
TO Brent Covey, Senior Development Officer

FROM Karl Wakelin, Thornton Tomasetti, Inc.

CC Lynn N. Simon; File
Paul McElwee, HKIT
Bill Dakin, DEG

DATE 11.14.2013

PROJECT Belmont Village – Greenhouse Gas Emissions Analysis

Thornton Tomasetti, Inc. and Davis Energy Group have been asked by Belmont Village per the City of Albany's sustainability committee to investigate the Greenhouse Gas (GHG) mitigation potential associated with the Belmont Village project.

Key Findings: GHG Mitigation Potential

Davis Energy Group has conducted an energy analysis of all energy using systems, including HVAC, domestic hot water, lighting and appliance/plug loads. The analysis established the possible emissions reductions of the current proposed design compared to a baseline design case (Title-24 code compliant). Key findings are highlighted below (further detailed information is provided in the GHG Mitigation Calculation summary spreadsheet on page two of this memorandum).

- A. Total GHG emission reduction = 154.7 (Mtons CO₂/year)
- B. Per capita GHG emission reduction = 0.68 (Mtons CO₂/year)
- C. % GHG emission savings = 35% reduction over code compliant design

The GHG emission mitigation potential is significant. The totals outlined above are the equivalent to:

- A. Total GHG = Carbon sequestered by 127 acres of U.S. forests in one year or annual GHG emissions from 32.2 passenger vehicles.
- B. Per capita GHG = Carbon sequestered by 0.6 acres of U.S. forests in one year or annual GHG emissions from 0.2 passenger vehicles.

Equivalentents above are based on Environmental Protection Agency national averages.

BELMONT VILLAGE - GREENHOUSE GAS MITIGATION CALCULATIONS

11/13/2013

Measure Descriptions			Annual GHG Emissions (Metric Tons CO ₂ / year)		
AREA	Title 24 Reference value	Belmont Village Proposed Design	Title-24 Code Compliant Case	Belmont Proposed Design (21% better than T-24 + PV to offset 1% of energy use)	GHG Emission Reductions
HVAC					
Residential	Packaged Heat Pumps; SEER 13, HSPF 7.7	Mix of Mini-Splits (12.5 EER, 10 HSPF) & PTHPs (3.4 COP, 11.7 EER)	43.0	31.3	11.7
Non-Residential	Central Plant w/ Boiler	System types vary, including VRF, Package Rooftop, & Mini-splits	116.2	69.5	46.6
DOMESTIC HOT WATER	80% Standard Efficiency Boilers	97% Condensing Boilers. Solar Water Heating (50% solar fraction)	113.5	46.1	67.5
LIGHTING					
Residential	~ 40% Fluorescent	100% Fluorescent + LED, 20% reduction in lighting energy	46.0	36.8	9.2
Non-Residential	W/sqft per Title-24 (varies by space occupancy)	100% Fluorescent + LED, 20% reduction in W/sqft	49.5	39.7	9.9
OTHER - Appliances / Plug Loads	Standard Efficiency Appliances	ENERGY STAR Refrigerators & Clothes Washers (where builder provided)	71.2	68.0	3.2
Renewables - Solar PV	None	PV to offset 1% of electricity. 13.2 kW	-	-6.7	6.7
Total GHG Emissions (Metric Tons CO₂/year)			439.3	284.6	154.7
Per capita GHG Emissions (Metric Tons CO₂ per capita)			1.94	1.26	0.68
% GHG Savings					35%

- Assumptions:
- 1) Per capita values assume 185 residents and 41 staff, or 226 occupants
 - 2) GHG emission rates for electricity based on US EPA 2009 emissions rates for California of 0.713 lbs. CO₂ per kWh (0.66868 lbs. CO₂ per kWh and adding an 8.21% grid loss) http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf
 - 3) GHG emissions rates for natural gas combustion is reported by U.S. Energy Information Administration as 11.7 lb CO₂/therm (EIA 2011).