Lombard Energy and Emissions Profile

About Your Municipal Energy Profile

This report provides energy consumption and greenhouse gas emissions data analyzed specifically for the village of Lombard. This profile is designed to give you information about how energy is consumed by the residents and businesses in your community and help you prioritize strategies for energy efficiency and conservation.

The Municipal Energy Profile Project provides all municipalities in the seven county Chicago metropolitan region[1] with 2005 citywide energy consumption and emissions data. Data includes natural gas and electricity consumption, vehicle miles traveled, and a full greenhouse gas emissions inventory. At the local level, having this aggregate baseline data for the entire city/village is important because it makes it possible to accurately benchmark energy use and how it is consumed in a municipality, thereby enabling better estimates of the potential for energy savings. Simply put, how does one measure energy savings without first knowing the amount of energy consumed?

This is an important time to understand your community energy use profile. New funding sources provide the opportunity to design and implement programs that reduce energy costs and use. Understanding the profile of energy use in your community will help you in developing programs that effectively impact that energy use, and provide the basis for measuring the impact of programs that are implemented in your community.

The timing of this project coincides with the release of the Energy Efficiency and Conservation Block Grants (EECBG), which requires the development of a local Energy Efficiency and Conservation Strategy (EECS). Millions of dollars will be allocated to fund energy efficiency projects for direct formula funding municipalities and to others by way of federal, state and county government.

At the regional level, this project is important because it provides every municipality with crucial data and information that has not yet been made available in aggregate form. In addition to a Municipal Energy Profile, an energy profile guidebook, follow up workshops and technical assistance will also be made available to the entire region. This project is funded by the Illinois Clean Energy Community Foundation with cooperation and support from ComEd, Nicor, Peoples Gas and North Shore Gas.

What's in Your Municipal Energy Profile?

The Municipal Energy Profile provides a lot of data, which can be confusing. An "introduction" section has been added before each dataset in order to familiarize readers with a few key concepts. The final section outlines some potential next steps in utilizing this data.

[1] The seven counties in the region include Cook, DuPage, Kane, Kendall, Lake, McHenry and Will.

Section 1: Energy Consumption Introduction
Section 2: Energy Consumption in Lombard
Section 3: Greenhouse Gas Emissions Introduction
Section 4: 2005 Emissions Inventory for Lombard
Section 5: Next Steps

Section 1: Energy Consumption Introduction

Natural Gas

In Northern Illinois, natural gas is the primary space heating fuel. In the residential sector it is also used for hot water heating, clothes dryers, and cooking. In the region, 56% of natural gas consumption is used in the residential sector, with the balance in the commercial and industrial sectors (including government). Residential natural gas consumption per household has been decreasing slightly over time as homes become more efficient. Consumption in the commercial and industrial sector has also decreased due to both efficiency and de-industrialization. Natural gas is measured in therms.

Electricity

In the residential sector, electricity is consumed primarily in air conditioning, lighting, and electrically powered appliances. Both commercial and residential consumption is on the rise nationwide. Residential sector increases are driven by growth in consumer electronics and information technology equipment, as well as by growing home size and air conditioning use. Telecommunications and network equipment, along with specialized technologies such as medical imaging advancements are driving growth in the commercial sector.[2] In the region, residential use accounts for about 1/3 of total electricity consumption, with the commercial and industrial sectors accounting for about 2/3 of all consumption. Electricity is measured in kilowatt hours.

Section 2: Energy Consumption in Lombard

Natural Gas

Total Consumption

In 2005, the amount of natural gas consumed in Lombard was 26 million therms (26,861,030). (Table 1.) The village's consumption accounts for about 4.8% of the total consumption in DuPage County. Lombard's consumption accounts for about 0.49% of the region's natural gas consumption. In comparison, the village's population accounts for about 0.50% of the region's population.

Natural Gas by sector

In 2005, fifty-eight percent (58%) of Lombard's natural gas consumption occurred in the residential sector, with forty-two percent (42%) in the commercial and industrial sector. (Figure

[2] Energy Information Administration: "Miscellaneous Electricity Services in the Buildings Sector", AEO2007 http://www.eia.doe.gov/oiaf/aeo/otheranalysis/mesbs.html

1). This is comparable to both the county and the region, which also have a predominance of natural gas consumption led by the residential sector.

