the reduction in the use of natural gas. The second one shows the performance when the usage of natural gas is reduced. The impacts on the economy are then estimated by comparing the results of the two projections for key economic and fiscal variables such real Gross Domestic Product (GDP), the Consumer Price Index (CPI), employment, population, and government budget balances.

The C_4SE macroeconomic model is a multi-sector (industry) model that assumes the existence of a gross output (total value of production) KLEM production technology for the different sectors – KLEM stands for the production inputs of capital, labour, energy, and materials. It incorporates variable input-output coefficients that respond to changes in relative prices for production inputs. For example, increases in the price of natural gas will lead to a reduction in natural gas's share of total inputs to gross output and an increase in the share for the other inputs. The model also incorporates a Green House Gas emissions component that estimates CO_2 equivalent emissions by industry.

The projection that does not contain the reductions in natural gas is called the base case projection. It is created by making assumptions about the key drivers for the Ontario economy such as economic growth and inflation in Ontario's major trading partners, oil prices, natural gas prices, fiscal policy, and so on. The projection with the reductions in natural gas is created using the base case assumptions and then reducing the input shares of natural gas for the various industries along with the consumer expenditure share of natural gas for households. The input shares are variables in the macroeconomic model.

The Enbridge study does not cover all of Ontario's economy. The current study wishes to expand the coverage to the province as whole. The reductions in natural gas use employed are 25 percent for the industrial sector, 20 percent for the commercial sector, and 15 percent for the residential sector. These reductions are lower and, therefore, more conservative than those found in the Enbridge Economic Potential Forecast.

It is assumed that an increase in the share of capital in gross output will occur with the reduction in natural gas use in gross output as firms purchase new energy efficient technologies. As a result, there will be an increase in the share of value-added (net output or GDP) in gross output in the economy. In the case of households, the reduction in the share of natural gas in consumer expenditures is replaced by an increase in the share of the other consumer expenditure categories.

While the Enbridge study provides estimates of reductions in natural gas use, it does not contain estimates of the amount of capital expenditures that would be required to achieve these reductions. The C_4SE model suggests that the "incremental" increase in the stock of capital over the projection period required to achieve the non-residential natural gas reductions measured in $2010 would be about $4 billion. For the residential sector it is assumed that a $3 billion increase in the value of residential structures would be required – which is about $500 per household (occupied housing unit). This assumption is a "rough" estimate, but is similar to the ratio of the increases in non-residential capital stock to natural gas reductions produced by the model. Lower amounts of residential expenditures would reduce the economic impact on the economy and higher ones would increase the impact.

It is also assumed that the prices for capital goods purchased to reduce natural gas usage will not rise from those found in the base case projection other than through possible increases in wholesale and retail trade margins for local firms as demand pressures rise. The prices for imported capital goods remain unchanged from base case values.

While the reductions in natural gas use are assumed to take place over the 10-year period 2012 to 2021, the projection period is extended for another 5 years to 2026. The longer time period is adopted to allow the economy to fully adjust to both the direct and indirect impacts of the reductions in the use of natural gas on the economy.

A final set of assumptions includes the absence of a response of fiscal and monetary policy on the part of governments. The Bank of Canada will not respond to changes in inflation associated with the reduction in natural gas use. Governments will not change policies in the face of changes in their budget balances. Any improvements or deterioration in budget balances will lead to changes in government debt.

EXPECTED IMPACTS

Before presenting the quantitative estimates of the impact of the reduction in natural gas use it is worthwhile to review the nature of impacts expected from a qualitative point of view – that is, directions of change rather than the estimated size of change.

The reduction in the use of natural gas is to be accomplished by replacing natural gas with more energy efficient capital equipment. This replacement is expected to allow firms to produce the same amount of goods and services they did when using natural gas because the more productive capital replaces the contribution of natural gas use in gross output. It should be noted that the reductions in natural gas use implemented through the model's input shares will not likely reduce natural gas use in the same proportion. This difference is a result of changes in economic performance caused by the changes in technology. While the share of natural gas in the economy is reduced, the actual size of the economy will increase, which in turn, will lead to additional use of natural gas. Nevertheless, the latter increase will be small in relation to the decline that results from introducing more efficient capital equipment.

Significant increases in investment expenditures in the economy are expected to be observed over the period relative to the base case projection when firms substitute capital for natural gas. Over the long run when the more efficient capital begins to wear out, additional replacement expenditures are expected with the higher valued capital in contrast to the relatively lower replacement values for the old capital.

The purchase of new equipment and the construction of structures needed to achieve lower gas use will increase production and employment in industries throughout the economy. The increased employment and disposable income will lead to increases in consumer and housing expenditures. These increases, in turn, will lead to additional production and employment, and so on.

Because Ontario does not produce natural gas the reduction in its use will not have a major negative impact on the economy. Nevertheless, firms in the natural gas distribution system are likely to see a reduction in their sales, which will offset somewhat the increases in GDP resulting from the more productive capital.

The fall in natural gas use will be observed through a reduction in provincial imports, which will lead to an improvement in the trade balance (exports minus imports) over the long run. During the period in which the capital is being replaced, nevertheless, the reduction in natural gas imports will be offset by imports of machinery and equipment. The import share of the machinery that will be purchased to reduce natural gas use is high for the province.

The higher GDP associated with the increase in capital to replace natural gas will lead to increases in labour productivity, which, in turn, will result in increases in wages and personal income. The latter will cause an increase in consumer expenditures, in addition to that observed as a result of the increased investment activity mentioned above.

The increased economic activity resulting from the reduction in gas use will also result in an improvement in the budget balances of the federal and provincial governments. This improvement comes from increases in revenues from both income taxes – personal and corporate – and indirect taxes such as the HST. Expenditures also rise as the increase in employment results in additional persons moving into the province, but this increase will be lower than the increase in revenues.

The reduction in the use of natural gas will lead to a reduction in CO_2 emissions. This reduction will be somewhat offset by increases in emissions resulting from a higher level of economic activity associated with replacing the natural gas with more energy efficient capital.

ESTIMATED IMPACTS

Estimates of the impacts of reducing natural gas use in the province for key economic indicators are shown in **Table 1**. The impacts for many indicators refer to the percentage differences and level differences from the base case projection values. The level differences for expenditure or income variables are measured in millions of 2010 dollars.

The results for real GDP show a 0.6 percentage point increase from the base case in 2026. This increase represents $5.1 billion measured in 2010 dollars. It should be noted that part of the

TABLE 1: IMPACT ON KEY ECONOMIC INDICATORS
(Level or Percentage Difference from Base Case)

	2016	2021	2026
Real GDP $2010 Millions			
% Difference	0.2	0.7	0.6
Difference	1706	5497	5144
GDP Deflator % Difference	0	0.1	0
Consumer Expenditures $2010 Millions			
% Difference	0.2	0.6	0.5
Difference	787	2694	2630
Residential Investment $2010 Millions			
% Difference	1.4	3	0.6
Difference	686	1651	394
Non-Residential Investment $2010 Millions			
% Difference	0.5	1.3	0.7
Difference	346	891	559
Exports $2010 Millions			
% Difference	0	-0.1	0
Difference	-49	-284	142
Imports $2010 Millions			
% Difference	0.1	0	-0.1
Difference	204	126	-628
CPI % Difference	0	0.1	0
Hourly Wage Rate $ % Difference	0.2	0.5	0.2
Employment 000s			
% Difference	0.2	0.4	0.4
Difference	12.2	33.8	28.5
Productivity (GDP/Hour) % Difference	0	0.2	0.2
Personal Income $2010 Millions			
% Difference	0.3	0.7	0.5
Difference	1215	3738	2612
Corporate Profits Before Tax $2010 Millions			
% Difference	0.1	0.7	0.6
Difference	73	446	451
Federal Net Lending $2010 Millions Difference	231	496	148
Provincial Net Lending $2010 Millions Difference	159	479	443
Natural Gas Final Demand (BCF)			
Difference	-69	-196	-192
% Difference	-6.9	-16.1	-15.4
Total Provincial CO2 Equivalent Emissions (KT)			
Difference	-4107	-13742	-13061
% Difference	-2.1	-6.1	-5.5

increase in GDP and some of its components is a result of an increase in population caused by higher employment leading to additional migration to the province.

Consumer expenditures account for the largest amount of the increase in GDP in 2026 where the percentage difference in expenditures is 0.5. The increase in consumer expenditures is the result of an increase in personal income, which rises 0.5 percent.

The increase in personal income results from increases in employment and wages. The wage rate rises 0.2 percent above base case values while there is a 0.4 percent increase in employment. The increase in employment in level terms is 29 thousand in 2026. Part of the increase in wages is due to the higher productivity that results from the increase in capital with the reduction in the use of natural gas. The fact that the Consumer Price Index (CPI) does not change over the period adds to the purchasing power of the wage increase.

As expected non-residential investment expenditures show a noticeable increase reaching 0.7 percent above base case values in 2026. The latter increase is less than the 1.3 percent observed for 2021 when the use of natural gas is being reduced through investments in energy saving capital.

There is also a 3.0 increase in residential investment to 2021, which falls to 0.6 percent in 2026 as the additional residential capital needed to reduce natural gas consumption is put in place. Some of the higher residential investment is accounted for by an increase in population associated with the higher employment attracting more people to the province.

Imports rise to 2021 in the projection where natural gas use is reduced, which is a result of both higher investment and consumer expenditures. Nevertheless, they fall later as the higher level of investment and associated activity is reduced. The increase in productivity that is caused by the reduction in the use of natural gas reduces business costs enough to cause exports to rise slightly by 2026. This latter increase leads to an improvement in the trade balance of almost $800 million that year. The reduced costs are also responsible for the increase in corporate profits before taxes over the projection period.

The federal and provincial governments see an improvement in their budget balances with the increased economic activity. The federal budget balance by 2026 is nearly $150 million higher while that for the provincial government is about $445 million higher. The sum of these differences over the period suggests about a $3.8 and $4.4 billion decline in federal and provincial government debt, respectively.

The percentage reduction in natural gas use for total final demand – which excludes natural gas used to produce electricity – is 15.4 percent in 2026. The reduction in physical units is 192 billion cubic feet of natural gas (BCF). This reduction divided into the increase in GDP in 2026 shows a $26 million dollar increase in GDP for each 1 BCF of natural gas reduction.

The reduction in the use of natural gas has a noticeable impact on total provincial CO_2 emissions over the projection period. By 2026 the level of CO_2 equivalent emissions is reduced 5.5 percent or 13.1 megatonnes with the replacement of natural gas by the more energy efficient capital.

The estimated percentage impacts on the industries in the economy that are covered in the C_4SE model are shown in **Table 2**. The impacts on the various industries reflect their relative intensities of natural gas use as well as their involvement in producing and installing capital goods. The construction industry, for example, will see a larger increase in activity as it builds and installs new capital. Industries with high shares of their production represented by natural gas such as primary metals will tend to have larger responses to the reduction in gas use.

