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Projecting emissions to determine plan impact

In order to determine whether the Climate Action Plan could result in community wide emissions levels that meet the City Council-adopted targets in 2015 and 2025, projections of greenhouse gas emissions were developed for two scenarios:

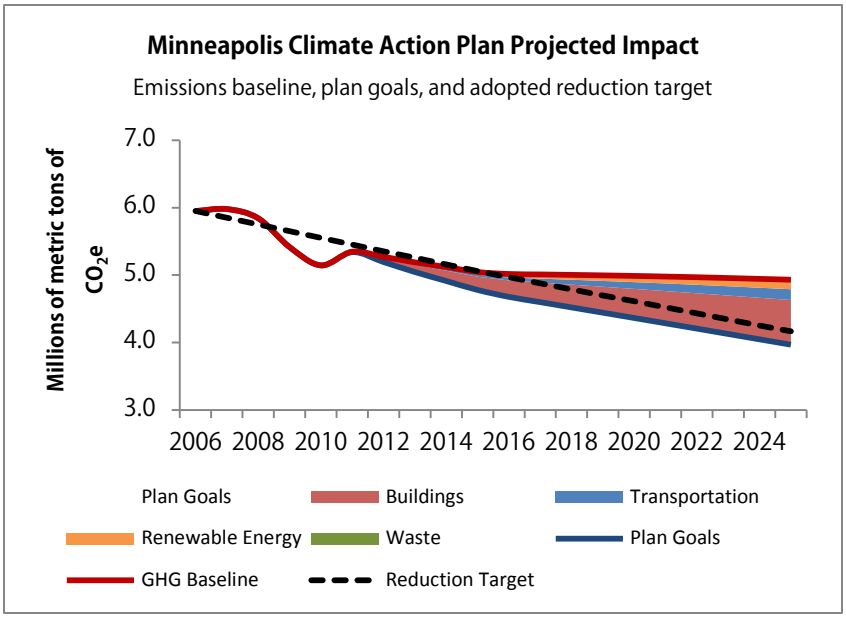

Figure 1. Climate Action Plan Projected Impact

1. **Baseline emissions scenario.** This is a "status quo" scenario that includes activities that will influence community emissions regardless of whether Climate Action strategies are undertaken. This includes assumptions about the growth in energy use due to population and job growth in the city, assumptions about Xcel Energy's fuel mix and new CAFE standards for vehicles.

2. **Plan scenario.** This is the Climate Action scenario, in which Minneapolis is able to meet all the goals established in the plan. Meeting these goals would change the growth in energy use, the expansion of renewables, emissions from transportation and the amount of waste disposal.

Both baseline and plan scenarios were developed for all the major greenhouse gas sources in the buildings, transportation and waste categories. These were then combined to develop a cumulative baseline and plan scenario.

Figure XX shows the contribution of each category of strategies to the overall emissions reduction potential of the plan. In the baseline scenario, Minneapolis would be responsible for 4.9 million metric tons (mmt) of CO_2e in 2025, a 24% reduction from 2006, but still short of the City's adopted target of 4.16 mmt. By meeting the plan goals, Minneapolis would be responsible for 3.9 mmt in 2025, or nearly 5% below the adopted target.

Baseline emissions scenario

The "status quo" baseline incorporates a number of assumptions about future changes to our energy, transportation and waste systems that will likely take place regardless of any climate action strategies advanced in Minneapolis.

Under the baseline scenario, community greenhouse gas emissions are expected to fall 4 percent between 2010 and 2025 and 17 percent from 2006 to 2025. This trend is most heavily affected by slowly growing electricity usage, cleaner fuels for making electricity, and more fuel-efficient on-road

transportation as vehicles are replaced. Figure 2 shows a summary of the baseline greenhouse gas emissions scenario.