Lombard's average annual consumption per household is 910 therms. (Table 2.) This number is simply an average and varies depending on factors including building size, age of the building and building envelope efficiencies, the efficiency of the furnace/boiler and water heater. The village's average annual is comparable to both the county and region.

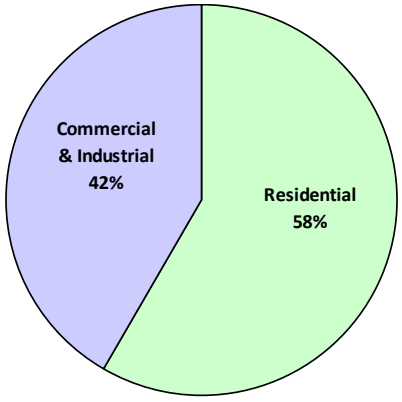
Table 1.

Location	Residential		Commercial & Industrial		Total
	(therms)	(% of total)	(therms)	(% of total)	(therms)
Region	3,122,788,779	57%	2,328,905,727	43%	5,451,694,507
DuPage County	296,676,156	53%	258,328,544	47%	555,004,701
Lombard	15,650,545	58%	11,210,484	42%	26,861,030

Table 2.

Average annual natural gas consumption (therms per household)	
Region	1,044
DuPage County	898
Lombard*	910
*total residential consumption(therms)	15,650,545
*number of households per 2005 - 2007 ACS	17,204

Figure 1.



Electricity

Total Consumption

In 2005, the amount of electricity consumed in Lombard was 503 million kWh (503,674,653). (Table 3.) The village's consumption accounts for about 5.1% of the total consumption in DuPage County and about 0.68 % of the region's electricity consumption. As mentioned above, the village's population accounts for about 0.66% of the region's population.

Electricity by sector

In 2005, thirty-seven percent (37%) of Lombard's electricity consumption occurred in the residential sector (Figure 2), while sixty-three (63%) was in the commercial and industrial sector. This is again comparable to both DuPage County and the region, which the commercial and industrial sector dominates usage with a nearly 2/3 split. At the household level, Lombard's average annual consumption is 10,754 kWh, which is higher than both the county and the region. (Table 4.) A combination of factors may contribute to this, as electricity consumption varies considerably between households, and depends on factors including square footage, the presence of air conditioning, and the efficiency of lighting, appliances and systems, and individual behavior.

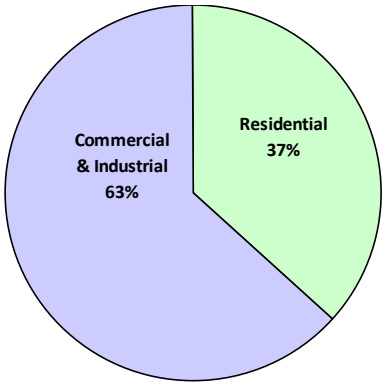
Table 3.

Location	Residential		Commercial & Industrial		Total
	(kWh)	(% of total)	(kWh)	(% of total)	(kWh)
Region	25,178,375,288	34%	48,465,369,055	66%	73,643,744,343
DuPage County	3,009,397,425	30%	6,865,868,510	70%	9,875,265,935
Lombard	185,016,784	37%	318,657,869	63%	503,674,653

Table 4.

Average annual electricity consumption (kWh per household)	
Region	8,420
DuPage County	9,104
Lombard*	10,754
*total residential consumption (kWh)	185,016,784
*number of households per 2005 - 2007 ACS	17,204

Figure 2.



Transportation – Vehicle Miles Traveled

After energy use in buildings, the second largest use of energy is transportation. For this report, Vehicle Miles Traveled (VMT) was calculated for households in Lombard.

VMT was tabulated from travel statistics provided by the Illinois Department of Transportation (IDOT) and scaled to your village based on IL EPA odometer data and population. In 2005, the number of VMT in Lombard was 380 million miles, with 248 million attributed to household VMT. This represents an average annual of 14,426 VMT per household in the village. (Table 5.) This is noticeably lower than DuPage County and slightly lower than the region.