The mining and manufacturing industries see relatively large increases in GDP because they use relatively large amounts of natural gas. Within the manufacturing industry the two automobile related industries show the smallest increase while primary metals and other manufacturing, which includes the pulp and paper industry, show relatively large increases in GDP.

As expected the construction industry registers a large increase to 2021 with a 2.0 percent difference between the base case projection and the reduced natural gas projection. This impact declines to 0.7 percent once the conversion to more efficient capital is completed.

The impacts on the service industries reflect in part the higher population associated with the employment increase as well as a reduction in natural gas use. The retail and wholesale trade, finance, insurance, and real estate, and accommodation and food services show the largest increases among private services.

TABLE 2: IMPACT ON INDUSTRY GDP (%)
(Percentage Difference from Base Case)

	2016	2021	2026
Total	0.2	0.7	0.6
Agriculture	0.1	0.2	0.2
Forestry	0.2	0.4	0.4
Mining	0.4	1.3	1.3
Manufacturing	0.4	1.3	1.1
Plastics	0.2	0.6	0.5
Motor Vehicle Assembly	0.1	0.4	0.3
Motor Vehicle Parts	0.1	0.4	0.4
Machinery	0.3	0.7	0.7
Fabricated Metals	0.3	0.8	0.6
Primary Metals	0.7	2.1	1.9
Other Manufacturing	0.6	1.8	1.6
Construction	0.8	2	0.7
Utilities	0.1	0.5	0.4
Transportation & Warehousing	0.1	0.3	0.3
Trade	0.2	0.6	0.5
Finance, Insurance & Real Estate	0.2	0.7	0.6
Professional, Scientific & Management Services	0.1	0.3	0.2
Accommodation & Food	0.2	0.6	0.5
Health Services	0.1	0.4	0.4
Other Services	0.2	0.6	0.5
Education Services	0.2	0.7	0.6
Government Services	0.1	0.4	0.5

APPENDIX: THE CENTRE FOR SPATIAL ECONOMICS

The Centre for Spatial Economics (C_4SE) monitors and forecasts economic and demographic change throughout Canada at virtually all levels of geography. The C_4SE also prepares customized studies on the economic, industrial and community impacts of various fiscal and other policy changes, and develops customized impact and projection models for in-house client use. Our clients include government departments, crown corporations, manufacturers, retailers and real estate developers.

The C_4SE was formed in July 2000 through an initiative of two consulting firms: Strategic Projections Inc. and Stokes Economic Consulting Incorporated. These two firms specialize in demographic and economic research. A key part of this research has been the geographical distribution of demographic and economic activity. The C_4SE was established as a partnership of SPI and SEC to improve the quality of information and research conducted in Canada and to make the information and research available to organizations requiring such information, and to the public as the opportunity arises. The C_4SE draws from a list of academics and research consultants on an as needed basis to minimize overhead costs and to obtain the best researchers for the topic at hand.

The staff of the C_4SE is currently as follows:
Ernie Stokes - Managing Partner
Tom McCormack - Partner
Robert Fairholm - Partner
Robin Somerville - Partner
Aaron Stokes - Staff Economist
Tara Schill - Staff Economist
Adam Papp – Staff Economist
Robert Daniells - Consultant
Sam Patayanikorn – Consultant

Ernie Stokes, the author of this report, is the Managing Partner of the C_4SE, as well as the President of Stokes Economic Consulting. He has more than 30 years experience as an economic advisor in both the private and public sectors. Ernie has worked both in North America and developing countries. He has a Ph. D. in economics from Queen's University (1979). Prior to establishing Stokes Economic Consulting in 1995 he served as Managing Director, the WEFA Group, Canada (1989 to 1994), as senior economist with the Alberta Energy Company (1987 to 1989), as a senior official with the Canada Department of Finance (1985 to 1987) and as Director of the National Forecasting Group with the Conference Board (1978 to 1984).

Stokes is currently a member of the B.C. Minister of Finance Forecast Council and the Ontario Minister of Finance Forecast Council as well as an expert on the Ontario Minister of Infrastructure Strategy Panel.

For more information on the C_4SE see our website: www.c4se.com

3. Re exhibit I.T3.EGDI.ED.17:

This interrogatory reads as follows: “Section 5.1.3 and Appendix E contain a benchmarking analysis. Please reproduce the tables and figures contained therein including only those jurisdictions where the utilities in question are required to implement all cost-effective DSM.”

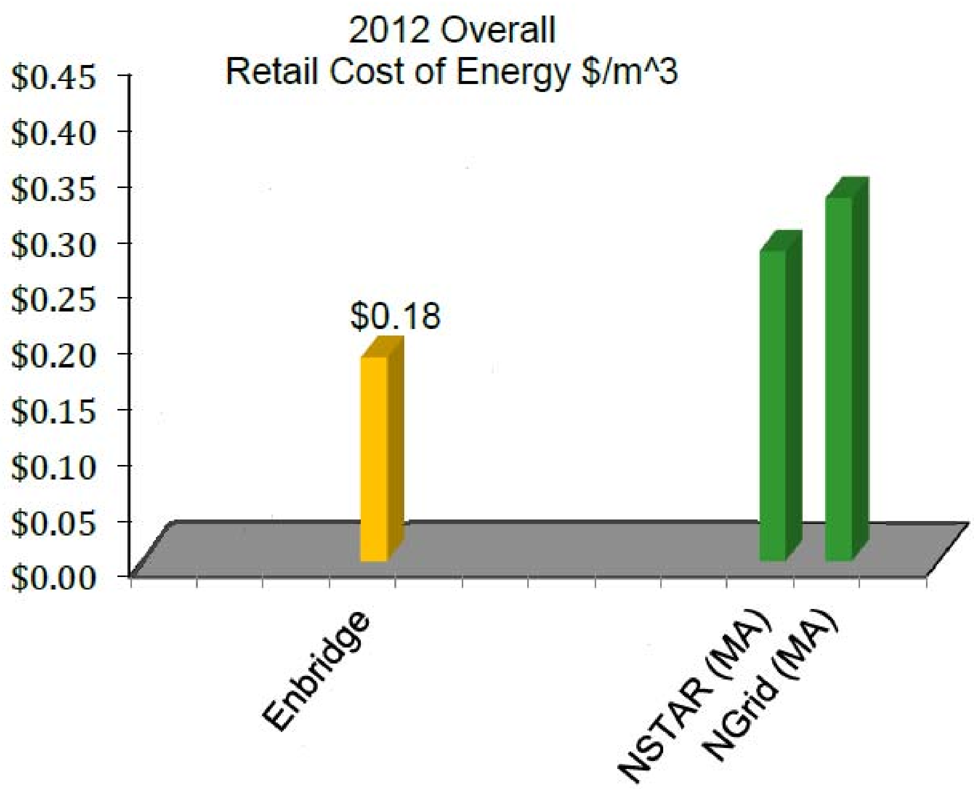
The response reproduced the tables appearing in Section 5.1.3 of the Navigant report but not those in Appendix E. Please also reproduce the tables and figures in Appendix E including only those jurisdictions where the utilities in question are required to implement all cost-effective DSM.

Enbridge provides the following response:

Please see on the following pages the revised versions of Figures E-1, E-2, E-3, E-4, E-5 and Table E-3. Please note that Enbridge has not investigated in detail the characteristics of the below noted utilities or their DSM portfolios. As such significant differences may exist in terms of the types of programs, technologies, input assumptions, adjustment factors, or other details between Enbridge’s DSM activities and those of the utilities displayed below.

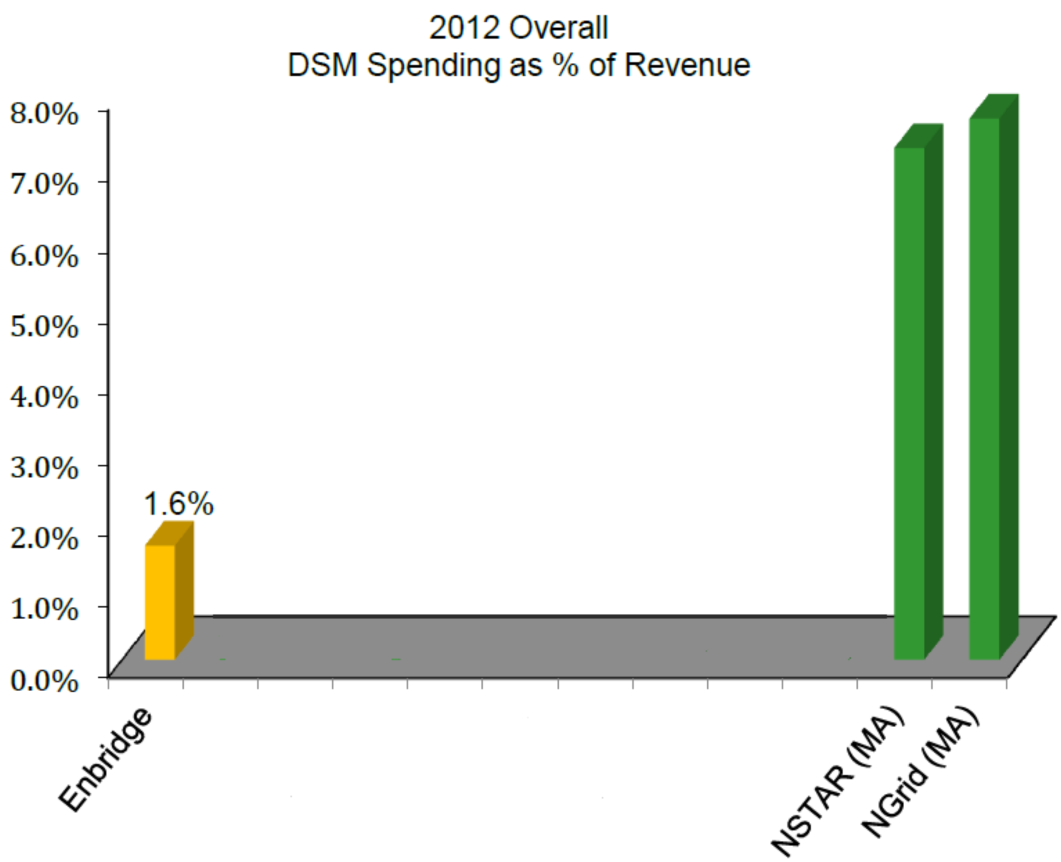
Witnesses: K. Mark
S. Moffat
B. Ott

Figure E-1. 2012 Retail Cost of Natural Gas [1,2,3,4,5,6,7]



