

# Ithaca 2030 District: Methods, Assumptions, and Final Data

*June 14, 2017*

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This document describes the methods used to generate the Ithaca 2030 District Baselines as presented in the Baseline Report. All raw data and calculation tables were provided to Peter Bardaglio.

## Existing Building Individual Energy Baseline

Ithaca 2030 District members contribute their energy and water use monthly, which results in the individual energy baseline. Each building owner signed an agreement with the District that their electric and gas consumption data from utility can be accessed by the District using their POD-ID numbers. This data is recorded and managed using ENERGY STAR's Portfolio Manager. Account access is also shared with the District.

## Existing Building District Energy Baseline

The overall energy baseline for the entire District was calculated using the Environmental Protection Agency's Target Finder Calculator, as per Architecture 2030 guidelines. Data for the Northeast region from CBECS 2003 data was used for the majority of identified space types within the Ithaca District. The 2003 data set had missing values for the Food Sales, Food Service, and Outpatient space types and so those values were instead obtained from the 2012 CBECS data. Target Finder was used to create the overall District goals by comparing the Northeast regional data to be 50% less than the national median.

The fundamental building characteristics used in Target Finder were determined using the following tables provided by CBECS 2003 and 2012:

- Table C15. Electricity Consumption and Conditional Energy Intensity by Census Region for Non-Mall Buildings
- Table C15. Electricity Consumption and Conditional Energy Intensity by Census Region for Non-Mall Buildings
- Table C25. Natural Gas Consumption and Conditional Energy Intensity by Census Region for Non-Mall Buildings
- Table B3. Census Region, Number of Buildings and Floorspace for Non-Mall Buildings,

Not all of the 2030 space types match with those in Target Finder. Therefore, assumptions were made to translate the 2030 space types into those in Target Finder, in order to use Target

Finder data. These assumptions appear in the table below. The only major space type for which there were no buildings within the District boundary was the Public Order and Safety space type.

<b>PM Space Type</b>	<b>TF space type</b>
Preschool	Education
Bar/nightclub	Food Service
Food Sales - other	Food Service
Restaurant	Food Service
Restaurant/Bar	Food Service
Hotel	Lodging
Multifamily	Lodging
Senior Care Community	Lodging
Manufacturing/Industrial Plant	Manufacturing*
Mixed Use	Mixed Use**
Adult Education	Office
Bank Branch	Office
Financial Office	Office
Office	Office
Vocational School	Office
Mall	Other
Parking	Other
Recreation	Other
Medical Office	Outpatient
Veterinary Office	Outpatient
Museum	Public Assembly
Performing Arts	Public Assembly
Social/Meeting Hall	Public Assembly
Worship Facility	Religious Worship
Automotive Dealership	Retail
Convenience Store	Retail
Retail	Retail

Personal Services	Service
Repair Services	Service
Grocery Store	Warehouse and Storage
Warehouse/ Distribution Center	Warehouse and Storage
Wholesale club	Warehouse and Storage

\*There is no national median value for manufacturing in Target Finder. Therefore the 2010 MECS was used, specifically Table 1.1 Northeast (energy use) and Table 9.1 All of US (floor area and number of buildings). The Ithaca 2030 District has two manufacturing facilities: electronics and printing. By averaging for those two manufacturing types, a baseline (kBtu/sqft) and target were approximated. For current baseline district energy use estimates, there were no regional estimates for floor area and number of buildings. Originally, the national numbers were used, but this is incorrect since the number of buildings in the nation drastically differs from that of the region.

\*\*For Mixed Use buildings (including the majority of buildings on the Commons), we assumed 50% as office space and 50% as retail. An average of the CBECS energy data for each space type was used. <https://www.eia.gov/consumption/manufacturing/data/2010/#r10>

The total floor area in square feet for each space type was determined using the data made available by the Ithaca Water and Sewer Division. Results are seen below:

Space Type	Square feet	# Buildings
Education (K-12)	4,118	1
Food Service	170,145	41
Lodging (Hotel)	1,233,075	65
Manufacturing	71,223	3
Mixed Use	2,563,300	106
Retail (Other Than Mall)	1,058,766	67
Office	735,539	82
Outpatient	113,614	27
Public Assembly	98,482	5

Public Order and Safety	0	0
Religious Worship	2,475	1
Service	251,204	50
Warehouse and Storage	172,330	8
Other	1,538,710	8
<b>Total</b>	<b>8,012,981</b>	<b>464</b>

To calculate the total energy baseline and 2030 Target, the energy use in kBTU of both electricity and natural gas were summed.

As stated in the PBMR, in order to convert energy savings into GHG reduction, the emissions factors from NYSERDA were used, as is required. Target Finder does not split energy by fuel type. Therefore, when determining final GHG values to use with the emissions factors, the percentage of current electricity and natural gas use out of the total energy consumption was calculated, resulting in a split of about 64% of energy from electricity use and 36% from natural gas.

<b>NYSERDA required emissions factor</b>	<b>Electricity</b>	<b>Natural Gas (NG)</b>
CO <sub>2</sub> Equivalent Electricity: (kg/MWh) NG: (kg/MMBTU)	283.5	53.072
kg/kBTU	0.0831	0.0531

<b>Annual kBTU saved by 2030</b>	<b>electric kBTU savings</b>	<b>Electric CO<sub>2</sub>Eq savings</b>	<b>NG kBTU savings</b>	<b>NG CO<sub>2</sub>E savings</b>
2,363,714,668	1,511,906,253	125,617,771	851,808,415	45,207,176

Resulting in a total savings of 170,825 Metric tons of CO<sub>2</sub> Equivalent between the baseline and target values.

