



The Toledo Museum of Art Goes Green: The Project Continues.



Presenter: Suzanne Hargrove

March 17, 2011

Practical Energy Savings

Energy efficient lights in galleries



Practical Energy Savings

T-8 Fluorescents in non-art areas



OLD
T-12

NEW
T-8

Soft White
Luz Blanca Suave

F32T8/TL830/
ALTO II

Great for the Kitchen,
Bath or Any Room
Para la Cocina, el Baño o
Cualquier Habitación

T8 

32 Watts Varios

48 Inch Pulgadas

Better for
the Environment
ALTO II
Mejor Para el Medio
Ambiente

- Provides comfortable, pleasant light
- Lasts 8 years!*



*T-8 with
electronic
ballast.*

Practical Energy Savings T-8 Fluorescents in non-art areas



Entrance areas



Practical Energy Savings

T-8 Fluorescents & LED's in non-art areas



Café area

Practical Energy Savings

Lights and fixtures





Practical Energy Savings

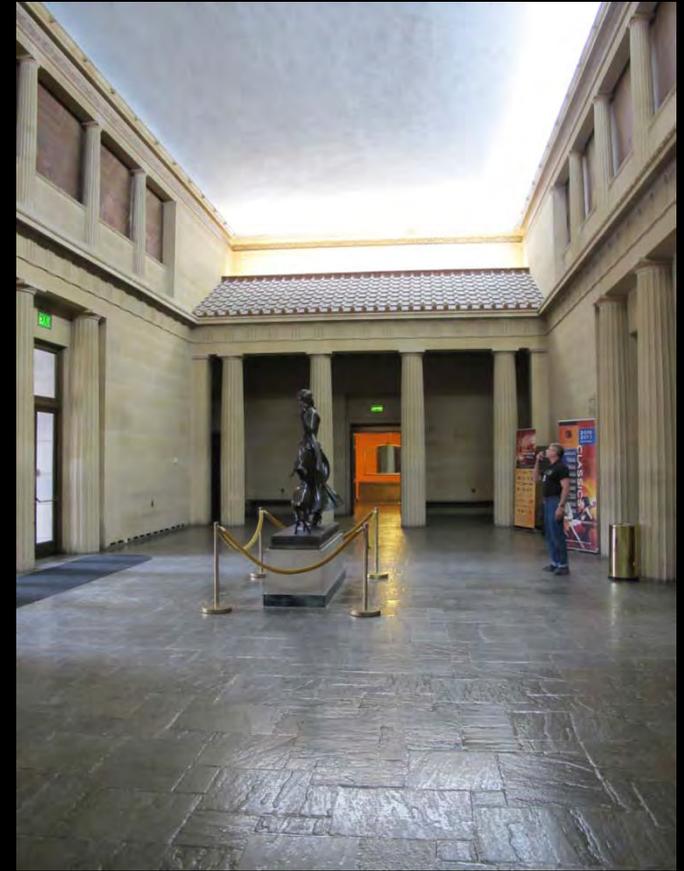
Energy efficient LED lights



Practical Energy Savings T-8 fluorescents in Peristyle Lobby



Nightlight T-8's



Event T-8's



Practical Energy Savings

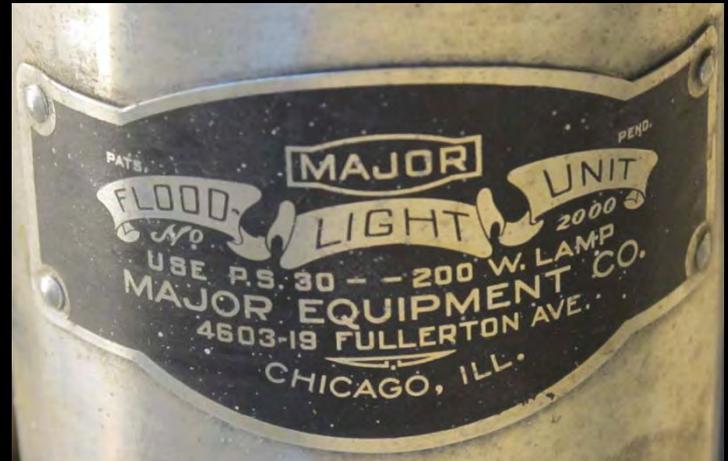
New light system in the Peristyle Lobby



Peristyle lobby, upper ledge

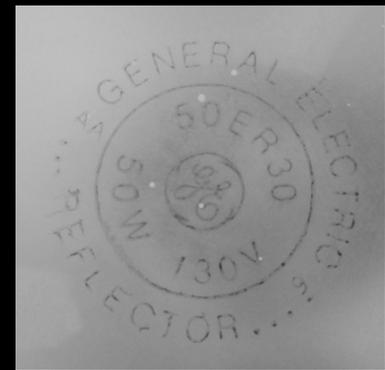
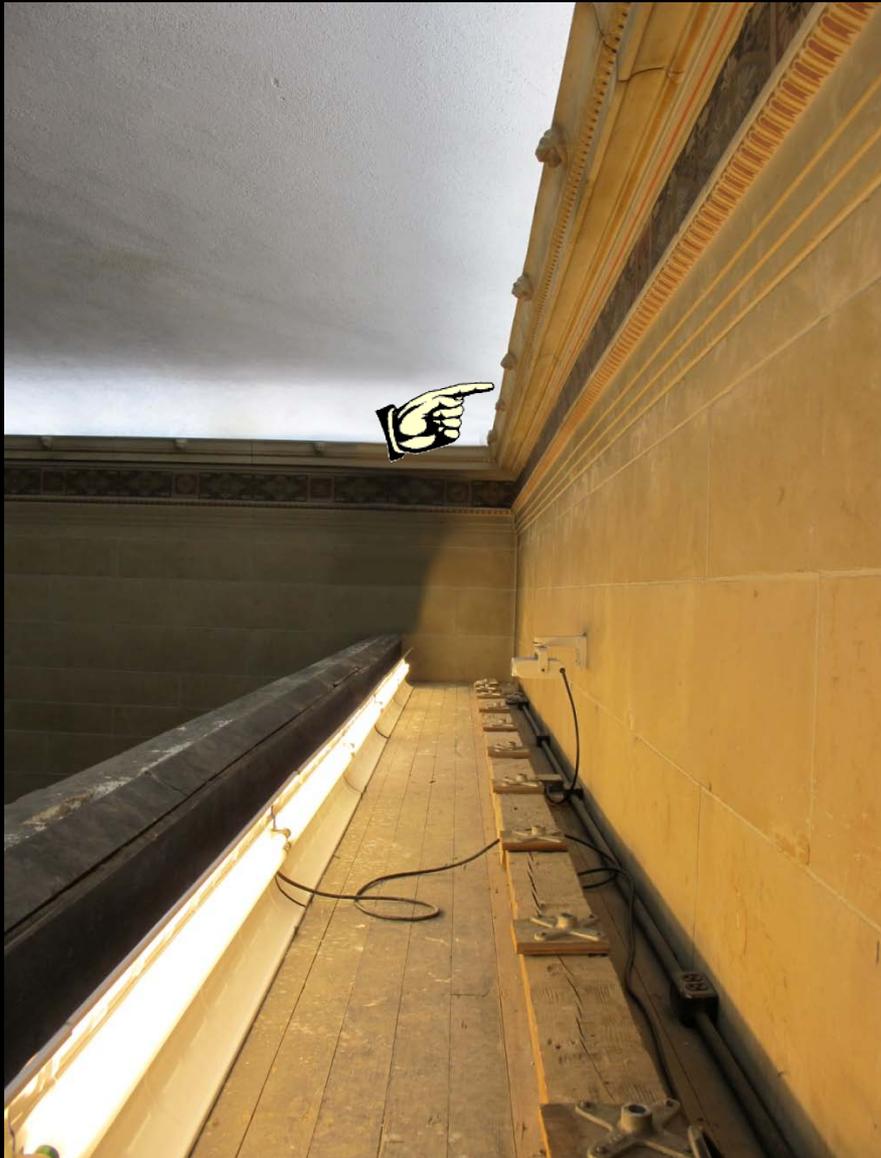


New T-8 lamps



Old 1930's lamps

Peristyle lobby, upper ledge



Practical Energy Savings

Energy efficient LED lights for artworks!