It should be noted that VMT per household is simply an average and individual household use varies widely depending on many things, including land use mix, and access to jobs and amenities, the availability of public transportation, and community walkability. These variations are also influenced by many different demographic factors including income, household size, and workers per household. For example, large households with higher incomes may own multiple cars, and drive them more, which is reflected in higher VMT relative to the average. Households situated close to reliable public transit or major employment centers may experience decreased annual VMT, because they do not have to depend as much on their cars.

Table 5.

Location	Total On-Road VMT (in millions)	Total HH VMT (in millions)	Number of HH	VMT per HH
Region	60,527	43,994	2,989,996	14,713
DuPage County	8,675	5,665	330,540	17,139
Lombard	380.2	248.2	17,204	14,426

Section 3: Greenhouse Gas Emissions Introduction

The Connection between Energy and Emissions

Most of the world's energy comes from the burning of fossil fuels that include coal, petroleum, and natural gas. Fossil fuels are made up of hydrogen and carbon, and when they are burned, the carbon combines with oxygen and creates carbon dioxide, one of the greenhouse gases. Other major energy sources include nuclear power and renewable energy from wind, solar, biomass or hydroelectric. Most energy sources are used for specific purposes. For example coal, nuclear, wind and biomass are used for making electricity, while petroleum is used primarily for transportation (with only small amounts used for electricity generation). Finally natural gas is used in two ways, as an end use fuel for heating homes and business and in industrial process, but also as a fuel source for the generation of electricity.

The actual amount of carbon dioxide produced for any given unit of energy depends on the carbon content of the fuel. The burning of coal produces the greatest amount of carbon dioxide per unit of heat energy[3], nearly two times that of natural gas. Crude oil combustion falls between the two. In the Midwest, electricity is generated roughly 40% from coal and 40% from nuclear, with the remainder from a combination of natural gas used for peak power generation and renewables. In contrast, the northeast United States has significant natural gas base load generation and very little coal, while the northwest has significant hydro-electric generation.[4] As a result, in the Midwest, electricity generation is the energy use with the greatest level of greenhouse gas emissions, surpassing natural gas (primarily for heating) or petroleum for transportation.

Emissions Calculations

Your municipal greenhouse gas emissions inventory was calculated for 2005 using United Nations Intergovernmental Panel on Climate Change (IPCC) methods and local data sources in combination with modeling of national data to local demographics. All data presented are measured in metric tons (tons) or million metric tons (MMT) CO2e (carbon dioxide equivalent), to enable comparison internationally.

Emissions were calculated for the six major categories of greenhouse gases regulated under the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Emissions were converted into CO_2e using global warming potentials from the IPCC Third Annual Assessment Report. Activity data were translated into emissions using standard emissions factors and global warming potentials.

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[3] Energy Information Administration: "Greenhouse Gases, Climate Change, and Energy," May 2008

[4] The Changing Structure of the Electric Power Industry 2000: An Update, Chapter Three. http://www.eia.doe.gov/cneaf/electricity/chg_stru_update/chapter3.html

Section 4: Lombard 2005 Emissions Inventory

When we understand the total energy use of Lombard, it's possible to calculate the total greenhouse gas emissions for the village. In addition to energy and transportation, by far the biggest contributors to greenhouse gas emissions, this total includes emissions estimates for waste, waste water, product use, and industrial processes based on regional totals previously analyzed for a regional profile developed for the Chicago Metropolitan Agency for Planning (CMAP). An inventory of energy use in the community serves as the basis for conducting a community greenhouse gas inventory. This greenhouse gas emissions inventory was developed by calculating emissions for the previously reported data on transportation and energy use, and adding the emissions estimates for waste, waste water, product use, and industrial processes.

The 2005 greenhouse gas emissions for Lombard were 0.729 MMT CO2e, which is 0.53% of the region's total emissions of 136.4. Below is the breakdown of Lombard's emissions contributors, with electricity at 45%, followed by transportation, then natural gas. (Table 6 and Figure 3). The region's breakdown (Figure 4) is slightly different, in part due to the calculations for aviation, for which no significant uses occurred within the boundaries of the village, however air travel and air delivery contributed to greenhouse gas emissions from these sectors in other parts of the region.

