MGA Campus
Building Greenhouse Gas Emissions Summary

Prepared for
MGA Entertainment

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Prepared by

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Your Energy Guide for Improving the Performance and Value of Buildings

CONTENTS

1. Executive Summary

This report summarizes the results of a whole building energy model to estimate reduction in greenhouse gas emissions relative to a Business as Usual (BAU) case for the proposed MGA Campus.

The BAU case is defined by Title 24-2008. The Proposed building will be built at a minimum to Title 24-2013 standards.

The project target is to demonstrate a GHG emissions reduction of at least 20% compared to the BAU case. The energy model results confirm that GHG emissions can be reduced by an estimated 20% by designing to the following targets:

- Meet the Title 24-2013 standards that will be applicable to this project
- Design the existing building to meet Title 24-2013 standards with some additional energy efficiency improvements consistent with a LEED v3 Certified project
- Install a PV system of minimum size of 175 kW DC.

Percent reduction in GHG emissions associated with different sized renewable energy systems is shown in this report for reference.

Estimated lbs CO2e/yr

	Business as Usual	Proposed
Nonresidential	3,516,604	3,061,940
Residential	4,704,878	3,935,085
Site	1,095,032	621,436
Subtotal	9,316,514	7,618,461
PV	0	-166,793
Total	9,316,514	7,451,668

Reduction = (9,316,514 - 7,451,668) / 9,316,514 = 20%

2. Greenhouse Gas Emissions Assumptions

This section summarizes the assumptions used for calculating GHG emissions. The assumptions are consistent throughout this report.

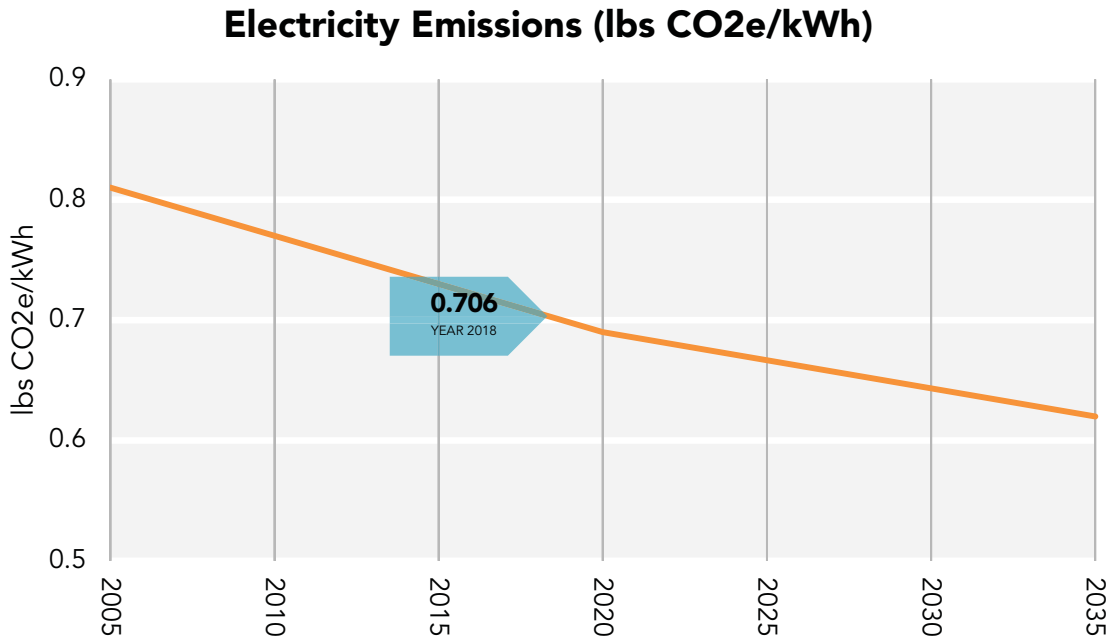
The source of GHG emissions values are from SCAG EIR scenarios, as modeled by Calthorpe Associates' using the Rapid Fire model.

http://rtpscs.scag.ca.gov/Documents/peir/2012/draft/2012dPEIR_AppendixE_GreenhouseGasAssumptions.pdf

Table 9 from Appendix E is reproduced below.