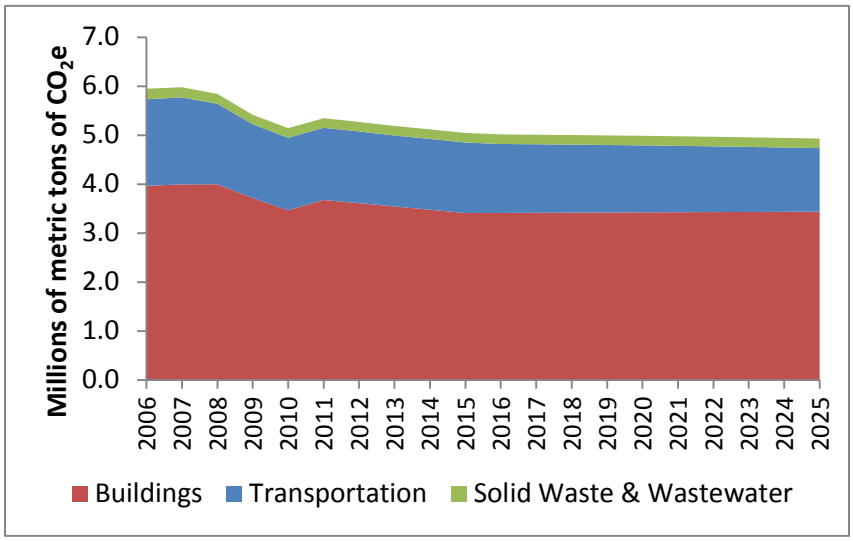

Figure 2. Minneapolis Greenhouse Gas Emissions Summary - Baseline Scenario

Electricity & natural gas baselines

The baseline greenhouse gas emissions scenario assumes Xcel Energy will continue to provide electricity to Minneapolis with a greenhouse gas intensity consistent with their 2011 Integrated Resource Plan (IRP) filed with the State Public Utilities Commission. These plans show a reduction in the greenhouse gas intensity of electricity between 2010 and 2025, with most of these reductions happening between 2010 and 2015. Table 1 shows the greenhouse gas intensity from Xcel Energy through 2025. Xcel provided estimates to the City of Minneapolis of intensity figures for the years 2015 and 2025. For each year up to and including the 2011 calendar year, the City has received verified greenhouse gas intensity figures from Xcel. Years between 2011 and 2015 and between 2015 and 2025 were estimated based on a straight line trend.

Based on discussions at the Buildings & Energy Working Group, which included an Xcel Energy representative, an annual rate of growth in electricity consumption was developed for the baseline scenario – 0.5%. This growth rate was in recognition of the planned growth in households and jobs in Minneapolis through 2025. Total electricity consumption in Minneapolis has declined over 2% between 2006 and 2011. The Energy Information Agency (EIA) predicts in their 2013 Annual Energy Outlook that electricity consumption in MRO West, our electricity grid region which includes multiple states, will grow between 0.4% to 1.4% annually between 2010 and 2025.[1]

Local combustion of natural gas (in residential and commercial heating, and industrial applications) will produce 0.0053060156 MT CO2e per therm. No changes in combustion efficiency were assumed in either the baseline or goals scenario. The Buildings & Energy Working Group, which included a Centerpoint Energy representative, developed a zero percent annual growth rate in natural gas consumption for the baseline scenario. The EIA predicts that the residential use of natural gas in the West North Central Region, which includes Minnesota and six other Midwestern states, will decline almost every year between 2010 and 2025, with the annual decline slowing to -0.5% by 2025.[1] According to the EIA, commercial consumption of natural gas is expected to decline slowly on an annual basis through 2025.

[1] http://www.eia.gov/forecasts/aeo/er/tables_ref.cfm

Consistent with the approach in the Minneapolis Greenhouse Gas Inventory[2], electricity produced at HERC and sold to Xcel Energy was subtracted from the total electricity emissions in each year to avoid double-counting.

Table 2 shows the greenhouse gas emissions from electricity and natural gas consumption under the baseline scenario.

University of Minnesota steam plant baseline

The steam plant on the University of Minnesota's Minneapolis campus provides heat to the campus through a district energy system. The plant is a source of greenhouse gas emissions in Minneapolis, and is fueled by coal, natural gas, fuel oil and oat hulls. Under the baseline scenario, the steam plant was assumed to continue operating with its current fuel mixture through 2025. This would produce greenhouse gases similar to 2010 levels, of roughly 127,000 metric tons per year.

Transportation baseline

The key drivers of change in transportation-related emissions are road transportation and the Minneapolis-Saint Paul International airport. Rail and barge traffic in the city make up a small portion of emissions. Within the road transportation area, which is the largest source of transportation-related emissions, vehicle fuel efficiency and the number of vehicle miles traveled (VMT) have significant impacts on emissions levels. The full methodology for the inventory of transportation-related greenhouse gases can be found in the Minneapolis Greenhouse Gas Inventory[2].

Road transportation baseline

The Metropolitan Council maintains a regional traffic and transportation model for the purposes of effectively planning the region's transportation system. Based on the assumptions contained in that model, VMT in Minneapolis is projected to grow at a rate of 0.3% for the entire period of 2010 to 2030. This annual growth rate was used in the baseline emissions calculation for road transportation.

The on-road vehicle fuel efficiency standards enacted in 2012 by the US Environmental Protection Agency were included in the baseline emissions scenario for transportation. While these would require new cars in some categories to achieve 54.5 miles per gallon in 2025, many older vehicles would still be on the road at that time. The US Energy Information Agency developed a set of average car and truck miles per gallon estimates that included the new CAFE rules as part of their 2012 early release of the Annual Energy Outlook. Table 4 shows the fuel economy assumptions used in the baseline emissions scenario, which are consistent with the 2012 EIA AEO.