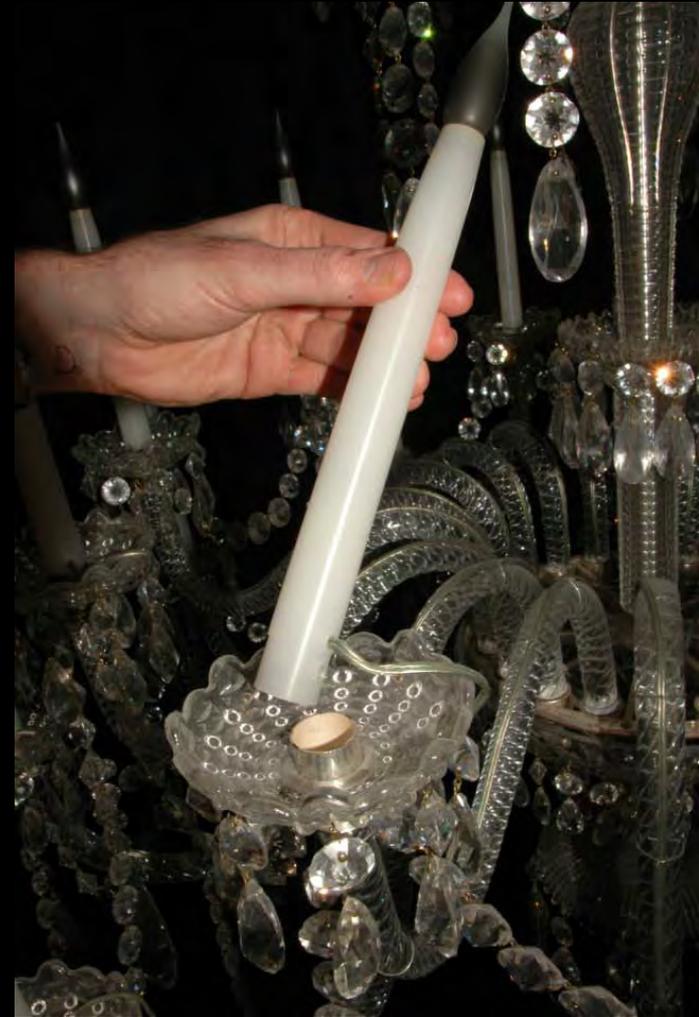


Incandescent (before)



LED (after)

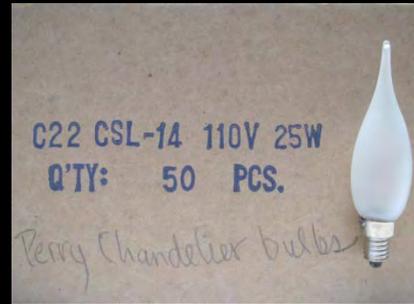
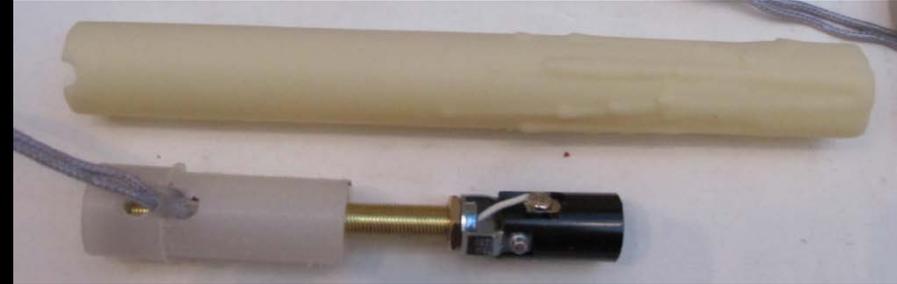
*Practical Energy Savings
Incandescent to LED lights*