Table 6. Lombard Greenhouse Gas Emissions by Sector

Year	Electricity (MMT CO2e)	Natural Gas (MMT CO2e)	Transportation (MMT CO2e)	Product Use (MMT CO2e)	Solid Waste (MMT CO2e)	Waste Water (MMT CO2e)	Total (MMT CO2e)
2005	0.336	0.143	0.204	0.023	0.019	0.005	0.729

Figure 3.

Lombard 2005 Emissions, Total MMT CO2e: 0.729

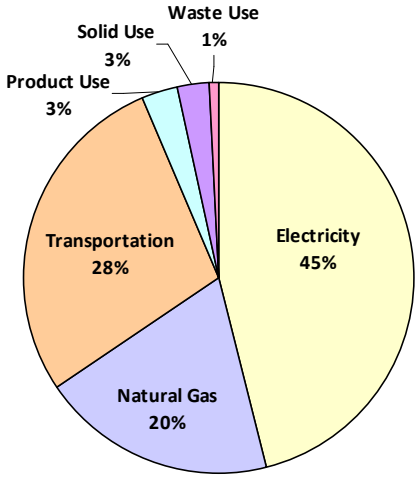
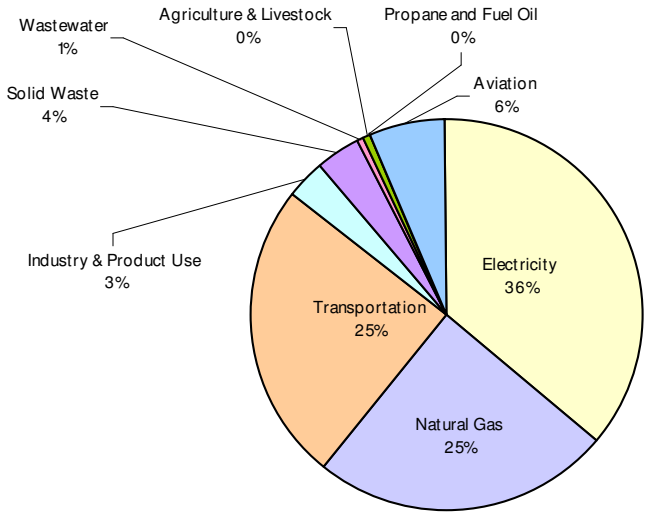


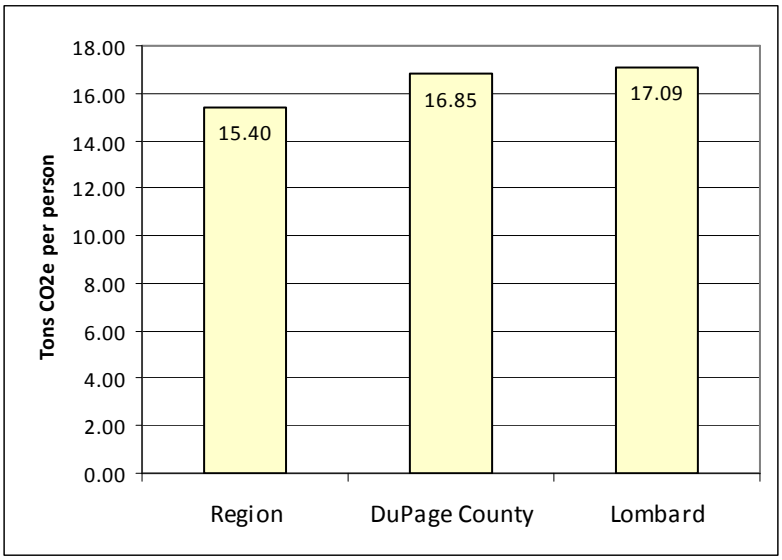
Figure 4.

Chicago Region 2005 Emissions, Total MMT CO2e: 136.4



Lombard's per capita emissions in 2005 were 17.09 tons CO2e in 2005, which is slightly higher than DuPage County's per capita rate of 16.85 tons CO2e, and the region's rate of 15.40, as seen in Figure 5.