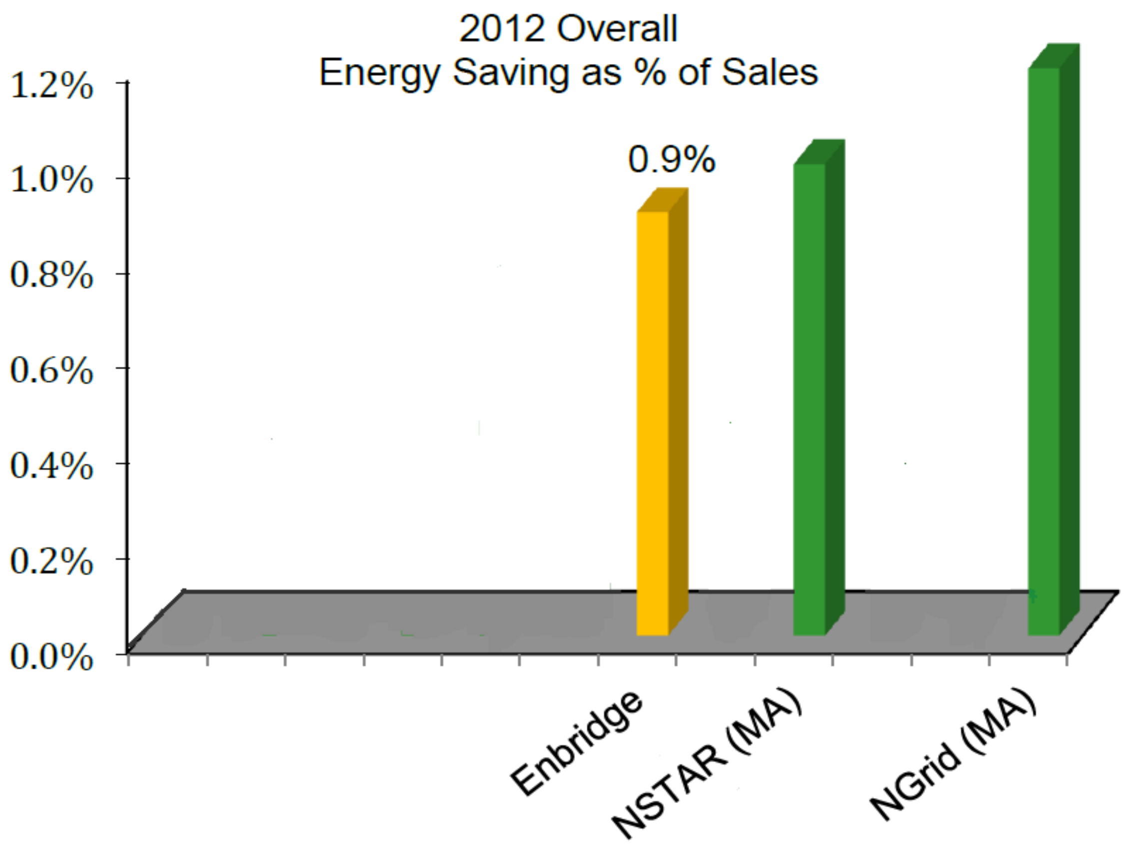
Witnesses: K. Mark
S. Moffat
B. Ott

Figure E-2. 2012 DSM Spending as a Percentage of Revenue [1,2,3,4,5,6,7]



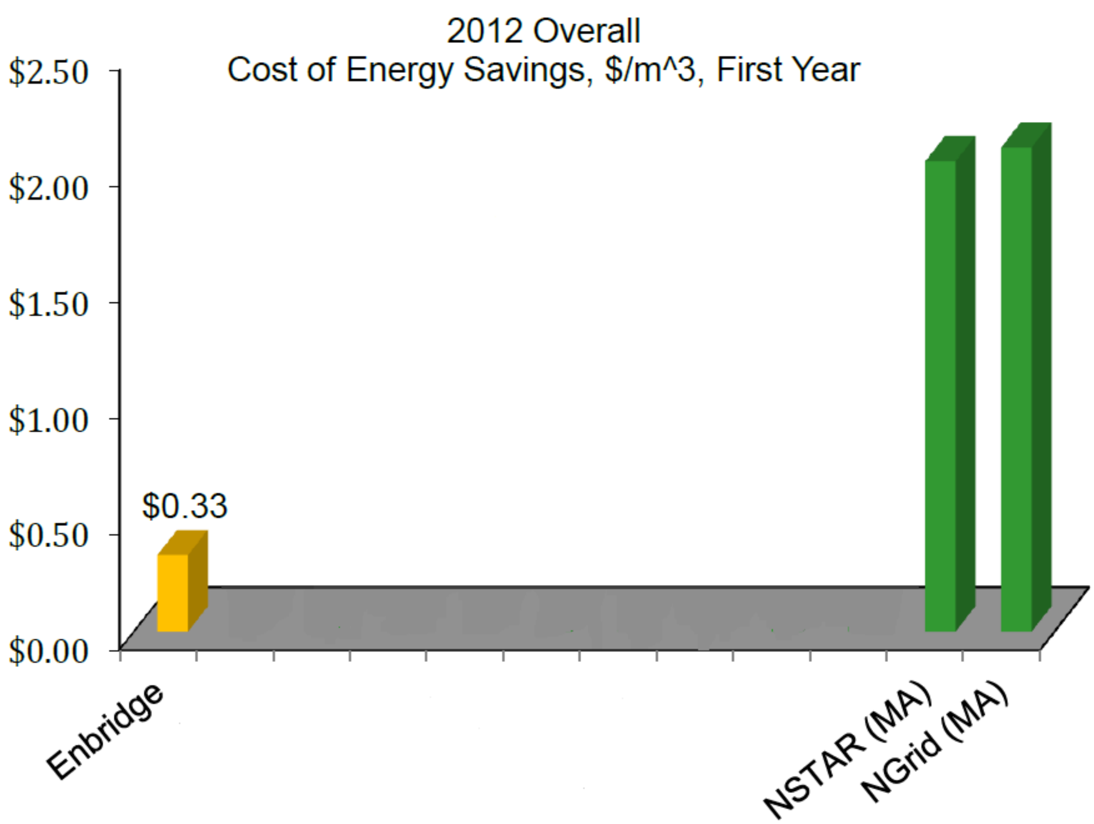
Witnesses: K. Mark
S. Moffat
B. Ott

Figure E-3. 2012 Gross Energy Savings as a Percentage of Gas Sales [1,2,3,4,5,6,7]



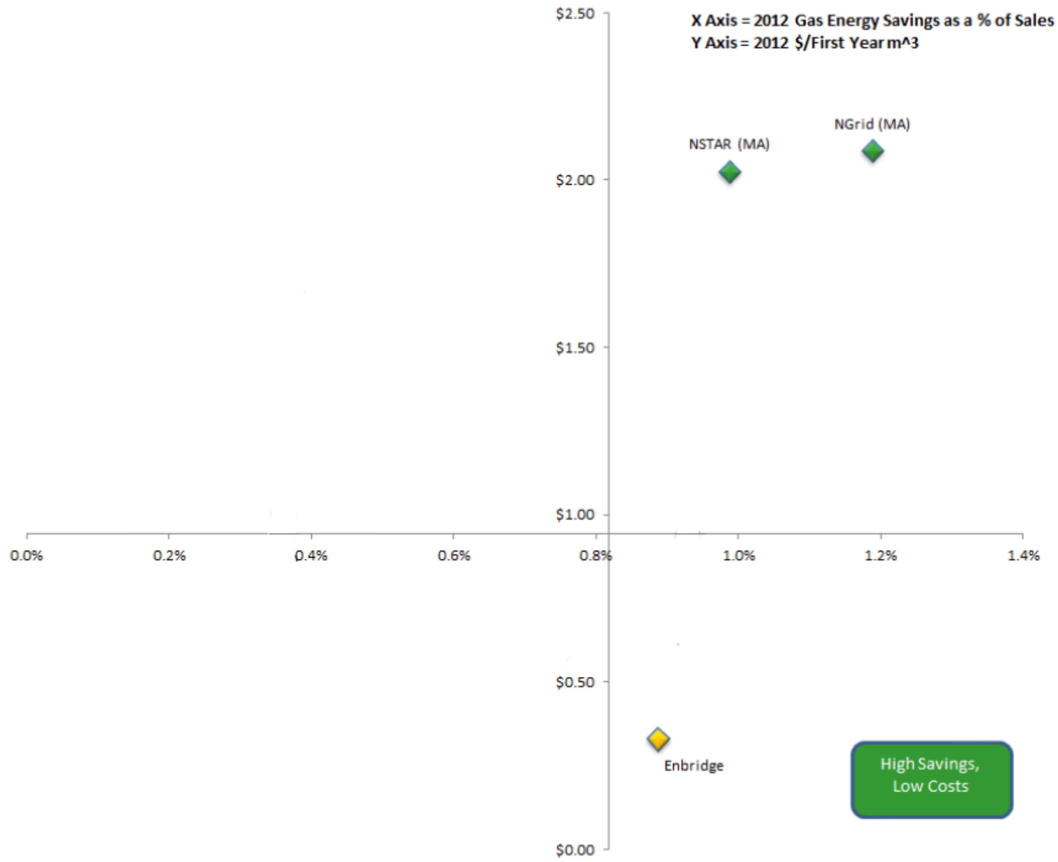
Witnesses: K. Mark
S. Moffat
B. Ott

Figure E-4. 2012 Cost of Natural Gas Savings [1,2,3,4,5,6,7]



Witnesses: K. Mark
S. Moffat
B. Ott

Figure E-5. 2012 Natural Gas Savings and First Year Costs ($/m^3) Over All Sectors [1,2,3,4,5,6,7]



Witnesses: K. Mark
S. Moffat
B. Ott

Table E-3 Detailed Benchmark Data [1,2,3,4,5,6,7]
2012- DSM Results by State

		2012 Incremental DSM Results		2012 Retail				Normalized DSM Results		
Customer Sector	Utility	m3	Costs $M	Customers	Annual m3	Revenue $M	Cost of Energy $/m3	Spending as a % of Revenue	Energy Savings as a % of Sales	Cost of Savings $/m3
Residential										
Canada	Enbridge	14,086,586	$16.6	1,929,313	3,868,127,000	$1,239	$0.32	1.3%	0.4%	$1.18
Massachusetts	NGrid	27,009,771	$71.1	808,556	1,942,084,180	$779	$0.40	9.1%	1.4%	$2.63
Massachusetts	NSTAR	4,867,191	$19.5	245,507	505,168,314	$212	$0.42	9.2%	1.0%	$4.01
C&I										
Canada	Enbridge	78,445,878.0	$14.0	160,167.0	6,567,894,000	$666	$0.10	2.1%	1.2%	$0.18
Massachusetts	NGrid	14,108,121.2	$14.6	82,795.0	1,517,942,300	$346	$0.23	4.2%	0.9%	$1.04
Massachusetts	NSTAR	6,966,670.1	$4.4	27,295.0	692,874,911	$120	$0.17	3.7%	1.0%	$0.64
Overall										
Canada	Enbridge	92,532,464.0	$30.6	2,089,480.0	10,436,021,000	$1,905	$0.18	1.6%	0.9%	$0.33
Massachusetts	NGrid	41,117,892.4	$85.8	891,361.0	3,460,026,479	1,124.6	$0.33	7.6%	1.0%	$2.03
Massachusetts	NSTAR	11,833,861.2	$24.0	272,802.0	1,198,043,225	332.2	$0.28	7.2%	1.0%	$0.66