Both the baseline emissions scenario and the plan scenario assume the fleet distribution of cars, light trucks and heavy duty vehicles remains the same between 2010 and 2025.

The baseline emissions scenario also assumes that Minnesota's biodiesel and ethanol mandates remain the same from 2010 to 2025. This means that gasoline will continue to contain 10% ethanol through 2025. At the time the Climate Action Plan was being developed, Minnesota issued new rules for ethanol in gasoline, calling for a 20% requirement for gasoline starting in 2015. This means the baseline emissions scenario for road transportation will likely be higher than actual emissions after 2015. Diesel

[2] http://www.minneapolismn.gov/sustainability/reports/sustainability_carbon

fuel will contain 5% biodiesel until 2013, when the blend will increase to 10%. In 2016, the blend will increase to 20%[3].

MSP Airport baseline

The Minneapolis-Saint Paul International airport (MSP) is a significant source of greenhouse gas emissions and is included in the Minneapolis Greenhouse Gas Inventory. Including airport-related emissions is somewhat unique among community inventories.

The baseline emissions scenario assumes that emissions from the airport will rebound from a low point in 2010 and grow at 1% per year from 2012 through 2025. Table 6 shows the baseline emissions from the airport and air travel.

Small sources baseline

Small sources in the Minneapolis Greenhouse Gas Inventory included rail and barge traffic and backup power supplies. Emissions from these sources were projected to continue at equal levels of 26,262 MT CO_2e in both the baseline and plan scenario.

Total transportation baseline

Table 7 shows the total greenhouse gas emissions from the transportation sector in the baseline scenario. While emissions from the airport and air travel are expected to increase 16% between 2010 and 2025, emissions from road transportation are projected to decline by 22%, due to improvements in vehicle fuel economy and the transition to cleaner fuel sources. Overall, by 2025 emissions in the transportation baseline are projected to decline 12% from 2010 and 27% from 2006.

Solid waste and wastewater treatment baseline

The baseline scenario for greenhouse gas emissions from solid waste disposal are based on assumptions of changes in the solid waste stream under the status quo. Under the baseline scenario, emissions from the processing of wastewater are assumed to remain flat through 2025.

Solid waste baseline

Greenhouse gas emissions from solid waste occur when solid waste disposed of by Minneapolis residents and business is processed in a landfill or energy recovery facility. In the baseline scenario, the total waste stream was anticipated to grow at 1.2 percent annually. This figure is based on the Hennepin County Solid Waste Master Plan assumptions.

In 2010, recycled material accounted for 32.5 percent of the total Minneapolis waste stream. This percentage was expected to grow to 40 percent of the waste stream by 2025 under the baseline scenario. Source-separated organics are expected to grow to 6 percent of the waste stream by 2025. Household Hazardous Waste (HHW), landfilled construction debris, and yard waste tonnages are expected to remain flat through 2025. Tonnage estimates for the baseline scenario are shown in Table 8.

In the community greenhouse gas inventory completed in 2012, greenhouse gas emissions from the burning of waste at the Hennepin Energy Recovery Center (HERC) were included in solid waste emissions estimates for 2006 – 2010. Because HERC operates under state permits limiting the amount of waste that can be processed, the baseline scenario assumes that the amount of waste from other communities processed at HERC would decline as Minneapolis waste sent to HERC increased. Total

[3] http://www.afdc.energy.gov/laws/laws/MN#Laws and Regulations

greenhouse gas emissions from HERC are expected to stay flat at around 131,000 MT through 2025 in the baseline scenario.

Under the baseline scenario emissions from Minneapolis-generated solid waste would increase 3 percent between 2010 and 2025. Table 9 shows baseline scenario greenhouse gas emissions from solid waste and wastewater.

Plan emissions scenario

The Plan emissions scenario is the Climate Action scenario, in which Minneapolis is able to meet all the goals established in the plan. Meeting these goals would change the growth in energy use, the expansion of renewables, emissions from transportation and the amount of waste disposal.