Figure 5.



Section 5: Next Steps

This Municipal Energy Profile provides aggregate data and information that can help in the development of local strategies to reduce energy consumption. The funding of the Energy Efficiency and Conservation Block Grants (EECBG) created both new opportunities and time pressure for developing substantive energy efficiency plans. Most municipalities applying for Block Grant funds will be submitting an Energy Efficiency and Conservation Strategy (EECS) in October, 2009. The suggestions below may provide some initial help as you work to target the right mix of strategies, use this data to quantify opportunities or potential results, and look for additional resources to develop your Energy Efficiency and Conservation Strategy or portfolio of energy efficiency projects.

Identifying Strategies for Your Community

Many municipalities have already identified strategies that will impact municipal operations. It's relatively straightforward to identify those needs, which likely range from street or traffic light enhancements, to lighting retrofits and other municipal building energy saving measures.

The EECBG also provides an unprecedented opportunity to adopt strategies that will reduce energy use community-wide—and the opportunities to leverage the funds to maximize the benefits for residents and businesses. While developing these strategies can require more analysis and planning than the strictly municipal uses, the impacts can create real reductions in costs for local residents and businesses. The data in this municipal energy profile provides a good basis to begin an analysis of these potential benefits.

CNT Sustainable Communities Attainable Results

CNTenergy

What did you already know before receiving this data?
If you are putting together an energy efficiency plan or set of projects for your municipality, there are probably a lot of things about the community that you already know. For example, what is the mix of land use? Will there be a lot of new development/construction in the future that could benefit from energy code and building standards? Is there a major industry or commercial component that uses a lot of energy? Are residents already poised to act, or will energy efficiency be a new concept? The answers to these questions will help point to potential high-impact strategies.

What does the data tell you?
Is your consumption higher than average in a particular sector? If so, that's worth further investigation as to whether there are particular opportunities to influence that sector, whether through a policy strategy such as the adoption of energy codes for new construction buildings, or an efficiency program for a targeted subsector (e.g. older residential homes or multi-family buildings).

What might be your biggest potential for energy savings?
You want to include strategies that help you achieve high energy savings, so that you get the biggest impacts for your investment. The greatest opportunity to reduce energy consumption and greenhouse gas emissions is to develop strategies targeting the highest consuming and emitting sectors. As seen in your municipal emissions profile, these sectors are energy used in buildings and transportation. For example, CFLs are a great technology, but many programs are encouraging consumers to adopt them. If you have a large, older housing stock, a retrofit program that focuses on the whole house will likely provide greater, more long-lasting savings, and is most likely to need a jump-start from public investment to make it successful. Know the segments in your municipality that are "ripe" for energy efficiency projects

Investigate the eligible activities for the EECBG on the U.S. Department of Energy's EECBG website: http://www.eecbg.energy.gov/solutioncenter/eligibleactivities/default.html.

Think about strategies based on existing land use and the people who live and work there.
The main sources of the region's greenhouse gas emissions are from electricity, natural gas and transportation, and thus, where we should target most of our strategies. But not all strategies are a good fit for every community.

The strategy matrix below (Table 7) outlines those that pertain to energy in buildings, energy behavior and habits, and transportation. These may or may not be applicable to every municipality. Three suitability factors are listed below, but each municipality will likely need to consider the financial, legal and political feasibility of these as well.

Table 7.

Strategy Areas	Areas with significant older building stock	Areas with significant new construction (residential)	Areas with significant new construction (commercial)
Energy in Buildings			
Residential Retrofit Program	X		
Commercial & Industrial Retrofit Program	X		
Green Building Program for Major Renovation	X		
Green Building Program for New Construction, Residential		X	
Green Building for New Construction, Commercial			X
Adopt most recent Energy Code (IECC 2009)		X	X
Household Renewable Energy	X	X	
Behavior Change			
Encourage Residential Behavior Change (e.g. CFLs; raise a/c thermostat 3°; lower heat 3°; reduce phantom load)	X	X	X
Encourage Commercial Behavior Change (e.g. lighting; raise a/c thermostat 3°; lower heat 3°)	X	X	X
Appliance Trade-in (Upgrade a/c window units, refrigerators to efficient models)	X	X	
Transportation			
Increase Transit Oriented Design		X	X
Bike/Pedestrian Improvements	X	X	X
Shared parking/reducing parking requirements		X	X
Adopt Complete Streets	X	X	X
Context Sensitive Design		X	X
Alternative Fuels/Efficient Use of Fuels (e.g. hybrids; biofuels; anti idling law)	X	X	X
Grouped Transportation (e.g. car-sharing; vanpool)	X	X	X