[1] (0.2% annual savings in 2011, ramping up to 1.5% in 2019) (ACEEE (2014) *State and Local Policy Database: Illinois*, http://database.aceee.org/state/illinois#sthash.bGWyz5jh.dpuf)
[2] http://database.aceee.org/state/iowa#sthash.8lQbPs2e.dpuf
[3] http://database.aceee.org/state/michigan#sthash.TZP0sYSN.dpuf
[4] Vermont law requires program administrators to set *electricity* energy utility budgets at a level that would realize "all reasonably available, cost-effective energy efficiency. A separate proceeding for setting gas energy efficiency budgets is expected in the future, but is not currently in place.
[5] http://database.aceee.org/state/massachusetts#sthash.ulRAAgsM.dpuf
[6] The Green Communities Act requires that electric and gas utilities procure all cost-effective energy efficiency before more expense supply resources http://database.aceee.org/state/massachusetts#sthash.ulRAAgsM.dpuf).
[7] http://database.aceee.org/state/minnesota#sthash.Lr12YnGK.dpuf

Witnesses: K. Mark
S. Moffat
B. Ott

MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE

ONTARIO'S CLIMATE CHANGE UPDATE 2014

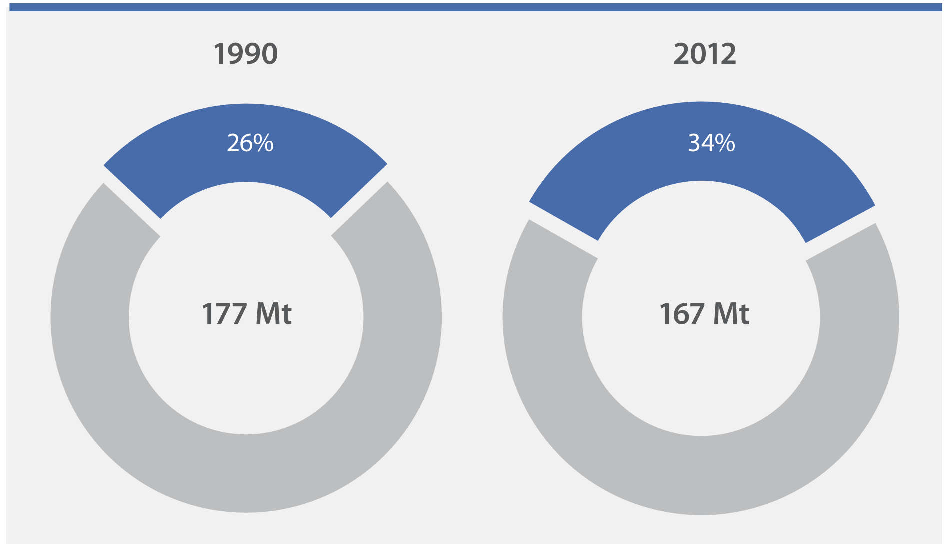
Ontario

SECTION 2

EMISSIONS BY SECTOR

This section provides specific information about GHG emissions by sector, including a description of the main sources, drivers of trends, a sector-specific forecast and sectoral initiatives.

Transportation Sector



Transportation Emissions

1990: 45.5 Mt
2012: 56.6 Mt
% Change: +24%

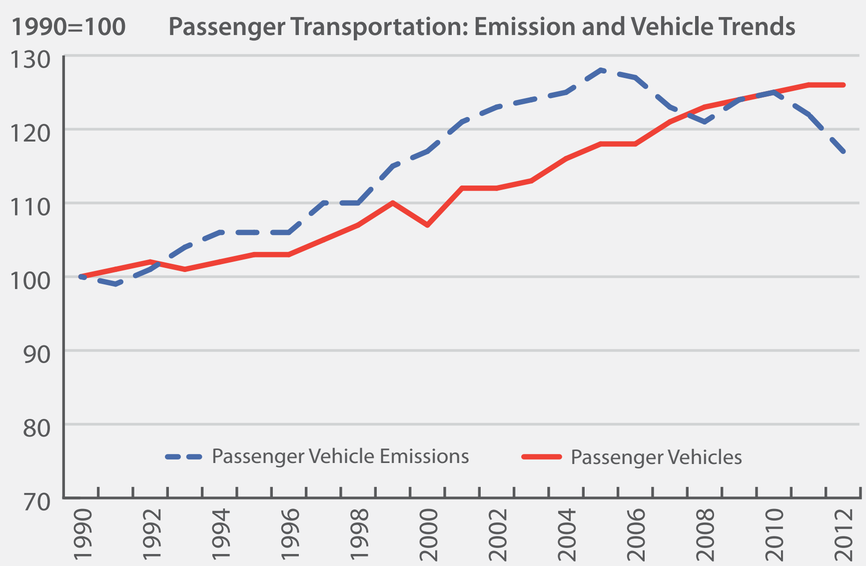
For 2012, the transportation sector represents approximately 34% of Ontario's greenhouse gas emissions. Transportation GHGs are emitted from combustion of fossil fuels in vehicles, mainly gasoline and diesel, and mostly from road travel. The largest sources are passenger cars and light-duty trucks, accounting for over half of the sector's emissions. The remainder come from other modes of transportation such as freight trucking and domestic air, ship and rail travel. International air and marine travel are not included in the Inventory.

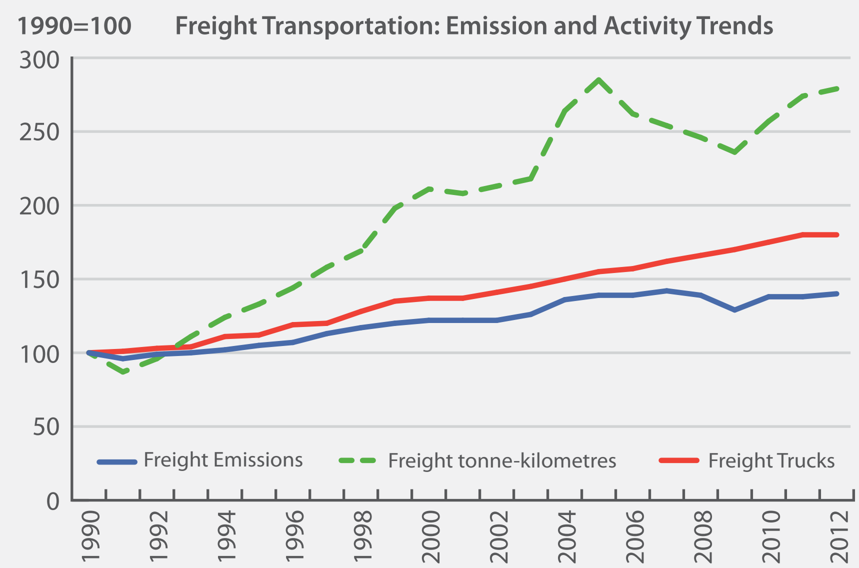
It should be noted that while public transit vehicles (i.e., buses, commuter trains, etc.) are sources of emissions, transit use contributes to reducing overall emissions levels by removing car trips from the road.

TRENDS

Emissions in the transportation sector have grown by 24% since 1990; road transportation is responsible for the greatest increase. **Figure 10** shows how historical emission levels have changed from 1990 to 2012 for passenger vehicles and freight transportation compared to changes in the number of vehicles and amount of freight in tonne-kilometres. A tonne-kilometre represents the measure of freight [tonne] carried over the distance of a kilometre. Through the 1990s, emissions increased as travel increased with population and economic activity. Furthermore, specialization and globalization in the economy have increased the distances freight is shipped. Vehicle efficiency improvements, along with other policies, have contributed to these trends flattening in recent years.

FIGURE 10 Historical Trends in Transportation





Source: the 2014 National Inventory Report: 1990–2012 data; *National Energy Use Database (2014)*

IMPACT OF INITIATIVES

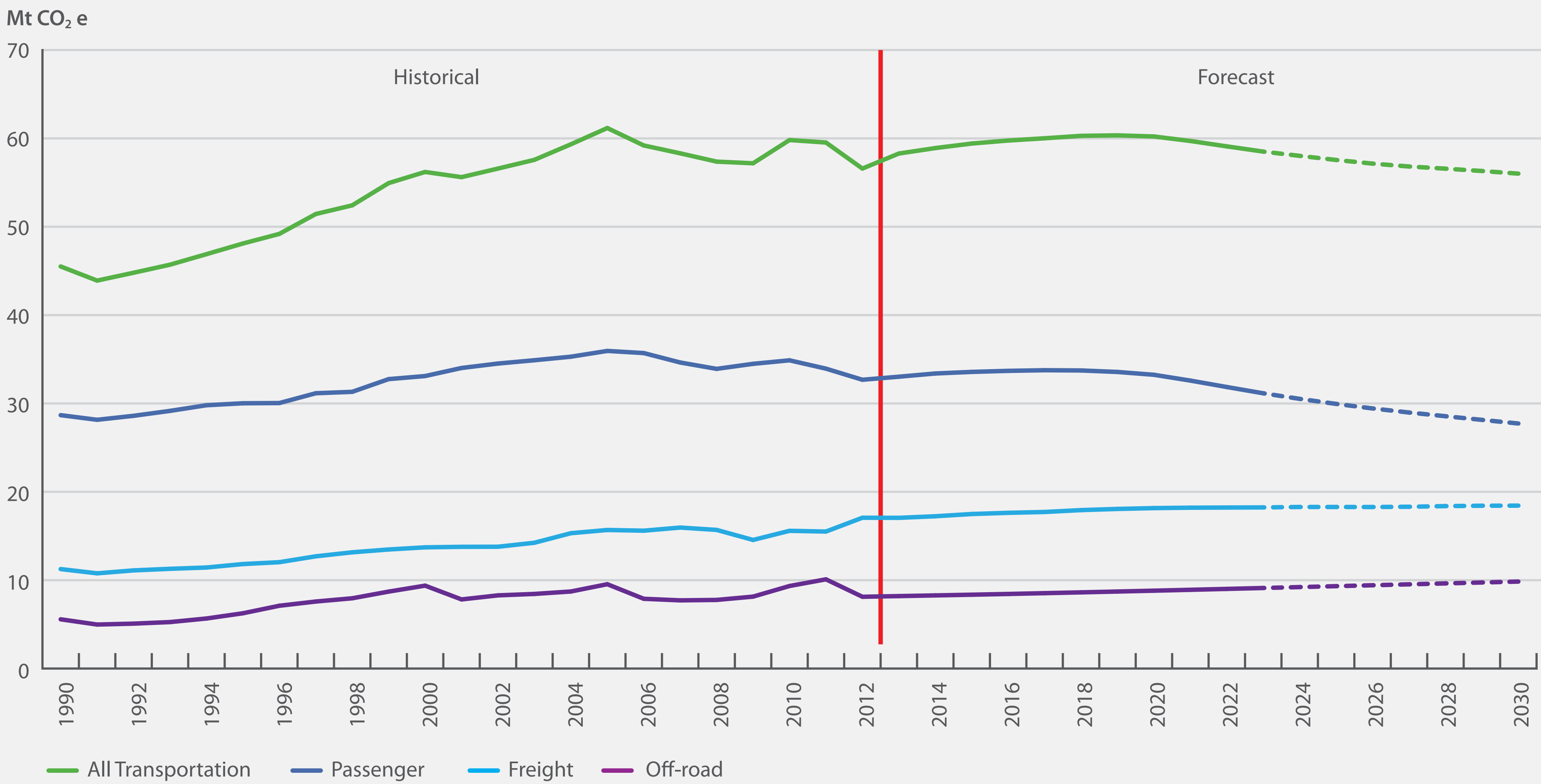
Many policies contribute to more carbon-efficient transportation. Ontario's Ethanol in Gasoline regulation (O. Reg. 535/05) has improved vehicle emission intensities in recent years. The recently introduced Greener Diesel regulation promotes the use of diesel fuels with better environmental performance. Combined with federal fuel efficiency standards, these regulations are expected to continue to improve intensities. Speed limiter requirements for freight trucks also contribute modest reductions.