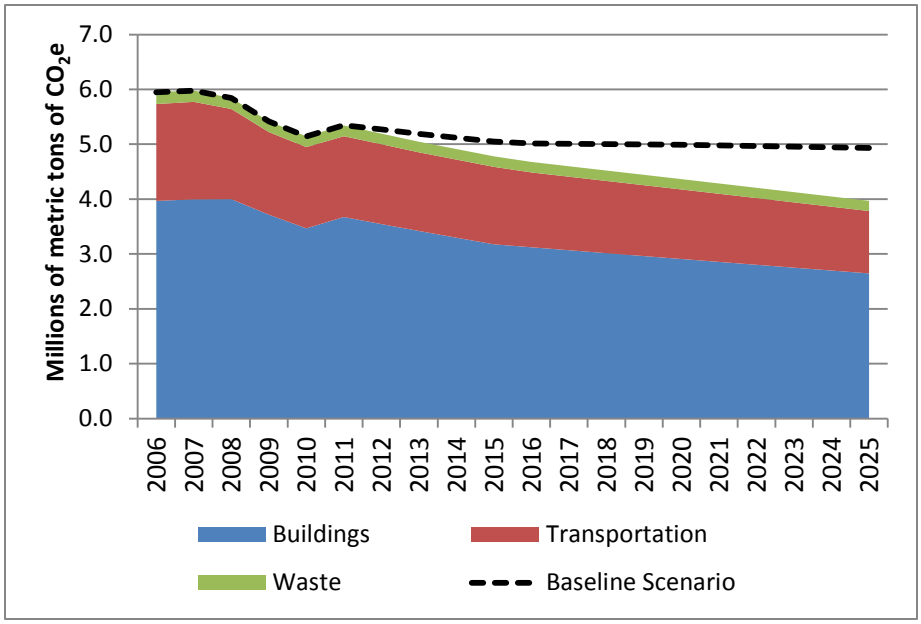

Figure 3. Minneapolis Greenhouse Gas Emissions Summary - Plan emissions scenario

Under the Plan emissions scenario, community greenhouse gas emissions are expected to fall 23 percent between 2010 and 2025 and 33 percent from 2006 to 2025. This trend is most heavily affected by meeting the aggressive energy efficiency goals, cleaner fuels used for making electricity, and flat or declining vehicle miles traveled combined with more fuel-efficient on-road transportation. Figure 3 shows a summary of estimated emissions through 2025 under the plan scenario.

Electricity & natural gas plan scenario

The plan greenhouse gas emissions scenario, like the baseline scenario, assumes Xcel Energy will continue to provide electricity to Minneapolis with a greenhouse gas intensity consistent with their 2011 Integrated Resource Plan (IRP) filed with the State Public Utilities Commission. These plans show a reduction in the greenhouse gas intensity of electricity between 2010 and 2025, with most of these reductions happening between 2010 and 2015. Table 1 shows the greenhouse gas intensity from Xcel Energy through 2025. Xcel provided estimates to the City of Minneapolis of intensity figures for the years 2015 and 2025. For each year up to and including the 2011 calendar year, the City has received verified greenhouse gas intensity figures from Xcel. Years between 2011 and 2015 and between 2015 and 2025 were estimated based on a straight line trend.

Electricity usage

Based on discussions at the Buildings & Energy Working Group, which included an Xcel Energy representative, an annual rate of growth in electricity consumption was developed for the baseline scenario – 0.5%. The Buildings & Energy Working Group adopted energy efficiency goals – 20% efficiency over the baseline in commercial/industrial buildings by 2025 and 15% efficiency over the baseline in residential buildings. Using baseline estimates for electricity usage, these goals were used to estimate 2025 electricity usage under the plan scenario.

Under the plan scenario, electricity use in commercial and industrial buildings in 2025 would be down 15 percent from 2011 levels, and residential use would be down 8 percent.

Consistent with the approach in the Minneapolis Greenhouse Gas Inventory[4], electricity produced at HERC and sold to Xcel Energy was subtracted from the total electricity emissions in each year to avoid double-counting.

Renewable energy

The plan scenario includes aggressive targets for renewable energy use by Minneapolis customers. This could include local, distributed generation or directly purchased renewable energy, like the Wind Source program currently run by Xcel Energy. Renewable energy was assumed to contribute to electrical usage only.

Under the plan scenario, 10% of electricity consumption by commercial and residential customers comes from renewable, carbon-free sources. This would mean an increase to 360 GWhs in 2025 from current levels of 55 GWhs in 2011. Total electricity consumption in 2025, from which the 10% renewable productive figure was calculated, was based on the estimates after achieving energy efficiency gains (see above).

While it is unlikely that renewable projects and participation in programs would occur in a linear fashion, for the purposes of these estimates, a straight-line trend was used to estimate level of renewable energy in the years between 2011 and 2025.

Natural gas usage

Local combustion of natural gas (in residential and commercial heating, and industrial applications) will produce 0.0053060156 MT CO2e per therm. No changes in combustion efficiency were assumed in either the baseline or goals scenario. The Buildings & Energy Working Group, which included a Centerpoint Energy representative, developed a zero percent annual growth rate in natural gas consumption for the baseline scenario. Similar to the approach used for electricity, the energy efficiency goals adopted by the Working Group were used to estimate natural gas usage under the plan scenario starting with the baseline estimates.

Under the plan scenario, natural gas usage in commercial buildings in 2025 would be down 20 percent from 2011 levels, and residential use would be down 15 percent. A goal for reduction of usage in industrial buildings was not adopted by the Working Group.