Old incandescent lights

Practical Energy Savings

Conversion to LED



*Old
incandescent
candle.*

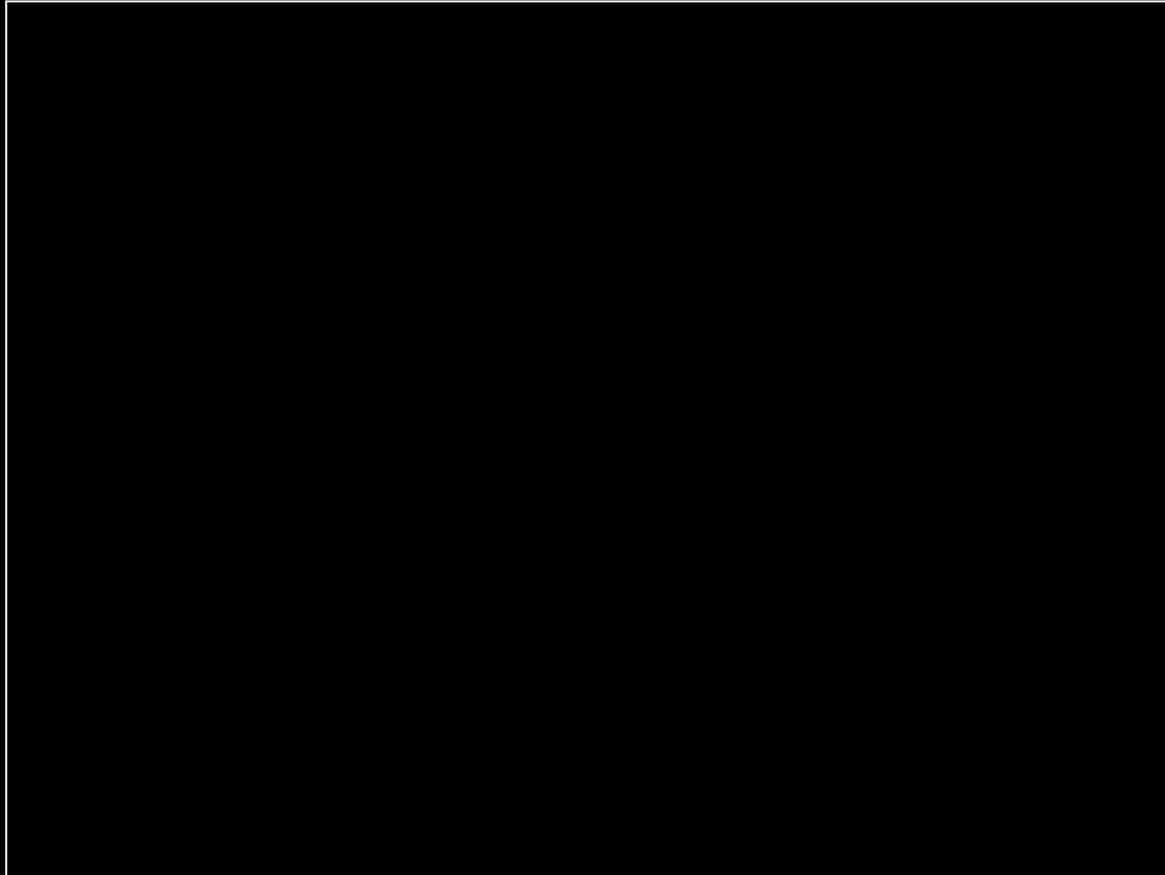


*New LED
candle.*



Practical Energy Savings

LED Electric Candles that flicker.





Practical Energy Savings: Energy efficient motors.