Investments in public transit; the Provincial Policy Statement, 2014; and Ontario's Growth Plan encourage and promote a shift from individual car trips to car-pooling, land use, densities and mix of uses that minimize length and number of vehicle trips, and encourage the use of transit, walking and cycling — which in turn leads to fewer vehicle kilometres travelled and the associated emissions. For example, in 2012, there was an increase of more than 193 million passenger trips on municipal transit systems, compared to 2003. This has removed approximately 161 million car trips from Ontario roads.

Several major transit projects underway in the Greater Toronto and Hamilton Area (GTHA), Ottawa and Waterloo will come into service by 2020, which are projected to result in overall GHG reductions. As these lines mature and additional transit investments are made, positive impacts will continue beyond 2020.

Figure 11 shows forecast emissions from passenger, freight and off-road transportation out to 2030. The combined impact of transportation initiatives is forecast to be about 4–5 Mt from the business-as-usual projection in 2020. The impacts of current policies do not entirely offset increases that will come from population and economic growth, so near-term emissions are forecast to rise. However, emission growth after 2020 is expected to be tempered by increasing impacts of policies.

FIGURE 11 Historical and Forecast Transportation Emissions

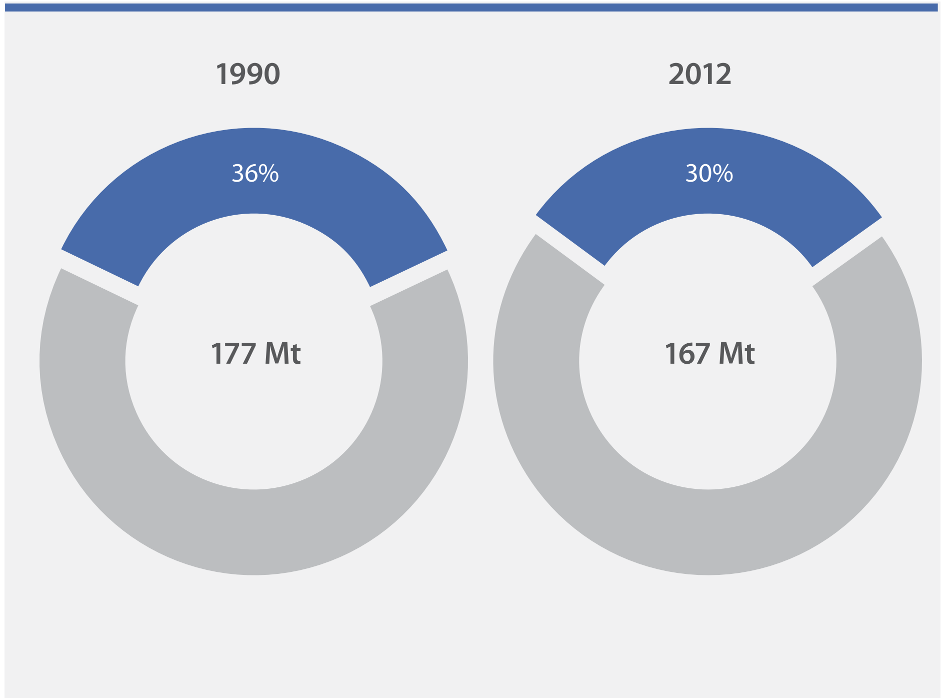


Source: the 2014 National Inventory Report: 1990–2012 data; MOECC forecast

Industrial Sector

In 2012, the industrial sector represents approximately 30% of Ontario's greenhouse gas emissions. Emissions in this sector come from the combustion of fossil fuels, such as natural gas and fuel oil. Some industrial processes themselves emit greenhouse gases. For example, when limestone is transformed into clinker, a precursor to cement, the process releases CO_2. These are called "process emissions."

Large industrial emitters in Ontario are required to report their greenhouse gas emissions.[14] Since small emitters are not required to report, this facility data does not represent the entire industrial sector in Ontario. However, this data is used to corroborate the trends estimated below.



Industrial Emissions

1990: 63.9 Mt
2012: 50.3 Mt
% Change: -21%

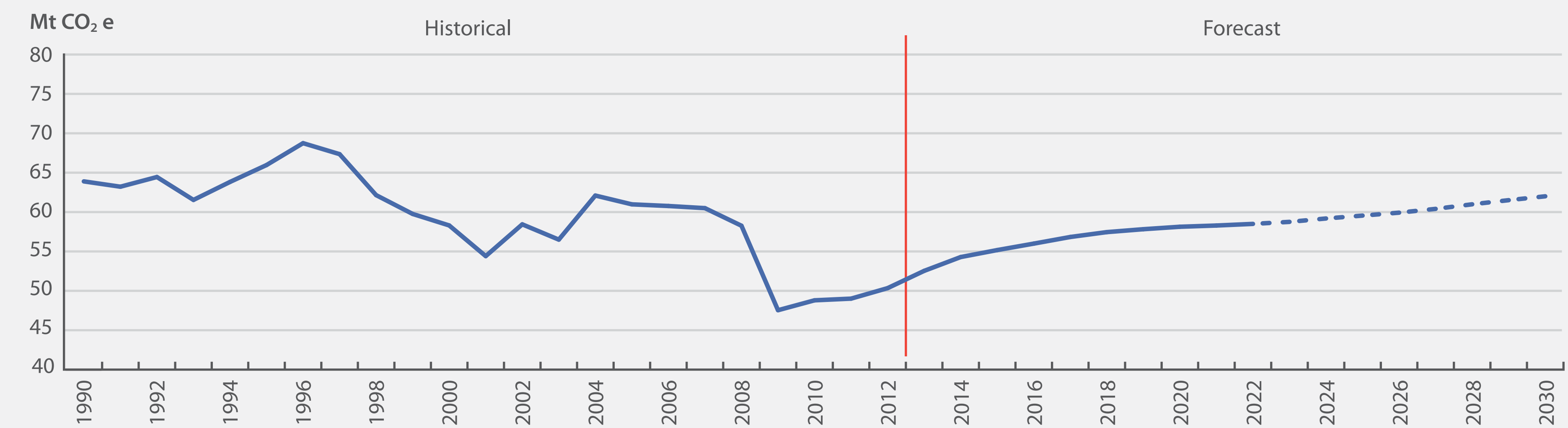
[14] Ontario's industrial emitters' report can be found here: http://www.ontario.ca/environment-and-energy/greenhouse-gas-emissions-reporting-facility.

TRENDS

Ontario's industrial emissions have dropped by 21% since 1990. In some cases, this was due to improvements in energy efficiency. This was also due to shifts in the economy from a predominance of manufacturing to a more diversified economy with a greater share of service industries. The overall improvement does not tell the story of significant variability across industries. For example, pulp and paper production has declined significantly and so too have emissions. Ontario's only adipic acid production plant reduced its emissions when it installed a catalytic emission abatement system in 1997. In 2009 this plant was indefinitely idled.

Figure 12 shows historical emissions from 1990–2012 and forecast emissions to 2030. Emissions decreased 10 Mt (17%) over the 2007–2012 period. This sharp drop was due to the recession; since then, emissions have been increasing. As the economy grows, it will be important to take the opportunity to find ways to level or decrease emission trends.

FIGURE 12 Industrial Emission Trend



Source: the 2014 National Inventory Report: 1990–2012 data; MOECC forecast

In the industrial sector, most emissions are generated by the manufacturing subsector (see Section 3: Methodology for more detail). In 2012, the emission intensity of manufacturing industries, calculated as emissions per dollar of manufacturing GDP, was 34% lower than in 1990.

IMPACT OF INITIATIVES

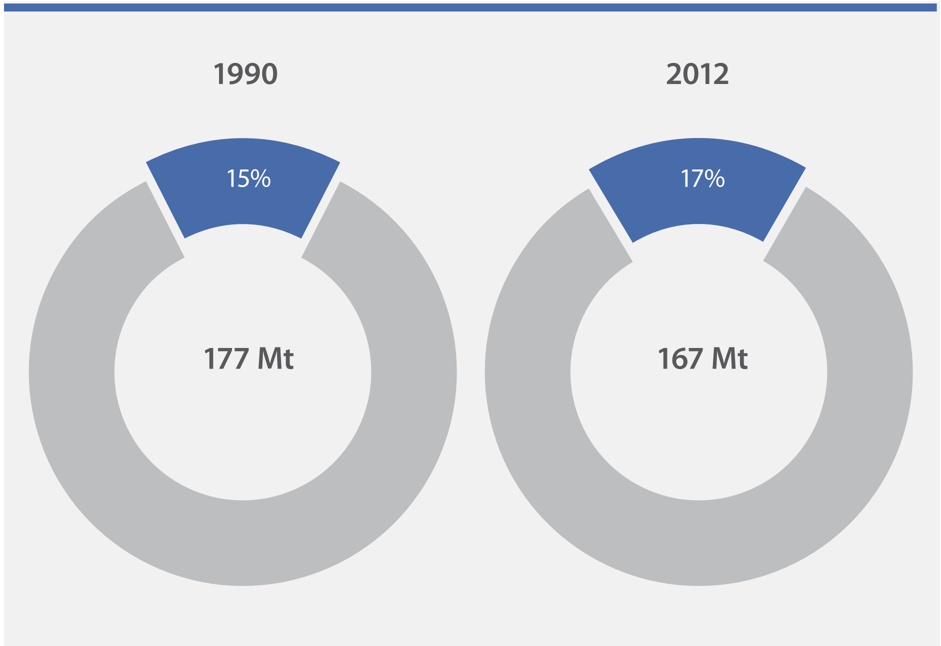
By 2020, total industrial emissions are projected to increase by 15% from the 2012 level, both combustion and process emissions. The carbon intensity of those emissions, measured as emissions per dollar of manufacturing GDP, is projected to decrease. This expected future decrease will likely be consistent with an existing decreasing trend (see Figure 6, p. 10).

Natural gas demand-side management programs are expected to reduce approximately 1 Mt of GHGs annually by 2020, compared to business as usual.

