The Creighton Energy Technology Program: Case Study on Solar Energy Education and Urban Installation

Andrew Baruth, Ph.D.

Dept. of Physics, Creighton University

The Program

- A Science, Technology, Engineering and Mathematics Program
- Interdisciplinary Investigation of Energy Issues
  - Design
  - Material Science
  - Physics
  - Atmospheric Science
  - Communication
  - Policy

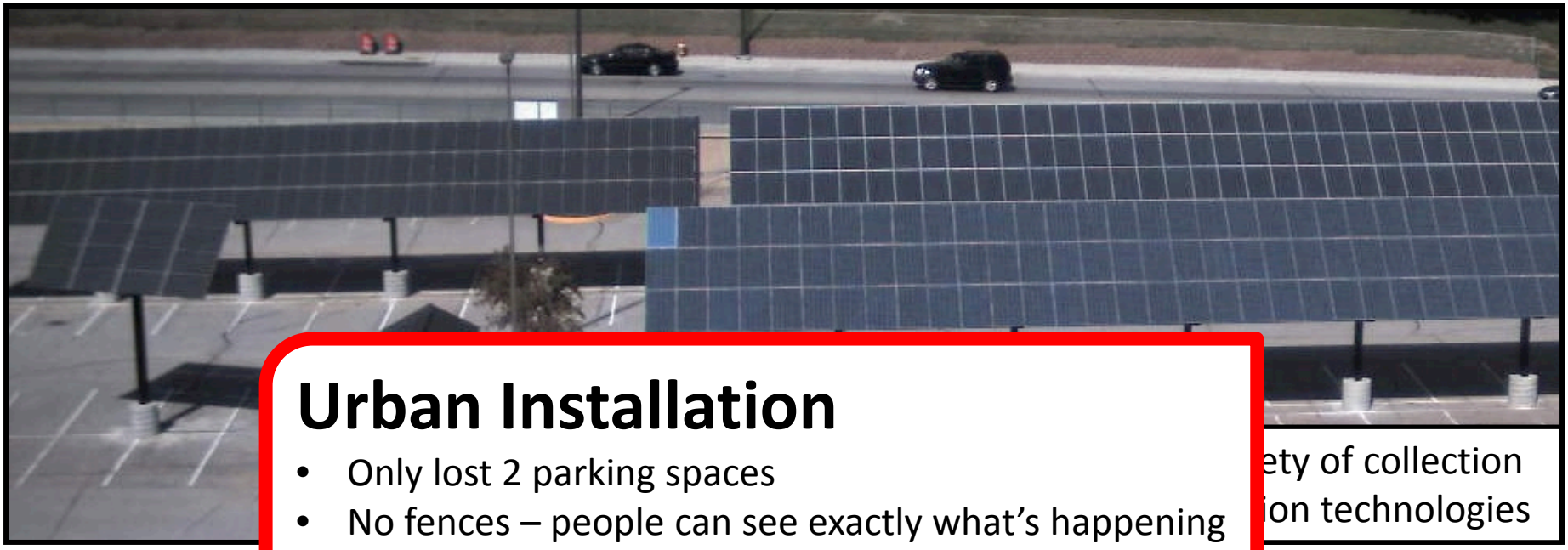
The Construction

- $1.4 million
  - US Department of Energy ($1.14 million)
    - Photovoltaics
    - Solar Heated Air
  - Omaha Public Power District ($250,000)
    - Wind
    - Geothermal
    - Solar Hot Water
    - Additional Photovoltaics
- Teaching Facility
  - Designed for student learning
- Demonstration Project for Solar and Wind in an Urban Environment

The New Curriculum

- $1.2 million from US Department of Energy
  - Solar Training and Education
  - 4 Year Interdisciplinary Program at Creighton
  - First Students Entered in July 2011
  - Collaboration with Metropolitan Community College for initial Installation and Maintenance Courses
- Working to incorporate Bio-fuels

