



Varo is a multi-disciplined engineering firm providing comprehensive energy services to industrial, utility and institutional clients. Varo, with its staff of PE's and CEM certified engineers, is a single source provider to:

- Perform energy audits and/or studies.
- Recommend, specify and design improvements.
- Procure and install all equipment and materials required.
- Assist with training and commissioning.
- Measure and verify results.

Supplemental qualifications to provide sustainable and cost savings strategies:

- CEM and LEED AP certified engineers.
- ENERGY STAR PARTNER; [www.energystar.com](http://www.energystar.com)
- Solution Provider, AEP Ohio, gridSMART program; <http://www.gridsmarthio.com>
- Active leadership in Ohio Capital City Chapter of Association of Energy Engineers; [www.occae.org](http://www.occae.org)
- Municipal Electric Partner, American Municipal Power (AMP); <http://amppartners.org/about-amp/partners/>



Our range of services for traditional and renewable energy projects includes:

- Performance studies, application studies and forensic analysis.
- Site evaluation and selection.
- Financial calculations, payback analysis, third party financing assistance, grant-writing assistance.
- Sophisticated electrical controls solutions for integration of equipment.
- Power system design and analysis including: arc flash analysis, coordination analysis, metering, utility negotiations, etc.
- Design and optimization of supplemental environmental systems: scrubbers, fume collectors, incinerators, bag houses and dust control systems.
- Balance of plant services for traditional and renewable energy equipment integration: including structural, mechanical and piping systems.

**Energy Management:**

- Economic Savings
- Emissions Reductions
- Energy Efficiency

Coal Cost, mmbtu	\$ 4,5200
Electric Cost/kwh	\$ 0.0654
Boiler Efficiency	80%
# CO2/billion BTU nat gas	117,000
# NOx/billion BTU nat gas	92
KWH/ton cooling	0.9
Coal Elec. Gen. Mix, Assumed,	80%
Tons CO2/ MWH coal	0.971
Tons NOx/MWH coal	0.0026
Tons CO2/Ton Coal	3.5
Tons NOx/Ton coal	0.0094

	Savings Total	Heat Savings	Cooling Savings	Motor Savings	Heating Savings BTUH	Kwh Saved Total	Mwh Saved Total	Coal Mix	Tons CO2 Saved/Yr	#NOx Saved/Yr
ECONOMIZER	\$ 9,000		\$ 9,000			137,615	138	80%	107	716
RECIRCULATION AIR	\$ 24,000	\$ 24,000			6,637,168,142		-	80%	1,162	6,239
REDUCE AIR TEMPERATURE AND FLOW	\$ 31,000			\$ 31,000		474,006	474	80%	368	2,465
LAB HVAC RECIRC AND VAV	\$ 27,000	\$ 13,000	\$ 4,000	\$ 10,000	3,595,132,743	214,067	214	80%	795	4,493
CONVERT LAB FROM DUAL DUCT TO VAV	\$ 18,000	\$ 7,000	\$ 5,000	\$ 6,000	1,935,840,708	168,196	168	80%	469	2,694
HIGH RISE VAV CONVERSION	\$ 18,000	\$ 5,000	\$ 3,000	\$ 10,000	1,382,743,363	198,777	199	80%	396	2,333
<b>Totals</b>	<b>\$ 127,000</b>					<b>1,192,661</b>	<b>1,193</b>		<b>3,298</b>	<b>18,940</b>

Notes: 1. All quantities are on a per year basis  
 2. Coal is assumed to generate 80% of electricity. All other emission sources from electricity generation are neglected.  
 3. Source for power plant coal emissions are based on a paper presented by SFA Pacific, Inc, titled "CO2 Mitigation Economics for Existing Coal Fired Power Plants, May 14-17, 2001"  
 4. Source for natural gas emissions are based on data on NaturalGas.org web site, Natural Gas and the Environment" web page. All Emissions based on Coal Generated Steam During The Winter.  
 5. Economizer Btu savings are cost prorated from the generic model.  
 6. Coal assumed to have a heating rating of 20,000,000 btu/ton