Looking ahead to 2020 and beyond, we will look to continue to work with industry towards the goals of clean-tech innovation and high resource productivity. Ideally, highly resource-efficient industries would increase profits and maintain a competitive edge in the global marketplace while reducing greenhouse gas emissions.

Buildings Sector

In 2012, the buildings sector represents approximately 17% of Ontario's greenhouse gas emissions. This sector includes emissions related to fossil fuel combustion — primarily natural gas — for space heating, water heating and other direct emission sources in residential, commercial and institutional buildings. While buildings also use a significant amount of electricity for lighting, air conditioning and appliances, these are considered *indirect emissions* resulting from electricity use and are included in electricity sector emissions.



Buildings Emissions

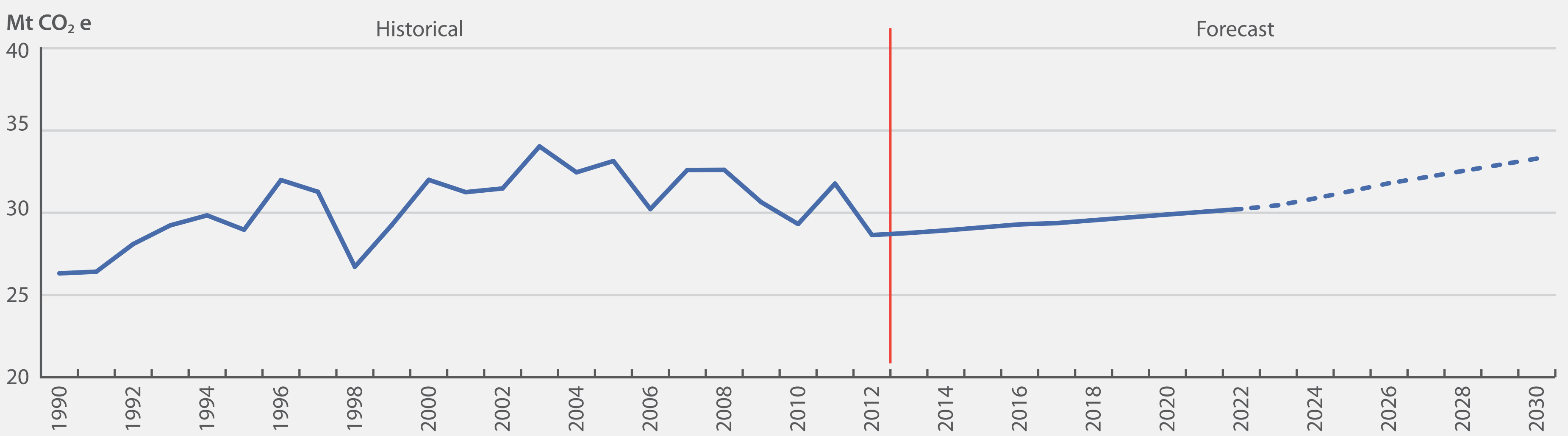
1990: 26.3 Mt
2012: 28.7 Mt
% Change: +9%

TRENDS

In Ontario, emissions in the buildings sector have grown steadily since 1990 along with population and the economy. These trends are expected to continue.

Figure 13 shows historical emissions from 1990–2012 and an emission forecast out to 2030. Annual fluctuations in historical emissions can be attributed to changes in heating demand due to weather and changes in activity in the commercial sector. Building emission intensity improved by about 32% from 1990–2012. This was due to improvements in both the residential (37%) and the commercial/institutional (21%) segments of the sector.

FIGURE 13 Buildings Sector Emission Trend



Source: the 2014 National Inventory Report: 1990–2012 data; MOECC forecast

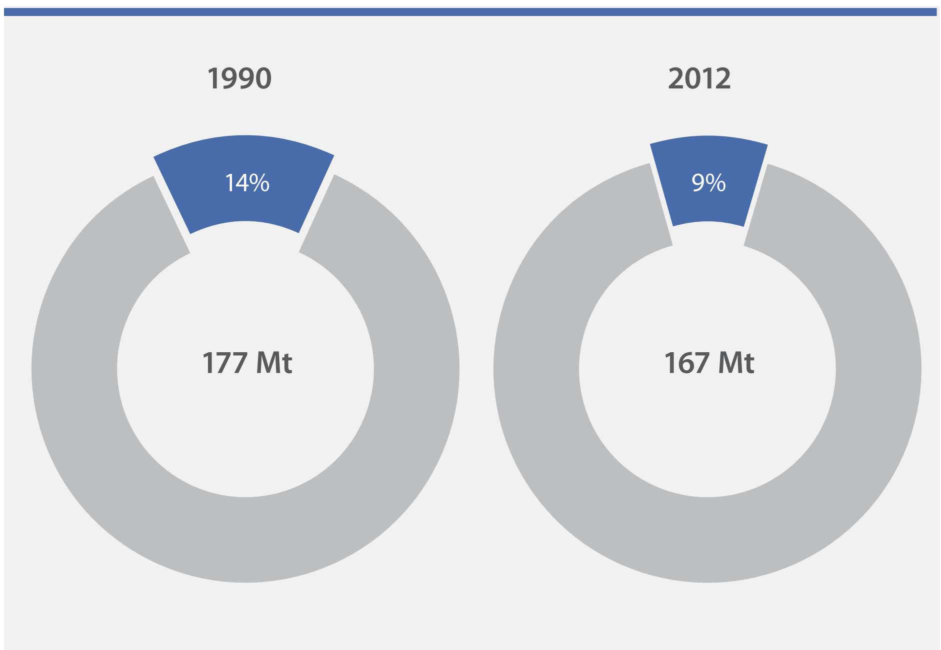
IMPACT OF INITIATIVES

Recent changes to the Ontario Building Code mandate more efficient new buildings. For building stock already constructed, property owners have added insulation, sealed cracks, upgraded windows and have taken advantage of incentives from utilities and government. New furnace standards require higher efficiency appliances. As a result of these and other initiatives, the energy use per square metre in Ontario has decreased by more than 30% (see **Figure 6**, p. 10). The Provincial Policy Statement, 2014 promotes compact land use and development forms that will contribute to the reduction of greenhouse gas emissions from the building sector and the built environment. The expected combined impact of all of the activities described here will be about 2–3 Mt from the business-as-usual projection in 2020.

However, these improvements are not expected to completely counteract emission growth in building space overall — emissions are projected to rise in the coming years.

Electricity Utilities

In 2012, the electricity sector emitted approximately 9% of Ontario's greenhouse gases. Greenhouse gases are emitted from electric generation burning fossil fuels — natural gas or coal in the province. Note that Ontario fully eliminated coal as a source of electricity generation in April 2014. Emissions from the sector are driven by the demand for electricity and the carbon intensity of the generation source.



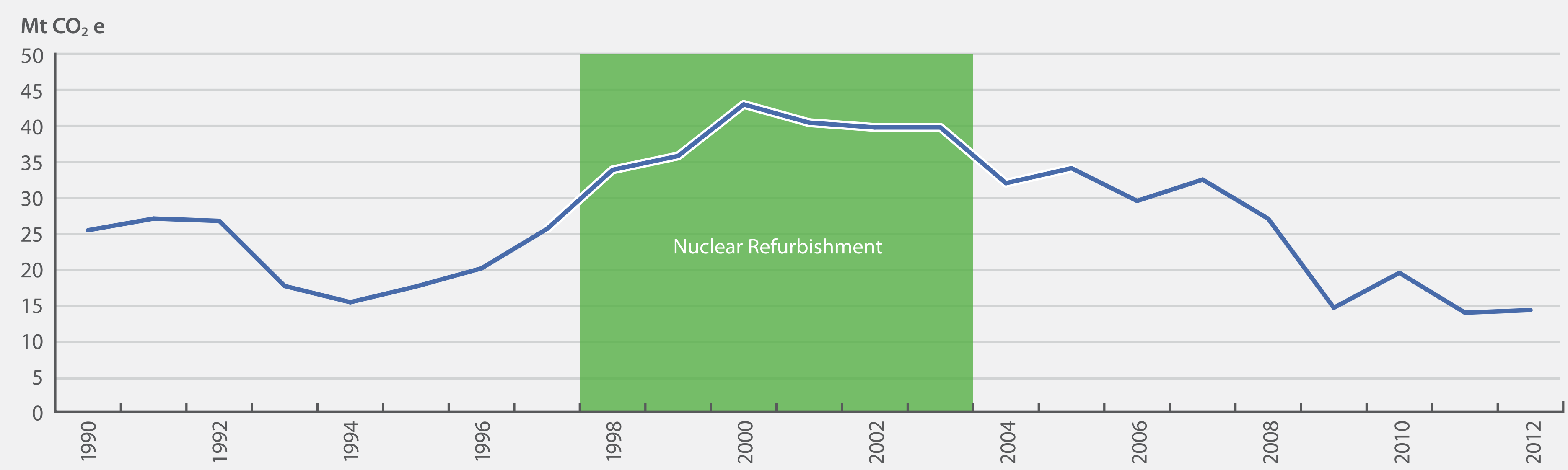
Electricity Emissions

1990: 25.5 Mt
2012: 14.5 Mt
% Change: -43%

TRENDS

There was a sharp increase in Ontario's electricity emissions from the early 1990s to 2000, when coal-fired power plants represented a larger portion of energy generation. Emissions peaked in 2000 at around 70% above 1990 levels and have been decreasing ever since (see Figure 14).

FIGURE 14 Electricity Generation Historical Emissions, 1990–2012



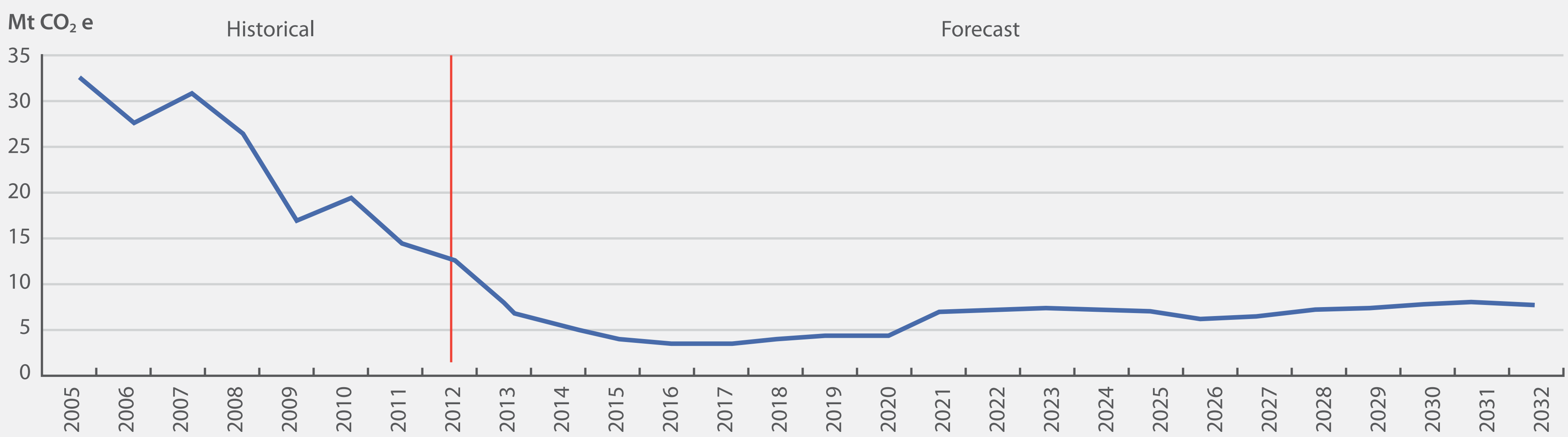
Source: the 2014 National Inventory Report: 1990–2012 data

Since 2007, electricity emissions have decreased due to the phase-out of coal-fired electricity (see above). Emissions in 2012 were about the same as in 2011. Phasing out coal-fired electricity has improved the intensity of electricity in Ontario. Combined with demand management, this reduces the use of fossil fuels by electricity utilities.