Use Data to Quantify Results for each Strategy

Now that you have access to real data that is tailored to your municipality, you can use that to estimate energy savings much more accurately, and measure the real savings over time. These kinds of calculations should be made for each strategy that you prepare with data specific to your community, instead of attempting this equation with an unknown data field.

Example: City A has a significant percentage of their housing stock that was built prior to the 1950's. These homes are often less efficient than homes built more recently. City A decides that a good strategy to include in its plan would be a Residential Retrofit Program, which the city estimates will reduce electricity and natural gas consumption by an average of 30 percent.

City A Household:
Average Annual Natural Gas consumption: 1238 therms
1238 therms x .30 (anticipated savings)= 371 therms saved per household

Average Annual Electricity consumption: 9300 kWh
9300 kWh x .30 (anticipated savings)= 2790 kWh saved per household

City A targets 150 homes (let's say 10% of its existing housing stock) for total annual savings of:
371 therms x 150 households = 55,650 therms
2790 kWh x 150 households = 418,500 kWh

Note: Working with program participants to determine real savings versus anticipated savings will also help in tailoring the program in the future to better fit your community.

Other Resources for Help

The Center for Neighborhood Technology/Municipal Energy Profile Project
Along with this profile, the Center for Neighborhood Technology (CNT) is preparing a profile guidebook, and will provide follow-up workshops and general technical assistance for the overall region. General technical assistance may include technical questions about the profile numbers, help with calculating reduction strategies, and questions about potential strategies. Contact Lindy Wordlaw at CNT for questions and assistance at (773) 269-4012.

The Chicago Guide to Completing an Energy Efficiency and Conservation Strategy
This guide, co-authored by CNT, introduces the energy efficiency and conservation strategy, gives a model outline, a process guide, execution options, and where to go for resources and help for communities receiving EECBG funding. You can find this document at http://www.cnt.org/repository/CHICAGOEECGUIDE4POST.pdf

Technical Assistance
- **Project 2°** provides practical software tools to measure and reduce greenhouse gas emissions
- **ICLEI-Local Governments for Sustainability** is a membership organization committed to advancing climate protection and offers tools and information to its members
- **Center for Neighborhood Technology** is a nonprofit agency that pioneers new approaches to climate action, energy efficiency, transportation and green infrastructure. CNT is available for more detailed assistance through consultancy projects.

Local Resources and Examples
- Chicago Climate Action Plan http://www.chicagoclimateaction.org/

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- Evanston Climate Action Plan
  http://www.cityofevanston.org/global/green/documents/ECAP.pdf

Other Resources

- USDOE, Energy Efficiency and Renewable Energy, Block Grant: www.eecbg.energy.gov
- ICLEI, Local Governments for Sustainability: www.icleiusa.org
- The U.S. Green Building Council: www.usgbc.org
- The United States Conference of Mayors: www.usmayors.org/bestpractices
- Clean Air–Cool Planet: www.cleanair-coolplanet.org
- Sierra Club Cool Cities: www.coolcities.us
- Worldchanging: www.worldchanging.com
- Grist: www.grist.org/
- Treehugger, A Discovery Company: www.treehugger.com
- Playbook for Green Buildings + Neighborhoods: www.greenplaybook.org
- C40 Cities Climate Change Leadership Group: www.c40cities.org
- Institute for Sustainable Communities: www.iscvt.org
- EPA Energy Star Community Challenge: www.energystar.gov
- US Environmental Protection Agency, Clean Energy, Rapid Deployment Energy Efficiency (RDEE) Planning Guide: http://www.epa.gov/RDEE/documents/rdee_planning_guide.pdf