Practical Energy Savings

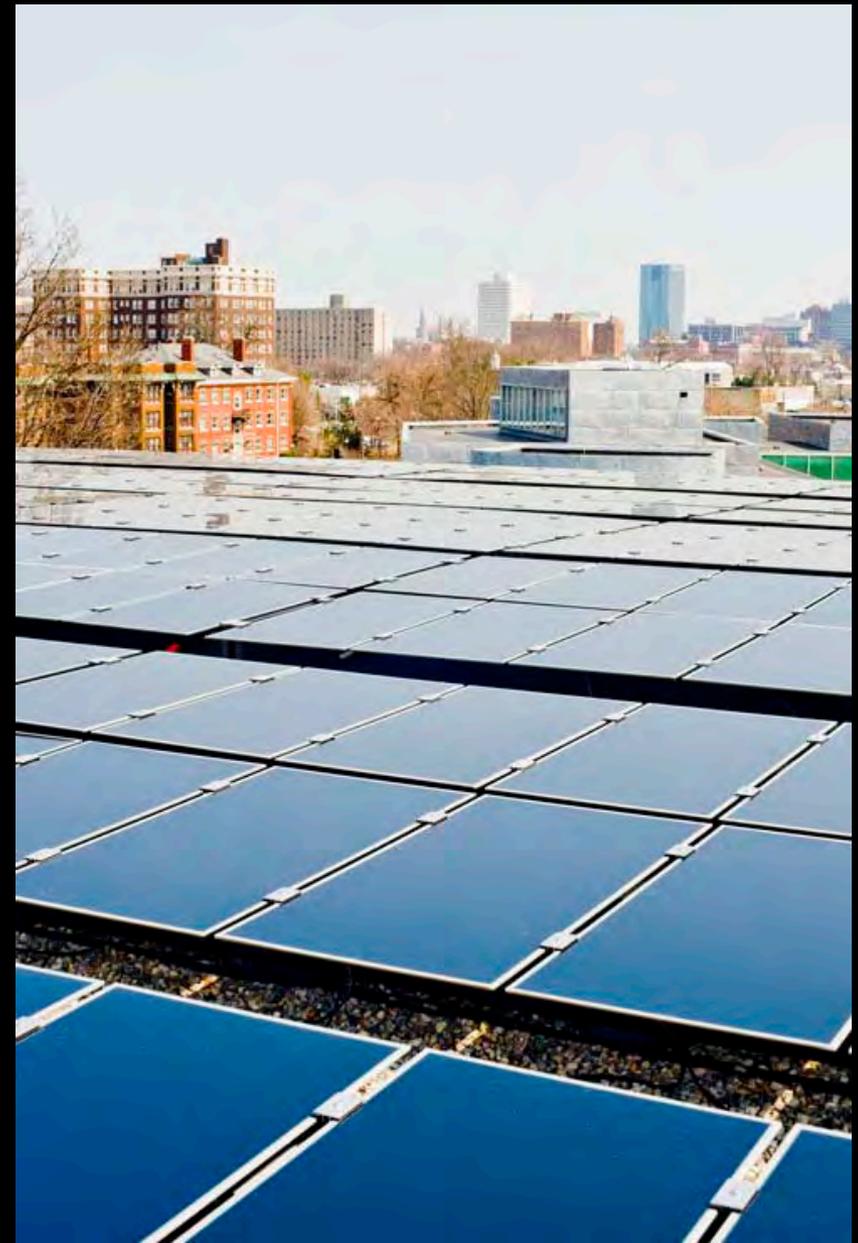
Variable Frequency Drives



Microturbines 2004



Solar 2008



Four Capstone Microturbines

- *Generate heat*
- *Hot water*
- *Electricity*
- *Very low pollutant emissions*



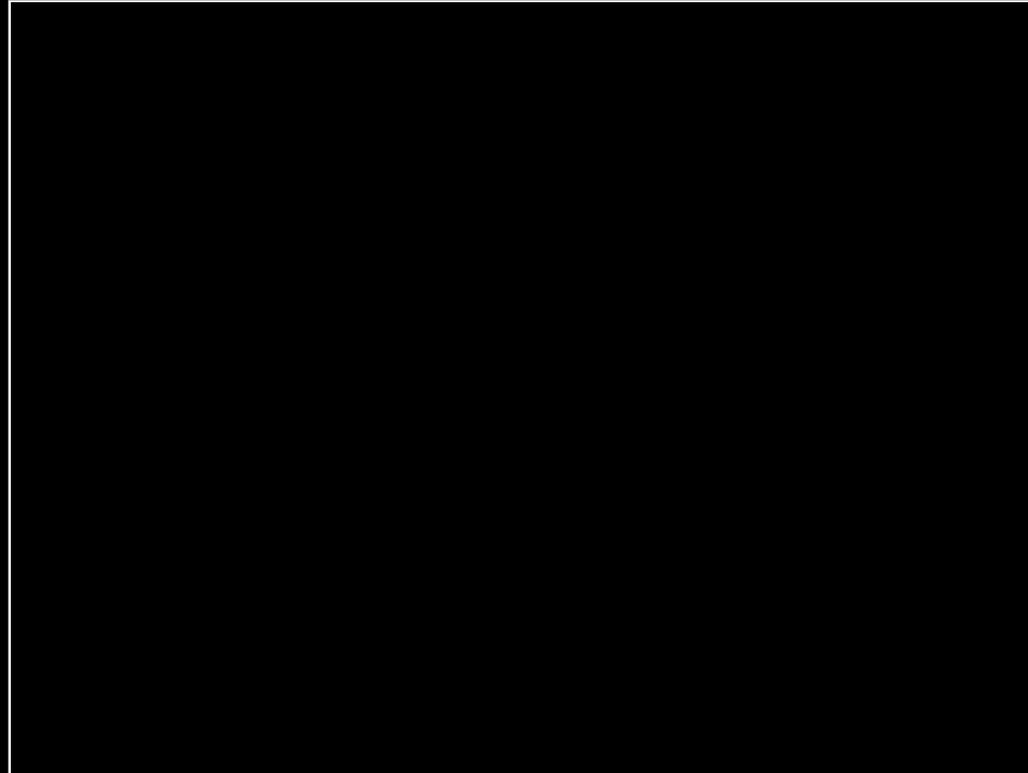
Microturbine elements



- *Fuel supply at back (natural gas)*
- *Air supply at front*
- *Microturbine engine*
- *Digital power controller*
- *Heat exchanger not shown.*



Inside a Capstone MicroTurbine



How microturbines work in the existing museum energy system.