IMPACT OF INITIATIVES

Phasing out coal-fired electricity generation is the single largest climate change initiative in North America to date and with associated electricity policies is projected to reduce Ontario's emissions by 32.5 Mt in 2020 from business-as-usual (see **Figure 15**).

FIGURE 15 Electricity Sector Greenhouse Gas Emission Forecast



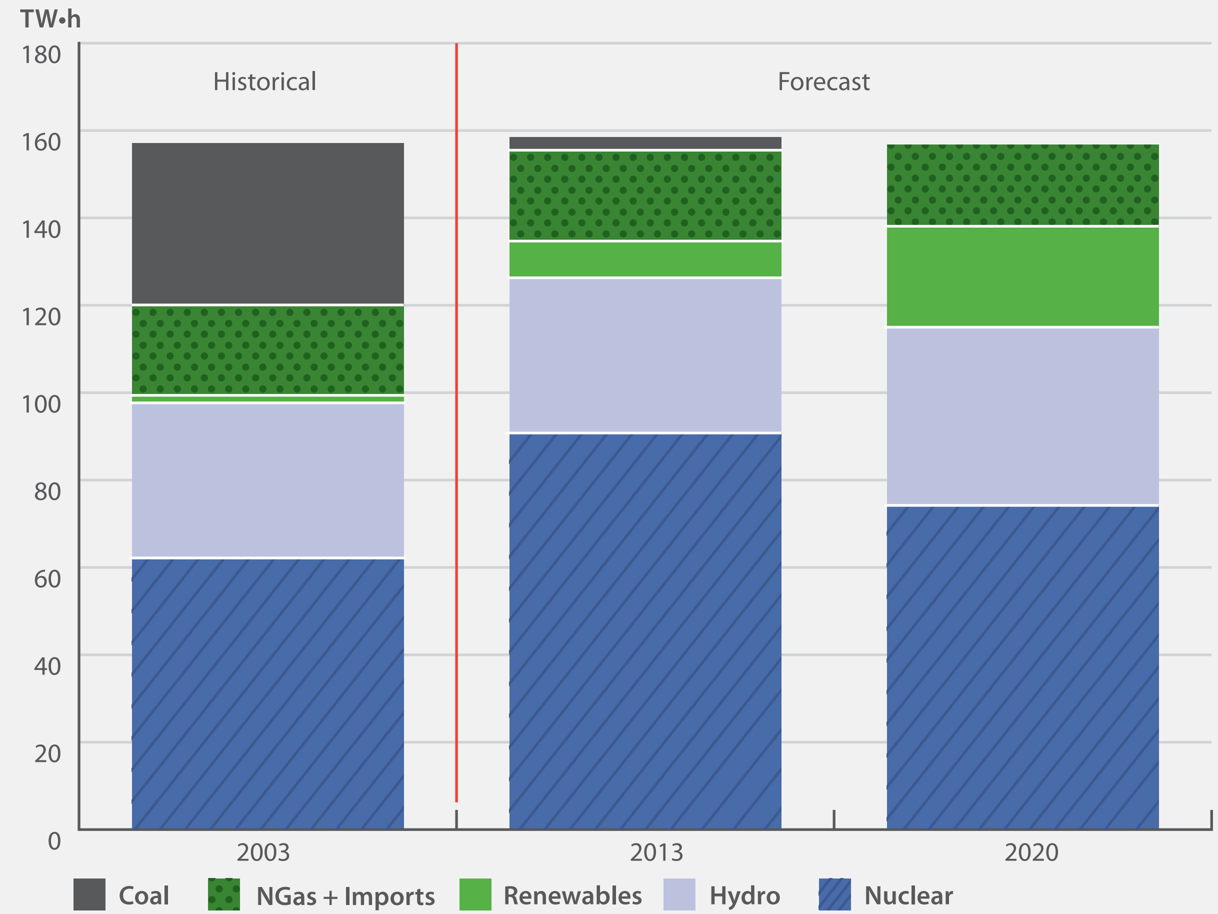
Source: Achieving Balance: Ontario's Long-Term Energy Plan *data (2013)*

Between 2010 and 2014, the Ontario Government reduced the use of coal in power plants, closing or converting all generating units at these plants. *The Green Energy and Green Economy Act*, 2009 and the 2013 *Long-Term Energy Plan* have replaced coal with hydroelectric power, nuclear power, renewable electricity generation, demand management and conservation (see **Figure 16**). In the near term, the power grid will also rely on natural gas generation, so emissions from this sector many increase, especially during the refurbishment of some nuclear plants.

We also note that Ontario's reductions in the carbon intensity of electricity generation means households, businesses and industries have a smaller carbon footprint. This change also provides opportunities for electricity to be a low-carbon alternative to other, more carbon-intense energy sources. For example, the carbon footprint of the operation of an electric vehicle in Ontario is substantially lower not only than that of a gasoline vehicle but also of an electric vehicle used in a jurisdiction dependent on coal-fired electricity.

In the future, we will continue to look to further develop Ontario's clean energy sources and new technologies, as well as promote energy and resource efficiency and conservation across government, and among businesses and individuals.

FIGURE 16 Ontario's Electricity Production by Source

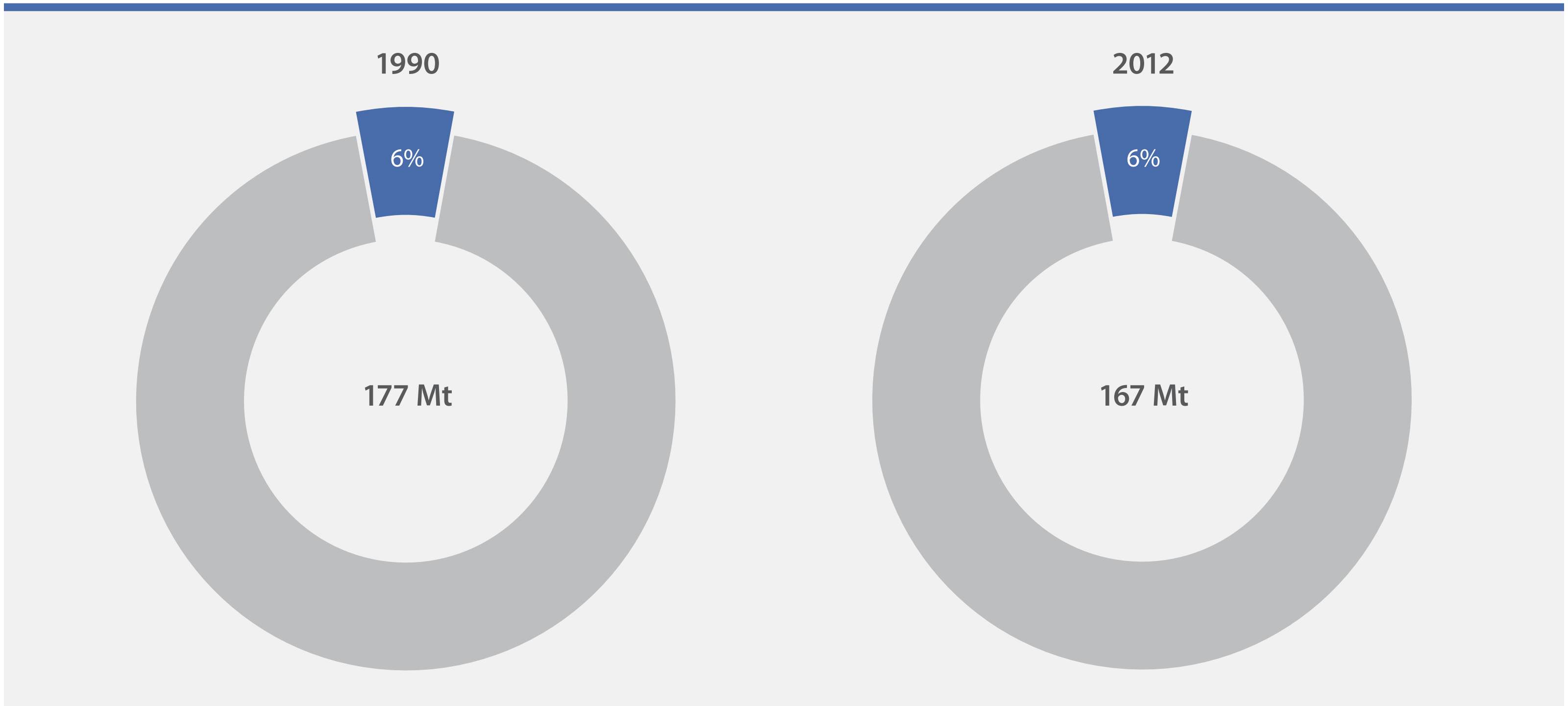


Sources: Ontario's Long-Term Energy Plan: Building Our Clean Energy Future *(2010)*; Achieving Balance: Ontario's Long-Term Energy Plan *data (2013)*

Agriculture Sector

Agriculture has numerous roles with respect to greenhouse gas emissions and the carbon cycle. Many agricultural activities are sources of GHG emissions, while others *remove* carbon from the atmosphere and store it in soils. According to the UN accounting conventions, emissions and removals of GHGs from agricultural lands are part of the Land Use, Land Use Change and Forestry (LULUCF) sector, which are estimated but *not* included in Inventory totals. Ontario does not include LULUCF emissions and removals in this report. Emissions from fossil fuels used in agricultural equipment like combines and tractors are included in the transportation sector, while emissions from fuels used to heat greenhouses are included in the industrial sector.

For the purposes of this report, emissions from the agriculture sector are restricted to livestock and crop production. A more detailed description of the sources can be found in the Inventory.