	2005	2020	2035
Electricity Emissions (lbs/kWh)	0.81	0.69	0.62
Natural gas emissions (lbs/therm)	11.7	11.7	11.7

Assuming a linear trend between years, GHG emissions rate from electricity consumption is estimated to be 0.706 lbs CO2e/kWh for the year 2018 (estimated buildout year).



Based on this data, multipliers for greenhouse gas (GHG) emissions used in this analysis are as follows:

- Electricity: 0.706 lbs CO2e / kWh
- Natural gas: 11.7 lbs CO2e / therm

3. Summary of Business as Usual (BAU)

Title 24-2008 Prescriptive Requirements

The following table is a summary of the Title 24-2008 Prescriptive Requirements for Climate Zone 9, which defines BAU for this project.

	Residential	Nonresidential
Walls	• Wood frame U=0.059	• Metal frame U = 0.062 • Mass walls U=0.690 • Wood frame U=0.059
Roof	• U=0.028	• U=0.039, Cool roof • 3-year aged solar reflectance = 0.55 • Thermal emittance = 0.75
Floor/Soffit	• U=0.039	• U=0.071
Slab on Grade	• F=0.73	• F=0.73
Windows	• Approx 15% WWR • U=0.47 • SHGC (North) = 0.61 • SHGC (North) = 0.40	• Approx 35% WWR • U=0.77 • SHGC (North) = 0.61 • SHGC (North) = 0.34
Skylights	• N/A	• Approx 3% SRA • U=1.11 • SHGC=0.40
HVAC	• Heat Pump, 13 SEER	• Heat Pump, 13 SEER (small nonres) • Packaged VAV units: 9.5 EER • Boiler, 80% for reheat • Constant speed HHW pumping
Lighting	• Residential units – not regulated • Corridors for residential: 0.60 w/sf	• Whole building office: 0.85 w/sf
Site Lighting	• Covered Parking: 0.3 w/sf • Surface parking: 0.092 w/sf	• Covered Parking: 0.3 w/sf • Surface parking: 0.092 w/sf
Domestic HW	• 80% Gas	• Electric, EF = 0.93
Renewable	• None	• None

BAU Results

A project built to the standards summarized on the previous page, and using Title 24-2008 ACM Performance energy modeling guidelines is estimated to consume:

	kWh/yr	Therms/yr	lbs CO2e/yr
Nonresidential	4,796,311	11,146	3,516,604
Residential	5,245,599	85,597	4,704,878
Site	1,551,037	0	1,095,032
Subtotal			9,316,514
PV			
Total			9,316,514

Total GHG emissions of BAU design are estimated to be 9,316,514 tons CO2e/yr.

4. Summary of Proposed Project

Proposed Project Features

The project will be built to comply with, at a minimum, the Title 24-2013 energy code requirements. The major Proposed project features are summarized in the table below. All items are consistent with the Title 24-2013 Prescriptive requirements unless marked with an asterisk, which indicates that higher efficiency products are planned. These "higher efficiency" items were selected by the project team to help support a planned LEED certification for the existing building.

	Residential	Nonresidential
Walls	• Wood frame U=0.059	• Metal frame U = 0.062 • Mass walls U=0.690 • Wood frame U=0.059
Roof	• U=0.028, Cool roof • 3-year aged reflectance = 0.63 • Thermal emittance = 0.75	• U=0.039, Cool roof • 3-year aged solar reflectance = 0.63 • Thermal emittance = 0.75
Floor/Soffit	• U=0.071	• U=0.071
Slab on Grade	• F=0.73	• F=0.73
Windows	• Approx 15% WWR • U=0.46 • SHGC (All) = 0.26	• Approx 35% WWR • U=0.41 • SHGC (All) = 0.26
Skylights	• N/A	• Approx 3% SRA • U=0.58 • SHGC=0.25
HVAC	• Heat Pump, 14 SEER	• Heat Pump, 14 SEER (small nonres) with economizers • (*) High efficiency water-cooled centrifugal chillers, VFD, NPLV=0.34 • (*) Primary-variable CHW pumping • CHW/HW VAV units • CHW/HW fan coils with economizers • Boiler, 80% for reheat • (*) Variable speed HHW pumping • Fault Detection & Diagnostics
Lighting	• Residential units – not regulated • Corridors for residential: 0.60 w/sf • Occ. sensors on all res. corridor lighting	• Whole building office: 0.80 w/sf
Site Lighting	• Covered Parking: 0.2 w/sf • Surface parking: 0.090 w/sf • Occupancy sensors - garage lighting	• Covered Parking: 0.2 w/sf • Surface parking: 0.090 w/sf • Occupancy sensors - garage lighting
Domestic HW	• 80% Gas	• Electric, EF = 0.93
Renewable	• None	• (*) Minimum 175 kW DC PV system