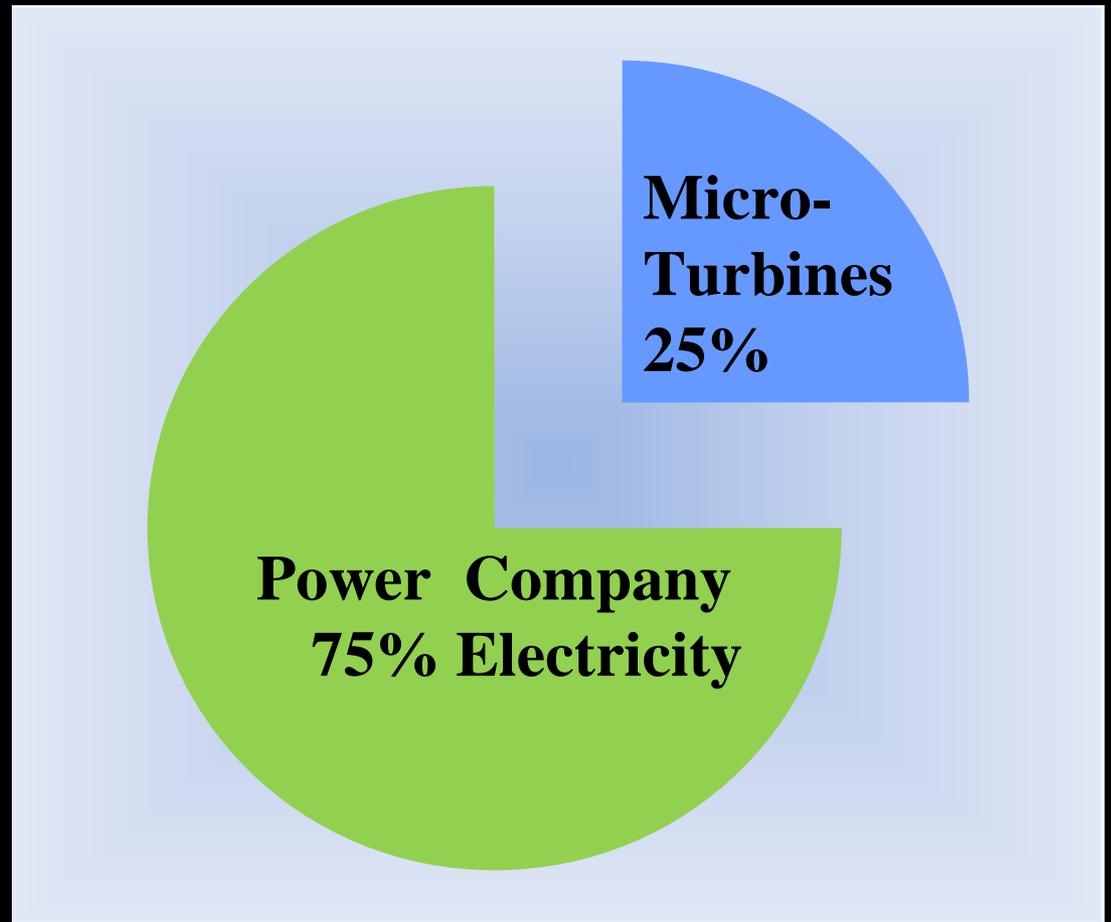


Microturbines:

- Generate electricity.*
- Generate 180 degree hot water for museum space heating and domestic hot water.*

Microturbines supplement the museums energy needs.

- Cut annual electrical grid consumption by 25%.*
- Reduce greenhouse gas emissions.*





Microturbine advantages:

- *Few moving parts (without oil lubricants)*
- *Burn a variety of fuels*
- *Durable and reliable (run 24/7)*
- *Immediate energy production*
- *Require little maintenance*
- *Create large amounts of energy in a small amount of space.*



Advantages continued:

- Work alone or in groups for capacity and redundancy.*
- Pollute less than conventional systems.*
- Increased efficiency so they use less fuel.*
- Can generate electricity if the power grid fails.*



Microturbine project installation costs:

- *Microturbine project cost=\$522,000*
- *Museum received \$75,000 grant from Ohio Dept. of Energy Efficiency (OEE).*
- *The balance was financed by a low interest Energy Loan Fund (ELF) for implementing energy efficient technologies.*
- *Loan payback in 4.5 years from microturbine energy savings.*



Solar Panel Project 2008

1,450 panels from First Solar, Inc.



Panel Installation



Solar Panel Project 2011

1,500 solar panels being installed.