Space Type	Total Energy Baseline (kBTU/sqft)	2030 Target (kBTU/sqft)	Delta
Education (K-12)	48.1	33.3	14.8
Food Service	203.8	87.3	116.5
Lodging (Hotel)	47.7	39.2	8.5
Manufacturing	44.4	203.2	-158.8
Mixed Use	64.2	39.1	25.1
Retail (Other Than Mall)	50.7	40.4	10.3
Office	77.7	37.8	39.9
Outpatient	104.3	14.7	89.6
Public Assembly	30.5	24.6	5.9
Religious Worship	28.2	19.7	8.5
Service	45.4	23.9	21.5
Warehouse and Storage	31.9	20.7	11.2
Other	128.6	26.5	102.1
	<b>TOTAL baseline</b>	<b>TOTAL 2030 Target</b>	<b>TOTAL Delta</b>
<i>Based on Target Finder</i>	905.4	610.4	295.0
	<b>in kBTU</b>	<b>in kBTU</b>	<b>in kBTU</b>
<i>Based on total Ithaca District Floor area (sqft)</i>	7,254,950,157	4,891,235,489	2,363,714,668

## Water Baseline

As no national median data exists to create a water baseline, a reduction target of 50% from baseline consumption is required by 2030 District guidelines.

A map of the Ithaca 2030 District was provided to the Ithaca Water and Sewer Division (IWSD), with whom the District signed a Memorandum of Agreement. Using GIS tools, IWSD generated a list of buildings inside the District and then matched water meters assigned to these addresses. Using a mix of IWSD descriptors and Google Street View, the project team determined and/or verified each address' space type. Consumption in 100 cubic feet/year was given to the team for the years: 2016, 2015, and 2014. IWSD did not recommend using data

before 2014 due to data inconsistency. The final Water Baseline used the average across the three years, while ignoring meter reads with reportedly zero consumption for the given year.

The number of buildings were assumed to be that found by the Ithaca Water and Sewer Division data using their GIS software and our District map, with a total of 464 non-residential (except for multifamily) buildings.

The water data provided by IWSD was used to generate the final number of buildings within the District, consequently affecting the final Commuter Baseline calculation.

Space Type	Baseline WUI (gal/ft2/year)	2030 target reduction (50% of baseline)
Education (K-12)	23.9	11.9
Food Service	84.2	42.1
Lodging (Hotel)	23.9	12.0
Manufacturing	1.0	0.5
Mixed Use	15.1	7.5
Retail (Other Than Mall)	7.6	3.8
Office	11.4	5.7
Outpatient	19.9	9.9
Public Assembly	11.8	5.9
Religious Worship	17.4	8.7
Service	38.5	19.2
Warehouse and Storage	56.5	28.2
Other	6.2	3.1
<b>TOTAL</b>	<b>317.3</b>	<b>158.6</b>

## Commuter Baseline

District goal for commuter Transportation is a 50% reduction in the baseline of District Average CO<sub>2</sub> Emissions by 2030. There are currently 4 EV charging stations in the District, 6 Ithaca Carshare locations, and 61 TCAT stops.

Metric 7 of the PBMR suggested a reduction in 6.7% of Single-Occupancy-Vehicles in order to achieve regional goals. However, this only resulted in a reduction of 13% of the total decreased needed to reach the 2030 target. The table below shows the emissions factors for modes of transportation (average kg CO<sub>2</sub> emitted per mile).\*

Mode	Bus	Single Occupancy Vehicle (SOV)	Carpool
Emissions factor*	0.058 kg / passenger-mile	0.368 kg / vehicle-mile	0.184 kg / passenger-mile
Notes			Assumed two people carpool (worst case scenario)

\*Source: *Emission Factors for Greenhouse Gas Inventories Table 7*

[https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors\\_2014.pdf](https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf) )

To calculate the total commuters in the District, we used an occupant per sqft multiplier derived from the following CBECS data:

- 17,775 average commercial GFA (2003 CBECS, Master sheet, NE region)
- 890 is the average sqft per worker (national data, 2003 CBECS)
- 17,775/890 = 19.97 occupants per building. We assume all occupants are commuters.

We have 464 buildings in our District (from the IWSD data), so there are a total of 8,816 commuters in Ithaca 2030 District. Data to determine mode of transport for the commuters and their average miles commuted per mode came from a City Workers Commuting Survey.

Mode of Transport	Transport Mode of population (%)	Average miles commuted	CO2 Emissions per mode per trip (for all miles traveled) kg/psgr-mile or kg/vehicle-mi	Emissions for all commutes in one year (kg of CO2/yr)
SOV	76.9%	20.3	50,646	12,712,047
Carpool	5.1%	10.7	885	222,186
Bus	7.7%	30	1,181	296,437
Non-Motorized Transit (NMT)	10.30%	4.58	0	0

Source: *Ithaca Commuting Survey Results for city workers (n=78)*

The final baseline for transportation emissions in the District is 13,231 MT of CO<sub>2</sub>, with a 2030 target of 6,615 MT of CO<sub>2</sub>. We recommend creating a survey of at least 400 District residents to have statistically significant results for commuter emissions data. This survey should happen multiple times to measure and track progress until 2030.