Table 10 shows greenhouse gas emissions from electricity and natural gas under the Plan scenario.

[4] http://www.minneapolismn.gov/sustainability/reports/sustainability_carbon

University of Minnesota steam plant plan scenario

The steam plant on the University of Minnesota's Minneapolis campus provides heat to the campus through a district energy system. The plant is a source of greenhouse gas emissions in Minneapolis, and is fueled by coal, natural gas, fuel oil and oat hulls. Under the plan scenario, greenhouse gas emissions from the steam plant were assumed to decline to 60,000 MT annually by 2025. According to the Climate Action Plan for the University of Minnesota Twin Cities, the University plans to reduce coal use at the steam plant by 85% by 2016. This would reduce emissions by 27,300 metric tons[5]. By 2021, the University plans to have a Combined Heat and Power generating plant operational which will augment the University's Southeast steam plant, reducing emissions by another 65,000 metric tons annually. These changes may bring the emissions from the steam plant below 60,000 metric tons by 2025.

Transportation plan scenario

The key drivers of change in transportation-related emissions are road transportation and the Minneapolis-Saint Paul International airport. Rail and barge traffic in the city make up a small portion of emissions. Within the road transportation area, which is the largest source of transportation-related emissions, vehicle fuel efficiency and the number of vehicle miles traveled (VMT) have significant impacts on emissions levels. The full methodology for the inventory of transportation-related greenhouse gases can be found in the Minneapolis Greenhouse Gas Inventory[2].

Road transportation plan scenario

The Transportation and Land Use Working Group developed a zero percent annual growth rate in VMT as the goal for the Climate Action Plan.

The on-road vehicle fuel efficiency standards enacted in 2012 by the US Environmental Protection Agency were used to calculate the baseline and plan emissions scenario for transportation. While these would require new cars in some categories to achieve 54.5 miles per gallon in 2025, many older vehicles would still be on the road at that time. The US Energy Information Agency developed a set of average car and truck miles per gallon estimates that included the new CAFE rules as part of their 2012 early release of the Annual Energy Outlook. Table 4 shows the fuel economy assumptions used in the baseline emissions and plan scenario, which are consistent with the 2012 EIA AEO.

Both the baseline emissions scenario and the plan scenario assume the fleet distribution of cars, light trucks and heavy duty vehicles remains the same between 2010 and 2025.

The baseline emissions scenario also assumes that Minnesota's biodiesel and ethanol mandates remain the same from 2010 to 2025. The plan scenario, including the strategy of supporting a state mandate for low-carbon fuels, assumed that a 20% requirement for ethanol or other form of low carbon fuel would be enacted and be in force by 2025. After 2015, the low carbon standard was estimated to take effect along a linear trend line from 10% to 20% in 2025.

At the time the Climate Action Plan was being developed, Minnesota issued new rules for ethanol in gasoline, calling for a 20% requirement for gasoline starting in 2015. This means the baseline emissions scenario for road transportation will likely be higher than actual emissions after 2015, and the plan

[5] Climate Action Plan for the University of Minnesota, Twin Cities. December, 2011. http://rs.acupcc.org/site_media/uploads/cap/812-cap_5.pdf

scenario likely more accurate. Diesel fuel will contain 5% biodiesel until 2013, when the blend will increase to 10%. In 2016, the blend will increase to 20%[6].

MSP Airport plan scenario

The Minneapolis-Saint Paul International airport (MSP) is a significant source of greenhouse gas emissions and is included in the Minneapolis Greenhouse Gas Inventory. Including airport-related emissions is somewhat unique among community inventories.

The plan emissions scenario assumes that emissions from the airport will remain flat at 2010 levels through 2025. The Greenhouse Gas Report[7], developed for the Metropolitan Airports Commission in 2010, suggests that the airport position itself to meet or exceed any reduction goals, and continue to track its own emissions. The report identifies a number of strategies the MAC can continue to undertake to reduce its impacts. Air travel and related emissions are highly dependent on the economy, so future changes in emissions at the airport will need to be monitored closely.

Small sources baseline

Small sources in the Minneapolis Greenhouse Gas Inventory included rail and barge traffic and backup power supplies. Emissions from these sources were projected to continue at equal levels of 26,262 MT CO_2e in both the baseline and plan scenario.

Total transportation baseline

Table 11 shows the total greenhouse gas emissions from the transportation sector in the plan scenario. Emissions from road transportation are projected to decline by 31% from 2010 levels, due to flat VMT growth, improvements in vehicle fuel economy and the transition to cleaner fuel sources. Overall, by 2025 emissions in the transportation baseline are projected to decline 23% from 2010 and 36% from 2006.