Green begins 2011

Red existing 2008

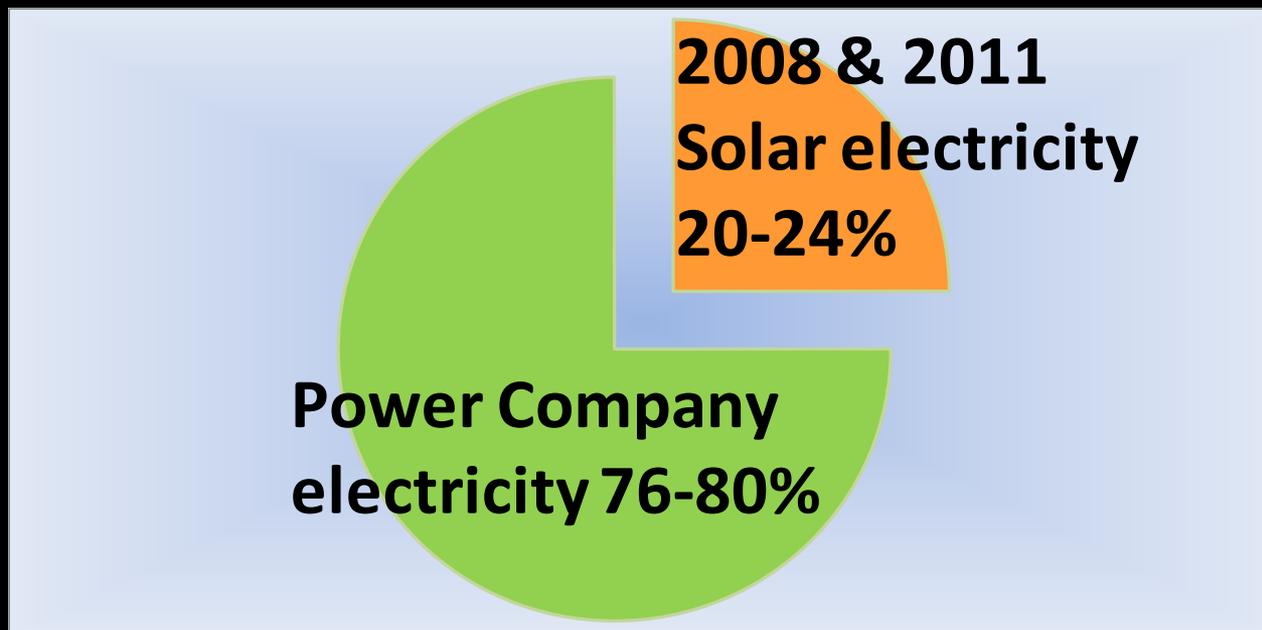
Panels to be installed on the West side of the museum building.



Panels on raised platforms above clerestory windows.

Solar panels supplement the museums energy needs.

- 2008 plus 2011 panels will cut annual electrical grid consumption by 20-24% and reduce greenhouse gas emissions.*





2011 Solar panel installation costs:

- Solar project cost \$665,000.*
- Museum received support totaling \$423,000 from the Ohio Department of Development (ODD) and stimulus funding from the American Recovery and Reinvestment Act (ARRA).*
- The museum is responsible for the remaining \$242,000 .*
- Payback in 20 years from solar panel energy savings.*



Solar panel advantages:

- *Do not require fossil fuels.*
- *Do not emit greenhouse gasses.*



Solar panel disadvantages:

- *Less efficient on cloudy days*
- *Don't work at night.*

*Results: Practical devices, microturbines,
solar=substantial energy savings.*



Lights

Motors

VFD's



Microturbines

Solar



What's Next? Investigate:

- More microturbines and heat recovery chillers for air conditioning.*
- More energy efficient systems (lights, pumps, variable speed drives etc.)*
- Wind turbines.*
- Funding sources to continue supporting our energy savings mission.*



What you can do:

- 1. Install energy efficient systems: Lights, motors, variable frequency drives, insulation, etc.*
- 2. Investigate alternative energy systems such as microturbines, wind turbines and solar panels.*
- 3. Look for funding opportunities (local, state, federal).*

Conservation advantages:

- *Efficient lights: Lower light exposure. Less equipment in galleries to change lights.*
- *Efficient HVAC: Better control of the environment. Maintain environment in power outage. Museum environment is relevant to grant application process.*
- *Saving energy=\$\$\$\$. You will protect the collection, save jobs, money, generate positive press.*

Thank you:

Toledo Museum of Art Staff:

*Paul Bernard, Brian Kennedy, Carolyn Putney,
D. Bacigalupi, C. Bintz, J. Boyer, T. Burke, R. Curry, J.
DePriest, C. Fixler, T. Gaewsky, T. Gonzalez, J. Hayes, J.
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Companies:

Advance Distributed Generation LLC

BHP Energy Solutions, Ltd

Capstone Turbine Corporation

First Solar, LLC