

Sichler Farms



Building Renovation & Electrification

September 26, 2024

**Study Conducted by
Sustainable Engineering LLC**

ENERGY AUDIT EXECUTIVE SUMMARY

This Technical Report and Energy Audit was prepared for Sichler Farms physically located at 820 San Mateo Blvd. NE, Albuquerque, NM 87108. The business operations occur in a 1960's steel building/warehouse and farm stand. The existing warehouse building is steel framed with steel exterior paneling. There is minimal ceiling insulation with most of the walls having no insulation. Many of the windows are broken and boarded up with many doors having large gaps in them allowing for outside air infiltration. There are HVAC units with natural gas heating already installed in the warehouse, but they cannot keep up with cooling demand loads with the poor state of the building envelope. An on-demand natural gas hot water heater is installed, but not functional. Additionally, there is a greenhouse found in the warehouse. The greenhouse will be moved outside, and the warehouse building will be renovated into a multiuse building including a small restaurant, produce stands, and storage/processing areas. These renovations will include upgrading the outdated poorly insulated walk-in refrigeration systems that are currently found outside. Sustainable Engineering LLC audited, analyzed, and recommends the following opportunities for energy efficiency improvements (EEI):

- R-28 Rooftop Insulation
- R-14 Wall Insulation
- HVAC improvements
- Hot Water Heater Improvements
- Walk-In Refrigerator with R-29
- Walk-In Freezer with R-32
- LED Lighting
- Windows & Glazing R-2.5
- Upgraded Doors

Sustainable Engineering LLC provides an energy savings & financial analysis summary in the table below. Costs are estimated based on quotes provided by vendors for this project. Energy savings and Greenhouse Gas (GHG) emissions savings associated with each EEI project are highlighted at the bottom the table. CO₂ equivalent emissions associated with the electric grid (kWh) and combusting natural gas (therms) were obtained from the EPAs Simplified GHG Emissions Calculator¹.

Energy Improvement Measures		
	Benefit	Potential Energy Savings
Warehouse envelope and insulation	Occupant safety and comfort, reduced HVAC system sizing requirements.	With the workspace fully occupied and future loads applied, the addition of upgraded wall insulation, roof insulation, and doors and windows could save 18% of overall building energy use.
Heat Pump Water Heating (HPWH)	No change to facility environment.	HPWH provides up to 385% efficiency improvement over natural gas with huge CO ₂ emission reduction. Setback thermostat control allows reduced temperature setting during winter months when the owner is away providing an overall 17% reduction in existing building energy use.
HVAC Heat Pumps	Occupant safety with no onsite fuel combustion, better regulation of space temperature.	Heat pumps can be up to 300% efficient during heating operations compared to less than 100% for gas fired furnaces. With the workspace fully occupied and future loads applied the installation of an HVAC heat pump could reduce oval annual energy consumption by 19%.
Walk-In Refrigeration	Keeps produce and food from spoiling, reduces system sizing requirements.	Moving the walk-in refrigeration units inside helps to save energy by reducing exposure to high summer temperatures. Furthermore, updating the cooler box insulation provides the highest energy savings second to mechanical system updates. 1% savings were still realized even with a 2,060 ft ³ increase in cold storage capacity.

¹ OAR US EPA, "Simplified GHG Emissions Calculator," Overviews and Factsheets, August 5, 2015, <https://www.epa.gov/climateleadership/simplified-ghg-emissions-calculator>.

Model Description / Ref #	Actual Energy Use (Utility Bills)	OpenStudio Model Baseline	Option 1: LED Lighting - 100	Option 2: Building Envelope - 200	Option 3: HVAC Heat Pump - 300	Option 4: Walk-In Refrigeration - 400	Option 5: Heat Pump Hot Water Heater - 500	Option 6: Combined EEI - 600
Total Annual Building Energy Use (kBTU)	935,783	1,224,201	1,261,450	1,005,217	993,112	1,211,746	1,011,639	730,251
Heating (kBTU)		369,507	350,436	175,564	126,325	364,208	369,507	68,622
Cooling (kBTU)		87,493	90,753	65,968	99,653	88,431	87,493	65,883
Lighting (kBTU)		15,895	68,660	15,895	15,895	15,895	15,895	68,660
Equipment (kBTU)		386,577	386,577	386,577	386,557	386,577	386,577	386,577
Fans (kBTU)		22,719	22,994	19,231	22,719	22,795	22,719	19,231
Pumps (kBTU)		0	0	0	0	0	0	0
Domestic Water Heating (kBTU)		283,416	283,416	283,416	283,416	283,416	70,854	70,854
Refrigeration (kBTU)		58,594	58,613	58,575	58,547	50,424	58,594	50,424
Electricity (kWh)	52,581	99,875	116,380	91,755	131,584	97,771	120,641	137,607
Electricity (kBTU)	179,415	340,788	397,105	313,081	448,982	333,608	411,645	469,535
Gas (therms)	0	8,836	8,645.5	6,923.0	5,442.8	8,783.5	6,001.4	2,608.0
Gas (kBTU)	0	883,413	864,340	692,130	544,150	878,140	599,997	260,735
Electricity Peak Demand (kW)		30	33	28	55	31	35	48
Natural Gas Peak Demand (kBtu/hr)		362	361	295	140	362	259	41
Electricity Savings (kBTU)			-56,317	27,707	-108,194	7,179	-70,857	-128,748
Natural Gas Savings (kBTU)			19,073	191,283	339,263	5,273	283,416	622,678
Total Energy Savings (kBTU)			-37,244	218,990	231,069	12,452	212,559	493,930
Energy Savings %			-3.0%	17.9%	18.9%	1.0%	17.4%	40.3%
Annual Electricity Cost Savings (\$0.047115/kBtu)				-\$2,654	\$1,306	-\$5,098	\$338	-\$3,339
Annual Gas Cost Savings (\$0.008052/kBtu)			\$154	\$1,540	\$2,732	\$42	\$2,282	\$5,014
Measure Cost			NA	NA	NA	NA	NA	\$958,195

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Simple Payback (yrs)			NA	NA	NA	NA	NA	-910.1
GHG Emissions CO2-e (metric tons)		59	62.8	49.9	55.3	58.2	54.3	46.6
GHG Emissions Reduced CO2-e (metric tons)		0	-3.8	9.1	3.7	0.8	4.7	12.4
Notes	CO ₂ -e (metric tons)/kWh 0.000270338							
EPA Calculator Tool	CO ₂ -e (metric tons)/therm 0.003621445							

The recommended model “Option 6: Combined EEI #610”, entails a fully occupied and utilized building with electrified heating and cooling and consists of the R-28 roof insulation, R-14 wall insulation, floor epoxy coating, double pane windows & upgraded doors, hot water & air sourced heat pumps, LED lighting and highly insulated refrigerated units (R-29 – R-32) with efficient mechanical systems. The recommended systems combined are expected to save 40% of the total annual building energy use, if using the existing warehouse mechanical equipment, electrical equipment, walk-in refrigeration equipment, and building envelope as a baseline model comparison. Though electrifying mechanical equipment such as HVAC and hot water systems, through fuel switching, reduces energy consumption substantially it increases electricity consumption. Currently, electricity rates are 6x greater than natural gas utility rates per BTU of energy. Therefore, energy savings does not always translate into cost savings without some sort of onsite renewable electricity generation such as a solar PV system.