Solid waste and wastewater treatment plan scenario

The plan scenario for greenhouse gas emissions from solid waste disposal are based on assumptions of changes in the solid waste stream under strategies developed in the Waste & Recycling Working Group. Under the baseline scenario, emissions from the processing of wastewater are assumed to decrease by 8 percent from 2010 levels by 2025.

Solid waste baseline

Greenhouse gas emissions from solid waste occur when solid waste disposed of by Minneapolis residents and business is processed in a landfill or energy recovery facility. In the plan scenario, the total waste stream was anticipated to have flat growth as strategies are implemented.

In 2010, recycled material accounted for 32.5 percent of the total Minneapolis waste stream. This percentage is expected to grow to 50 percent of the waste stream by 2025 under the plan scenario. Source-separated organics are expected to grow to 15 percent of the waste stream by 2025. These goals are consistent with Hennepin County's adopted Solid Waste Master Plan, and in the case of organics collection, exceed it.[8]

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[6] http://www.afdc.energy.gov/laws/laws/MN#Laws and Regulations

[7] Greenhouse Gas Report. December, 2010. Metropolitan Airports Commission. http://www.mspairport.com/docs/about-msp/sustainability/MSP-2010-GHG-Report-Jan-2011.aspx

[8] http://www.hennepin.us/solidwasteplanning

Household Hazardous Waste (HHW), landfilled construction debris, and yard waste tonnages are expected to remain flat through 2025. Tonnage estimates for the plan scenario are shown in Table 12.

In the community greenhouse gas inventory completed in 2012, greenhouse gas emissions from the burning of waste at the Hennepin Energy Recovery Center (HERC) were included in solid waste emissions estimates for 2006 – 2010. Because HERC operates under state permits limiting the amount of waste that can be processed, the plan scenario assumes that the amount of waste from other communities processed at HERC will increase as Minneapolis waste sent to HERC decreases. Total greenhouse gas emissions from HERC are expected to stay flat at around 131,000 MT through 2025 in the plan scenario.

Under the plan scenario emissions from Minneapolis-generated solid waste would decrease by 51% percent between 2010 and 2025.

Wastewater treatment

The Metropolitan Council, which operates the wastewater treatment facility that serves Minneapolis, has aggressive energy goals. By 2015, the Council aims to reduce purchased energy use by 25% from 2006 levels while meeting or exceeding current levels of service[9]. They will meet this goal through energy efficiency practices and deploying renewable energy for internal energy use.

The plan scenario assumes that through a combination of Met Council's improvements and a reduction in the proportion of wastewater treated at the plant that is coming from Minneapolis, greenhouse gas emissions from wastewater treatment will be 25% below 2006 levels in 2025. Reductions in wastewater flow are addressed primarily in the Buildings & Energy strategies including home energy efficiency visits which include water use reduction efforts.

Table 13 shows plan scenario greenhouse gas emissions from solid waste and wastewater.

[9] http://www.metrocouncil.org/Wastewater-Water/Projects/Energy-Conservation-Renewable-Energy.aspx

Table 1. Xcel Energy CO_2 Emissions Factor 2010 – 2025 (mt CO_2/MWh)

Year	CO2/MWh
2010	0.503488
2011	0.526621
2012	0.507116
2013	0.487612
2014	0.468107
2015	0.448603
2016	0.44697
2017	0.445337
2018	0.443704
2019	0.442071
2020	0.440438
2021	0.438805
2022	0.437172
2023	0.435539
2024	0.433906
2025	0.432274

Table 2. Greenhouse Gas Emissions from Electricity and Natural Gas Consumption - Baseline Scenario (mt CO_2e)

Year	Electricity	Natural Gas
2010	2,000,386	1,339,929
2011	2,057,384	1,493,930
2012	1,991,678	1,493,930
2013	1,925,219	1,493,930
2014	1,857,997	1,493,930
2015	1,790,007	1,493,930
2016	1,792,926	1,493,930
2017	1,795,823	1,493,930
2018	1,798,697	1,493,930
2019	1,801,550	1,493,930
2020	1,804,379	1,493,930
2021	1,807,185	1,493,930
2022	1,809,968	1,493,930
2023	1,812,728	1,493,930
2024	1,815,463	1,493,930
2025	1,818,174	1,493,930

Table 3. Minneapolis Vehicle Miles Traveled - Baseline Scenario (millions of miles)

Year	Interstate Arterial	Other Arterial	Other	Total
2010	1,064	588	749	2,401
2011	1,060	585	749	2,394
2012	1,063	587	751	2,401
2013	1,066	588	753	2,408
2014	1,070	590	756	2,415
2015	1,073	592	758	2,423
2016	1,076	594	760	2,430
2017	1,079	596	763	2,437
2018	1,082	597	765	2,445
2019	1,086	599	767	2,452
2020	1,089	601	769	2,459
2021	1,092	603	772	2,467
2022	1,096	605	774	2,474
2023	1,099	606	776	2,482
2024	1,102	608	779	2,489
2025	1,105	610	781	2,496