(*) Items marked with an asterisk are proposed improvements beyond the Title 24-2013 Prescriptive baseline requirements. These "higher efficiency" items were selected by the project team to help support a planned LEED certification for the existing building.

Proposed Project Results

A project built to the standards summarized on the previous page, using the same energy modeling methodologies as described for the BAU case, is estimated to consume:

	kWh/yr	Therms/yr	lbs CO2e/yr
Nonresidential	4,235,786	6,109	3,061,940
Residential	4,156,119	85,544	3,935,085
Site	880,221	0	621,436
Subtotal			7,618,461
PV	-236,250		-166,793
Total			7,451,668

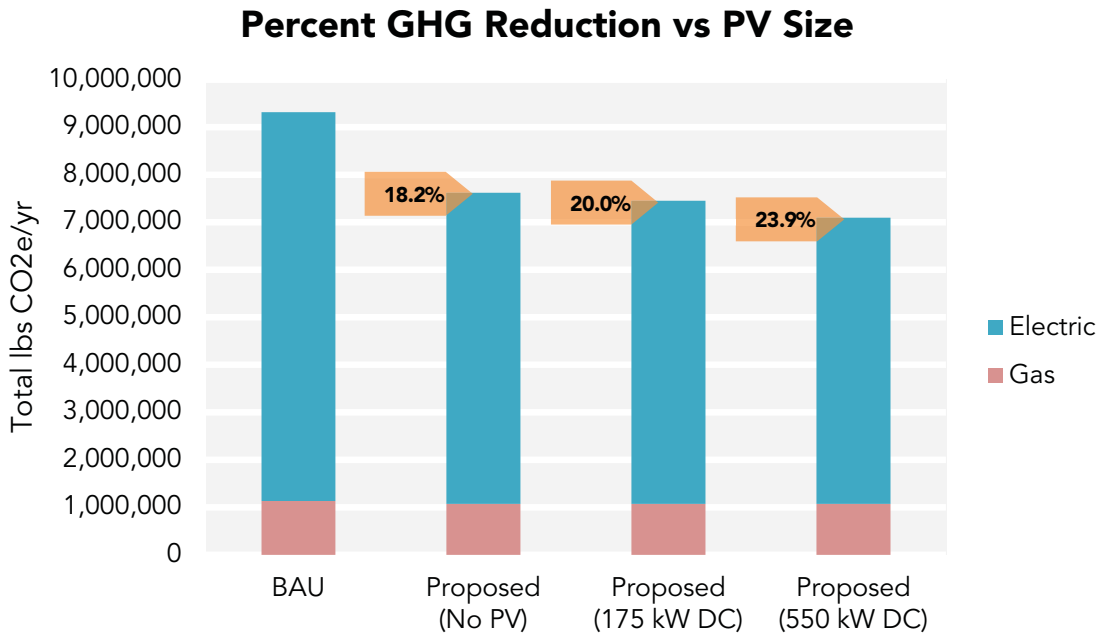
Total GHG emissions of Proposed design are estimated to be 7,451,668 tons CO2e/yr.

Reduction below BAU = (9,316,514 - 7,451,668) / 9,316,514 = 20%.

Summary of PV Benefit

The following chart shows the percent reduction in GHG gas emissions with three varying PV scenarios: No PV, 175 kW DC, and 550 kW DC.

- 175 kW DC is chosen as it represents the minimum required to achieve 20% GHG emissions reductions relative to BAU.
- 550 kW DC is chosen as it represents a conservative prediction of what could reasonably fit on the roof.