Agriculture Emissions

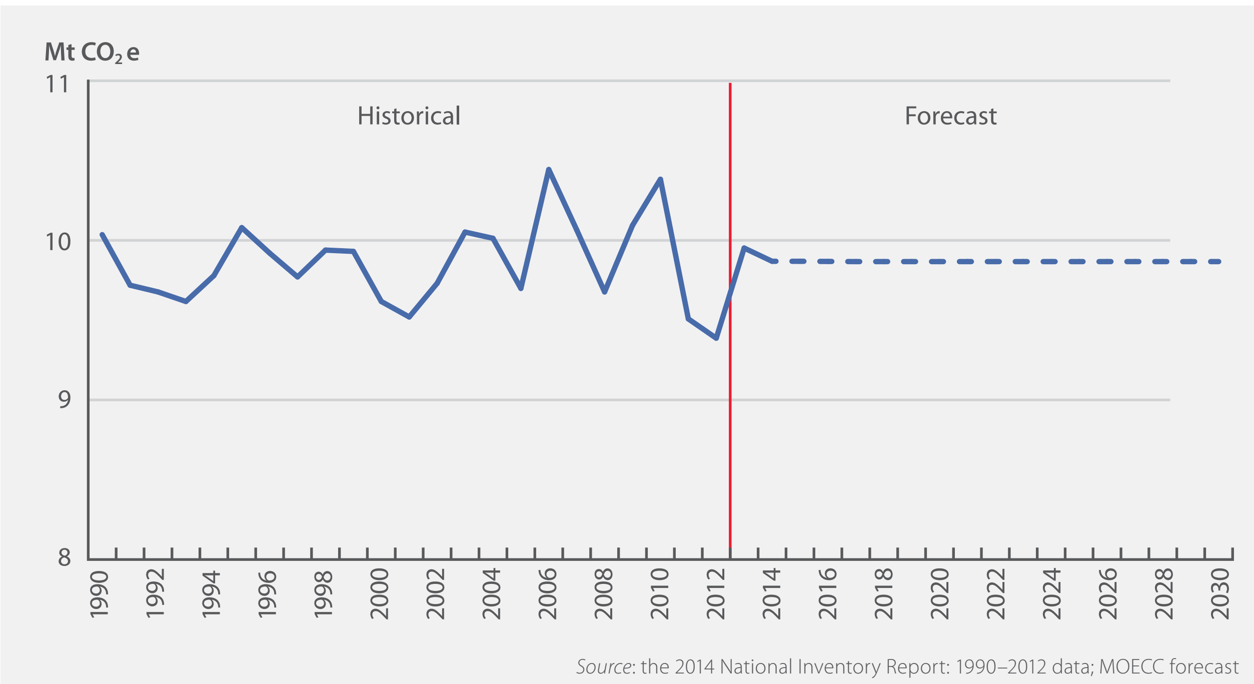
1990: 10.0 Mt
2012: 9.4 Mt
% Change: -6.5%

TRENDS

In 2012, the agricultural sector was responsible for 9.4 Mt (6%) of total GHG emissions in Ontario (6.5% below 1990 levels). Most of the agricultural emissions accounted for in this sector are from the application of nitrogen-based fertilizers and manure to agricultural soils (55%), followed by methane from the digestive processes of livestock (enteric fermentation (29%)) and manure management (16%).

The agriculture sector emissions have remained fairly constant since 1990 (see **Figure 17**).

FIGURE 17 Agriculture Forecast Emissions to 2030

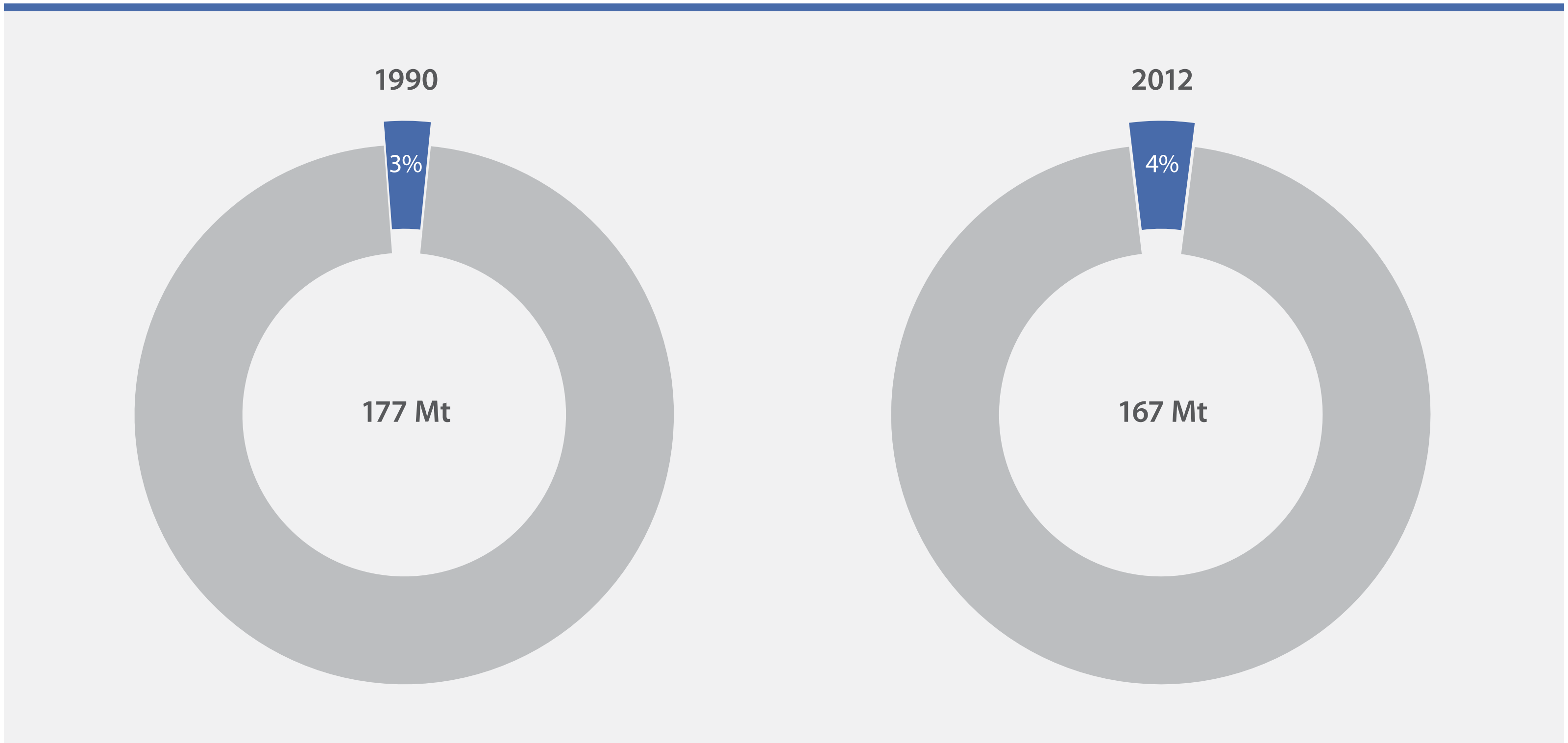


While the direct emissions from agriculture in Ontario are relatively small, the sector plays a critical role in the carbon cycle and the production of bio-fuels, which can displace fossil fuels in other sectors. On-farm biogas facilities (which were funded under the Ontario Biogas Systems Financial Assistance Program) are expected to achieve a reduction of 11 kilotonnes in 2020. Tillage practices can have an impact on emissions from agricultural soil; however, most of this impact is accounted for in the cropland category of the LULUCF sector and is not included in Ontario's inventory or forecast at this time.

Waste Sector

Emissions from Ontario's waste sector are primarily methane from the disposal of solid waste on land and, to a lesser extent, emissions from wastewater handling and waste incineration. Methane is generated from the decomposition of organic material over time in a landfill. The rate of methane generated depends on the amount and nature of the waste disposed and the conditions of the landfill.

Emissions from landfills are determined using a simulation model to account for the slow, long-term generation and release of these emissions.



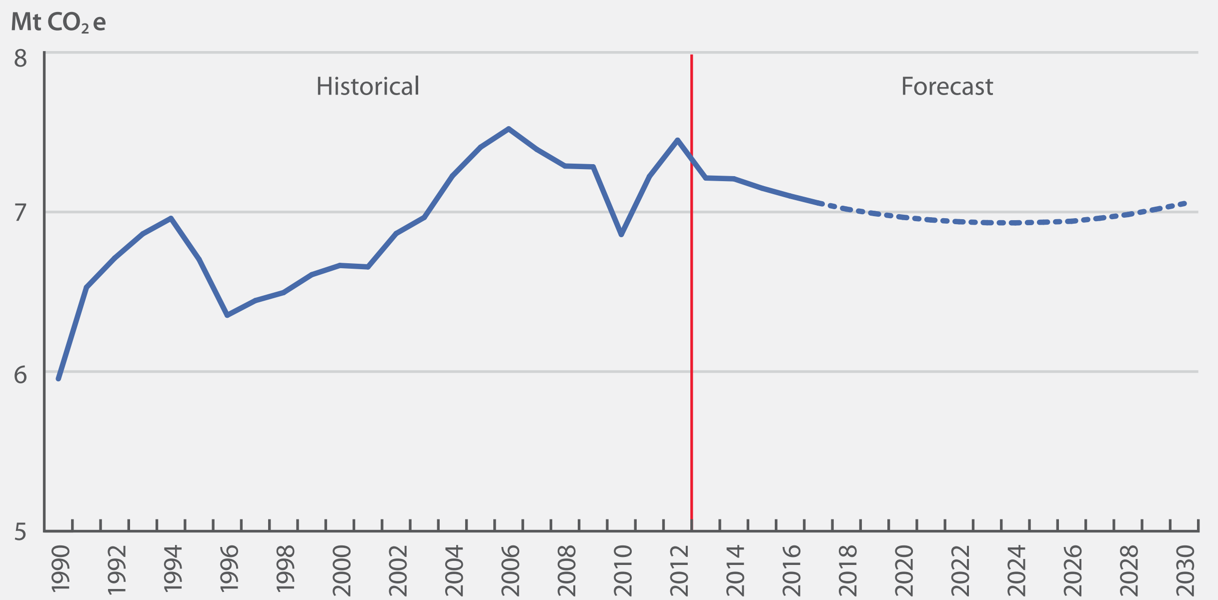
Waste Emissions

1990: 5.9 Mt
2012: 7.5 Mt
% Change: +25%

TRENDS

In 2012, the waste sector in Ontario was responsible for 7.5 Mt (4%) of the total GHG emissions in Ontario. Most of these (92%) came from methane emitted by public and private landfills. Figure 18 shows the emission trend and forecast for the waste sector. From 1990–2012, emissions grew by 25% as waste disposal on land increased. There are initiatives underway to reverse this trend that could be expanded; for example, by diverting organic matter from landfill and capturing or destroying the methane generated. Methane from landfill gas can also be used to generate electricity or heat.

FIGURE 18 Waste Forecast Emissions to 2030



Source: the 2014 National Inventory Report: 1990–2012 data; MOECC forecast

IMPACT OF INITIATIVES

Waste emissions are expected to remain relatively stable in coming years. Ontario has implemented regulations[15] requiring large landfills to capture and destroy methane generated. To date, 31 landfills are capturing landfill gas and these systems are expected to reduce emissions by 1.8 Mt in 2020.

[15] O. Reg. 216/08; O. Reg. 217/08. Made under the *Environmental Protection Act*.