Table 4. Average Vehicle Stock Fuel Efficiency - Baseline Scenario (miles per gallon)

Year	Avg. Car Stock MPG	Avg. Light Truck Stock MPG	Heavy Duty Stock MPG
2010	22.44	18.1	5.65
2011	22.6	18.18	5.65
2012	23.9	17.6	5.65
2013	24.2	17.8	5.66
2014	24.4	18.1	5.66
2015	24.8	18.3	5.67
2016	25.2	18.6	5.67
2017	25.7	19	5.69
2018	26.2	19.4	5.71
2019	26.7	19.8	5.73
2020	27.4	20.2	5.76
2021	28.1	20.6	5.8
2022	28.8	21.1	5.83
2023	29.7	21.7	5.87
2024	30.6	22.3	5.91
2025	31.54	22.97	5.95

Table 5. On-Road Fleet Distribution

	Diesel	Gasoline
Heavy-duty vehicles	5.4%	0.0%
Light Trucks	1.3%	32.4%
Passenger Cars	0.3%	60.6%
Total	**7.0%**	**93.0%**

Table 6. Greenhouse gas emissions from airport and air travel - Baseline Scenario (mt CO_2e)

Year	Airport & Air Travel GHG Emissions
2010	352,196
2011	353,957
2012	357,496
2013	361,071
2014	364,682
2015	368,329
2016	372,012
2017	375,732
2018	379,490
2019	383,285
2020	387,117
2021	390,989
2022	394,898
2023	398,847
2024	402,836
2025	406,864

Table 7. Greenhouse gas emissions from transportation - Baseline Scenario (mt CO_2e)

Year	Road Transport	Airport & Air Travel	Small Sources	Total
2010	1,105,984	352,196	22,262	1,480,442
2011	1,097,513	353,957	22,262	1,473,732
2012	1,083,421	357,496	22,262	1,463,179
2013	1,064,370	361,071	22,262	1,447,704
2014	1,058,021	364,682	22,262	1,444,965
2015	1,049,350	368,329	22,262	1,439,941
2016	1,012,860	372,012	22,262	1,407,134
2017	999,913	375,732	22,262	1,397,907
2018	986,582	379,490	22,262	1,388,334
2019	972,613	383,285	22,262	1,378,159
2020	957,777	387,117	22,262	1,367,156
2021	941,564	390,989	22,262	1,354,814
2022	924,802	394,898	22,262	1,341,963
2023	906,329	398,847	22,262	1,327,438
2024	887,243	402,836	22,262	1,312,341
2025	867,857	406,864	22,262	1,296,984

Table 8. Waste Stream Tonnage – Baseline Scenario (tons)

Year	Solid Waste	Recycling	Organics	HHW	Construction Landfilled	Yard Waste	Total
2010	267,029	156,088	17,625	17,055	6,613	15,875	480,285
2011	267,269	160,999	18,748	17,055	6,613	15,875	486,559
2012	267,509	165,910	19,870	17,055	6,613	15,875	492,832
2013	267,749	170,822	20,993	17,055	6,613	15,875	499,106
2014	267,989	175,733	22,115	17,055	6,613	15,875	505,380
2015	268,228	180,644	23,238	17,055	6,613	15,875	511,653
2016	268,468	185,555	24,360	17,055	6,613	15,875	517,927
2017	268,708	190,466	25,483	17,055	6,613	15,875	524,201
2018	268,948	195,378	26,605	17,055	6,613	15,875	530,474
2019	269,188	200,289	27,728	17,055	6,613	15,875	536,748
2020	269,428	205,200	28,851	17,055	6,613	15,875	543,022
2021	269,668	210,111	29,973	17,055	6,613	15,875	549,295
2022	269,908	215,022	31,096	17,055	6,613	15,875	555,569
2023	270,148	219,934	32,218	17,055	6,613	15,875	561,842
2024	270,388	224,845	33,341	17,055	6,613	15,875	568,116
2025	270,627	229,756	34,463	17,055	6,613	15,875	574,390

Table 9. GHGs from solid waste and wastewater treatment - Baseline Scenario (mt CO_2e)

Year	Residential Solid Waste	Commercial Solid Waste	Other Communities Waste	Wastewater Treatment
2010	37,294	45,635	66,516	46,476
2011	38,487	46,236	63,940	46,476
2012	38,521	46,278	63,880	46,476
2013	38,556	46,319	63,819	46,476
2014	38,590	46,361	63,759	46,476
2015	38,625	46,402	63,698	46,476
2016	38,659	46,444	63,638	46,476
2017	38,694	46,485	63,578	46,476
2018	38,729	46,527	63,517	46,476
2019	38,763	46,568	63,457	46,476
2020	38,798	46,610	63,396	46,476
2021	38,832	46,651	63,336	46,476
2022	38,867	46,693	63,275	46,476
2023	38,901	46,734	63,215	46,476
2024	38,936	46,776	63,154	46,476
2025	38,970	46,817	63,094	46,476