- Without PV, GHG emissions reduction is estimated at 18.2%
- With 175 kW DC PV, GHG emissions reduction is estimated at 20%
- With 550 kW DC PV, GHG emissions reduction is estimated at 23.9%

Appendix A: Energy Modeling Summary Output

The following attachments are the energy model outputs (UTIL-1 Summary) for:

1) Residential areas
2) Nonresidential areas
3) Site (parking garage and site lighting)

Nonresidential Areas

Savings By Design

UTILITY INCENTIVE WORKSHEET **UTIL-1**

Project Name: *MGA Campus - Nonresidential*

Date: *4/9/2014*

Step 1 **ANNUAL TDV ENERGY USE (kBtu/sqft-yr)**

ENERGY COMPONENT	Standard	Proposed	Margin
Space Heating	7.04	3.81	3.23
Space Cooling	124.76	42.33	82.43
Indoor Fans	44.69	46.72	-2.03
Heat Rejection	0.00	21.13	-21.13
Pumps	1.36	13.44	-12.09
Domestic Hot Water	27.88	27.88	0.00
Lighting	70.47	67.19	3.28
Receptacle	72.39	72.39	0.00
Process	46.68	46.68	0.00
Process Lighting	0.00	0.00	0.00
TOTALS:	395.27	341.57	53.70

Step 2 **PERCENT BELOW TITLE 24**

Adjusted TDV Energy Use
(Excludes Process Energy)

Standard Design		Proposed Design		Margin
395.27	-	341.57	=	53.70

Margin		Standard Design		% Below Title 24*
53.70	/	348.58	=	15.4 %

Incentive Eligibility Yes ☑ No ☐
Owner Incentive (>=10%)

Conditioned Floor Area = 284,467.0 ft² **sq. ft.**

Step 3 **ANNUAL SITE ENERGY USE**

	Standard	Proposed	Margin
Average 2pm - 5pm Peak Demand (kW)	1,424.6	1,134.4	290.1

The values shown here are based upon the results of an EnergyPro Compliance energy analysis that uses Title 24 profiles as specified in the Alternative Calculation Method manual.

ENERGY COMPONENT	Standard		Proposed		Margin	
	Electricity (kWh)	Natural Gas (therms)	Electricity (kWh)	Natural Gas (therms)	Electricity (kWh)	Natural Gas (therms)
Space Heating	6,591	11,146	2,551	6,109	4,041	5,037
Space Cooling	1,399,323	0	443,256	0	956,067	0
Indoor Fans	573,249	0	599,424	0	-26,175	0
Heat Rejection	0	0	262,318	0	-262,318	0
Pumps	20,566	0	173,144	0	-152,578	0
Domestic Hot Water	348,371	0	348,371	0	0	0
Lighting	896,260	0	854,772	0	41,488	0
Receptacle	945,432	0	945,432	0	0	0
Process	606,519	0	606,519	0	0	0
Process Lighting	0	0	0	0	0	0
TOTALS:	4,796,311	11,146	4,235,786	6,109	560,525	5,037

Step 4 **POTENTIAL OWNER INCENTIVE CALCULATION**

	% Below Title-24* (from step 2)		Incentive Rate		Savings (from Step 3)		Subtotal
The Gas Company — Electricity (kWh)	15.4 %	→	15.4 ¢/kWh	x	560,525 kWh	=	$86,321
Electricity (kW)		=	100.00 $/kW	x	290.1 kW	=	$29,010
A Sempra Energy utility℠ — Natural Gas		=	100.0 ¢/therm	x	5,037 therm	=	$5,037
Owner Incentive		→			**($150,000 max) =**		$120,368

Potential incentives indicated on this report are available only through the Whole Building Approach Element of the Savings By Design Program for new construction and are NOT GUARANTEED. Projects MUST receive prior, written approval from The Utility during conceptual or early design development and must meet all other program requirements to qualify. Potential incentives are subject to program limitations based upon the incremental cost of the measures.

*% Below in this equation is limited to 30%.

