GEOTHERMAL SYSTEMS

WHAT ARE GEOTHERMAL SYSTEMS?
Vertical geothermal systems utilize holes drilled 400-600 feet deep. Into these holes go pipes that are connected at the bottom with a U-bend to form a loop. The vertical loops are connected with horizontal pipe, placed in trenches, and connected to the heat pump in each building.

EDINBORO UNIVERSITY GREEN INITIATIVES
The development of green energy initiatives and sustainability projects at Edinboro University attests to our ambition to be a responsible and forward-thinking member of not only our local community, but also of the larger world. As an academic institution, we must lead by example and demonstrate to our students how to be responsible members of society. Transformation takes place in big and small ways, and with sustainable resources like our on-campus solar array and geothermal heating systems in several of our residence halls and academic buildings, Edinboro University is taking great strides to reduce its carbon footprint and help the environment.

BUILDING ENERGY COST COMPARISON

8 Residence Halls
Jeremy D. Brown Human Services Building
Cooper Science Center

>500 Geothermal wells
>700 Geothermal water source heat pumps

HVAC SYSTEM COMPARISONS

<table>
<thead>
<tr>
<th>GEOTHERMAL</th>
<th>TRADITIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain Temperature</td>
<td>Ground, pond or well water</td>
</tr>
<tr>
<td>Loop Temperature</td>
<td>35°F to 100°F</td>
</tr>
<tr>
<td>Energy Efficiency Ratio</td>
<td>36</td>
</tr>
</tbody>
</table>

ANNUAL ENVIRONMENTAL SAVINGS

Estimated annual reduction to air pollution

| 149.8 TONS Carbon Dioxide | 407 LBS Nitrogen Oxide |
| 6 LBS Methane | 5,326 GRAMS Mercury |
| 5 LBS Nitrous Oxide | 5.7 LBS Volatile Organic Compounds |
| 1.1 TONS Sulfur Dioxide | 7.1 TONS Heavy Metal Compounds |

FIELDHOUSE SOLAR ARRAY
System status as of August 26, 2015

12 KWH Average daily energy generated
506 TONS Lifetime energy generated*
810,976 KWH Lifetime energy generated*
6,000 W System AC power (watts)

BASED ON A 2009 INVESTMENT

732 SOLAR PANELS Useful life of 27 years
6,777,000 KWH Generated over lifetime of array
$440,000 Lifetime utility savings

LANDSCAPE MAINTENANCE
Use of wildflowers, native vegetation and natural stone to decrease landscape maintenance

LIGHTING IMPROVEMENTS
 Retrofit light fixtures with LED
 Lighting controls based on occupancy, ambient light

CLIMATE CONTROLLED DATA CENTER
Electric savings of 25% compared to unenclosed equipment racks

SCHEDULED MAINTENANCE
Includes upgrades to higher efficiency heating and cooling equipment

UNOCCUPIED SCHEDULES
HVAC system goes into Unoccupied Mode when school is not in session

COST SAVINGS INITIATIVES SINCE 2013
Via retrofits, CO2 sensors, thermostat set points and central plant efficiencies

| 20% | 22% |
| Overall utility cost savings | Electric savings |
| 27% | 13% |
| Cost decrease on square foot basis | Water and sewer cost savings |
| 9% | > $825K |
| Physical plant growth | Total annual savings |

www.edinboro.edu/green