Table 10. Greenhouse Gas Emissions from Electricity and Natural Gas Consumption - Plan Scenario (mt CO2e)

Year	Electricity	Natural Gas
2010	2,000,386	1,339,929
2011	2,057,384	1,493,930
2012	1,949,541	1,477,354
2013	1,845,299	1,460,778
2014	1,743,398	1,444,203
2015	1,643,838	1,427,627
2016	1,611,030	1,411,051
2017	1,578,418	1,394,476
2018	1,546,002	1,377,900
2019	1,513,781	1,361,324
2020	1,481,757	1,344,749
2021	1,449,929	1,328,173
2022	1,418,297	1,311,597
2023	1,386,860	1,295,021
2024	1,355,620	1,278,446
2025	1,324,576	1,261,870

Table 11. Greenhouse gas emissions from transportation - Plan Scenario (mt CO2e)

Year	Road Transportation	Airport & Air Travel	Small Sources	Total
2010	1,105,984	352,196	22,262	1,480,442
2011	1,097,513	352,196	22,262	1,471,971
2012	1,080,180	352,196	22,262	1,454,638
2013	1,058,013	352,196	22,262	1,432,470
2014	1,048,556	352,196	22,262	1,423,014
2015	1,036,852	352,196	22,262	1,411,310
2016	989,091	352,196	22,262	1,363,549
2017	965,006	352,196	22,262	1,339,464
2018	940,968	352,196	22,262	1,315,425
2019	916,750	352,196	22,262	1,291,208
2020	892,150	352,196	22,262	1,266,608
2021	866,726	352,196	22,262	1,241,184
2022	841,308	352,196	22,262	1,215,765
2023	814,845	352,196	22,262	1,189,303
2024	788,374	352,196	22,262	1,162,832
2025	762,184	352,196	22,262	1,136,641

Table 12. Waste Stream Tonnage – Plan Scenario (tons)

Year	Solid Waste	Recycling	Organics	HHW	Construction Landfilled	Yard Waste	Total
2006	310,491	167,407	19,035	16,723	8,363	17,089	539,108
2007	306,690	177,130	6,615	16,779	7,462	15,696	530,372
2008	254,433	174,917	6,369	16,888	6,125	19,523	478,255
2009	234,331	159,886	14,958	16,989	6,661	19,076	451,901
2010	267,029	156,088	17,625	17,055	6,613	15,875	480,285
2011	257,798	161,692	21,253	17,055	6,613	15,875	480,285
2012	248,566	167,295	24,881	17,055	6,613	15,875	480,285
2013	239,335	172,899	28,509	17,055	6,613	15,875	480,285
2014	230,103	178,503	32,136	17,055	6,613	15,875	480,285
2015	220,872	184,106	35,764	17,055	6,613	15,875	480,285
2016	211,640	189,710	39,392	17,055	6,613	15,875	480,285
2017	202,409	195,313	43,020	17,055	6,613	15,875	480,285
2018	193,177	200,917	46,648	17,055	6,613	15,875	480,285
2019	183,946	206,521	50,276	17,055	6,613	15,875	480,285
2020	174,714	212,124	53,904	17,055	6,613	15,875	480,285
2021	165,483	217,728	57,531	17,055	6,613	15,875	480,285
2022	156,251	223,332	61,159	17,055	6,613	15,875	480,285
2023	147,020	228,935	64,787	17,055	6,613	15,875	480,285
2024	137,788	234,539	68,415	17,055	6,613	15,875	480,285
2025	128,557	240,143	72,043	17,055	6,613	15,875	480,285

Table 13. GHGs from solid waste and wastewater treatment - Plan Scenario (mt CO2e)

Year	Residential Solid Waste	Commercial Solid Waste	Other Communities Waste	Wastewater Treatment
2010	37,294	45,635	66,516	46,476
2011	37,123	44,598	66,327	46,240
2012	35,794	43,001	68,653	46,004
2013	34,464	41,404	70,980	45,769
2014	33,135	39,807	73,306	45,533
2015	31,806	38,210	75,632	45,297
2016	30,476	36,613	77,959	45,061
2017	29,147	35,016	80,285	44,825
2018	27,818	33,419	82,611	44,590
2019	26,488	31,822	84,938	44,354
2020	25,159	30,225	87,264	44,118
2021	23,830	28,628	89,590	43,882
2022	22,500	27,031	91,917	43,646
2023	21,171	25,434	94,243	43,411
2024	19,842	23,837	96,569	43,175
2025	18,512	22,240	98,896	42,939