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Residential Areas (See common residential corridors on following page)

Savings By Design

UTILITY INCENTIVE WORKSHEET UTIL-1

Project Name: *MGA Campus - Residential*

Date: *4/9/2014*

Step 1 ANNUAL TDV ENERGY USE (kBtu/sqft-yr)

ENERGY COMPONENT	Standard	Proposed	Margin
Space Heating	0.02	0.19	-0.18
Space Cooling	54.40	29.66	24.74
Indoor Fans	10.53	6.71	3.82
Heat Rejection	0.00	0.00	0.00
Pumps	2.90	3.18	-0.28
Domestic Hot Water	20.12	20.11	0.01
Lighting	33.59	33.59	0.00
Receptacle	33.59	33.59	0.00
Process	0.00	0.00	0.00
Process Lighting	0.00	0.00	0.00
TOTALS:	155.15	127.03	28.12

Step 2 PERCENT BELOW TITLE 24

Adjusted TDV Energy Use
(Excludes Process Energy)

Standard Design		Proposed Design		Margin
155.15	-	127.03	=	28.12

Margin		Standard Design		% Below Title 24*
28.12	/	155.15	=	18.1 %

Incentive Eligibility — Yes ☑ No ☐

Owner Incentive (>=10%)

Conditioned Floor Area = 696,006.5 ft² **sq. ft.**

Step 3 ANNUAL SITE ENERGY USE

	Standard	Proposed	Margin
Average 2pm - 5pm Peak Demand (kW)	1,034.1	729.3	304.9

The values shown here are based upon the results of an EnergyPro Compliance energy analysis that uses Title 24 profiles as specified in the Alternative Calculation Method manual.

ENERGY COMPONENT	Standard		Proposed		Margin	
	Electricity (kWh)	Natural Gas (therms)	Electricity (kWh)	Natural Gas (therms)	Electricity (kWh)	Natural Gas (therms)
Space Heating	569	0	6,829	0	-6,260	0
Space Cooling	1,552,789	0	816,811	0	735,977	0
Indoor Fans	314,735	0	192,462	0	122,272	0
Heat Rejection	0	0	0	0	0	0
Pumps	92,487	0	104,657	0	-12,169	0
Domestic Hot Water	0	85,597	0	85,544	0	53
Lighting	1,143,190	0	1,143,190	0	0	0
Receptacle	1,143,190	0	1,143,190	0	0	0
Process	0	0	0	0	0	0
Process Lighting	0	0	0	0	0	0
TOTALS:	4,246,959	85,597	3,407,139	85,544	839,820	53

Step 4 POTENTIAL OWNER INCENTIVE CALCULATION

	% Below Title-24* (from step 2)		Incentive Rate		Savings (from Step 3)		Subtotal
The Gas Company — Electricity (kWh)	18.1 %	→	18.1 ¢/kWh	x	839,820 kWh	=	$152,007
Electricity (kW)		=	100.00 $/kW	x	304.9 kW	=	$30,490
A Sempra Energy utility℠ — Natural Gas		=	100.0 ¢/therm	x	53 therm	=	$53
Owner Incentive		→			($150,000 max) =		$150,000

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*% Below in this equation is limited to 30%.

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Unconditioned common corridors for residential

BAU Summary

	Area Estimate (sf)	Lighting watts/sf	Hours/yr	kWh/yr
Corridors	190,000	0.6	8,760	998,640

Proposed Summary

	Area Estimate (sf)	Lighting watts/sf	Hours/yr	kWh/yr
Corridors	190,000	0.6	6,570 (*)	748,980

(*) Occupancy sensors required in 2013 code. 25% savings in Corridors from 2013-2014 Statewide Customized Procedures Manual for Business - Section 2, Estimating Energy Savings

Site Energy Use

BAU Summary

	Area Estimate (sf)	Lighting watts/sf	Hours/yr	kWh/yr
Covered Parking	588,995	0.3	8,760	1,547,879
Exposed Parking	7,837	0.092	4,380	3,158
Total				1,551,037

Proposed Summary

	Area Estimate (sf)	Lighting watts/sf	Hours/yr	kWh/yr
Covered Parking	588,995	0.2	7,446 (*)	877,131
Exposed Parking	7,837	0.090	4,380	3,089
Total				880,221

(*) Occupancy sensors required in 2013 code. 15% savings in Corridors from 2013-2014 Statewide Customized Procedures Manual for Business - Section 2, Estimating Energy Savings