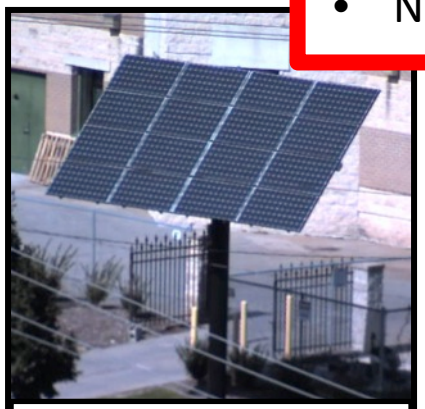
The Outdoor Classroom



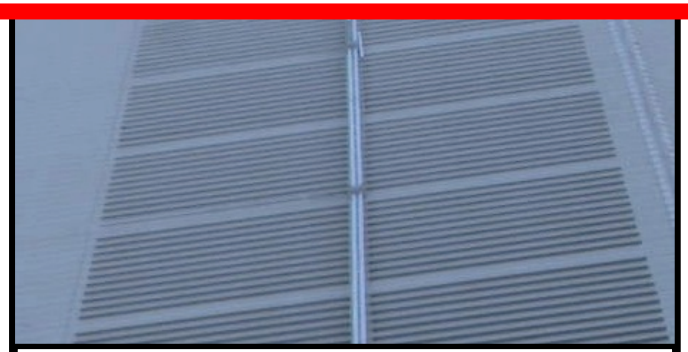
ety of collection
ion technologies

Urban Installation

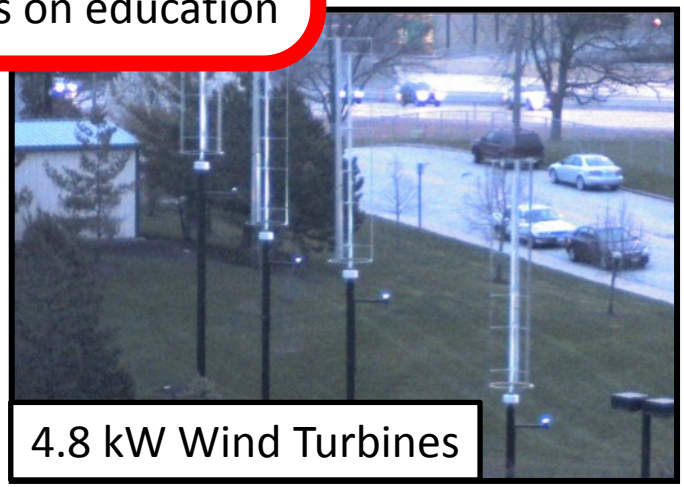
- Only lost 2 parking spaces
- No fences – people can see exactly what's happening
- Not the most energy per $ here – focus on education



3.4 kW tracker



20.5 kW – flexible PV laminate



4.8 kW Wind Turbines

Grid-Tie

- Altogether, these collectors are capable of generating approximately **120 kW** of clean, renewable energy.
- This must be converted from dc to ac to be grid compatible.

- Two strategies employed:
  - Large strings (~3 sets of 12+ panels) are converted with Fronius IG-Plus 7.5 Inverters – 10 units of this type
  - Individual panels are converted with Enphase M210 Micro Inverters More than 240 units of this type
- All of this is combined and distributed into the grid, so nothing is stored on our campus – rebate from OPPD

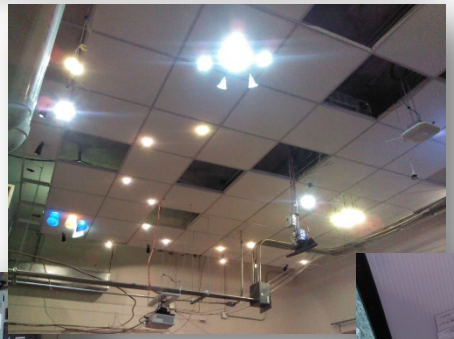
The Studio and Project Space

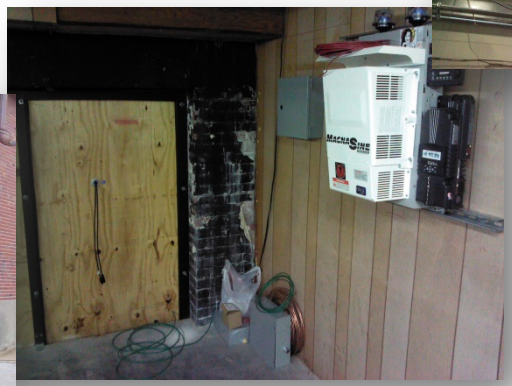
Off Grid

- We explore many off-grid strategies – from the small to large

Solar Powered Security Lighting

A Day Without "The Grid"





Building Lighting

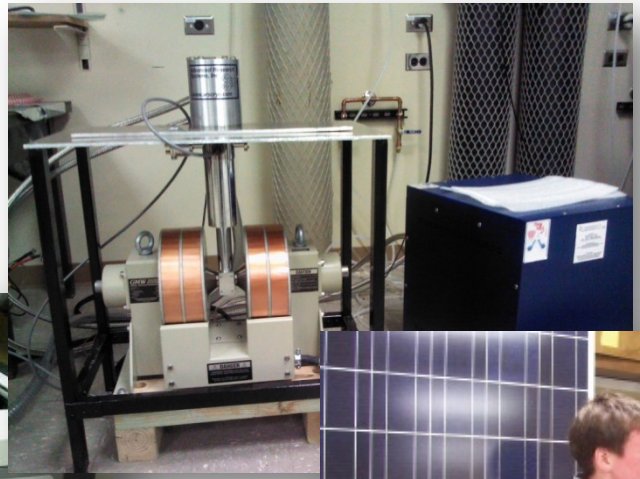
Solar Heating

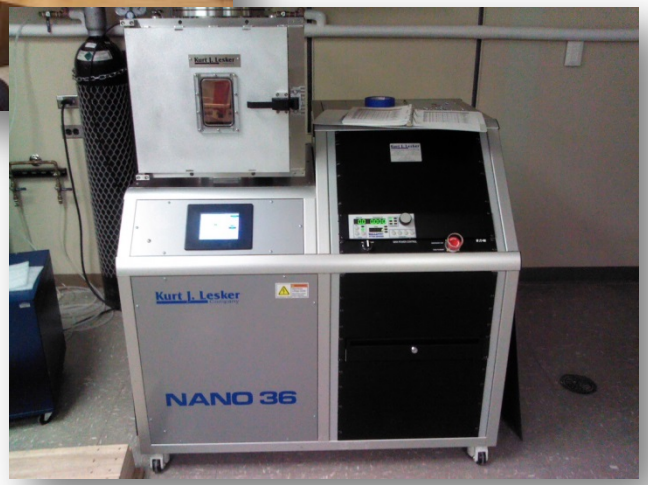
- Solar heating is an integral part of the curriculum

Student Installed Air Collector

Student Designed & Constructed Air Collector

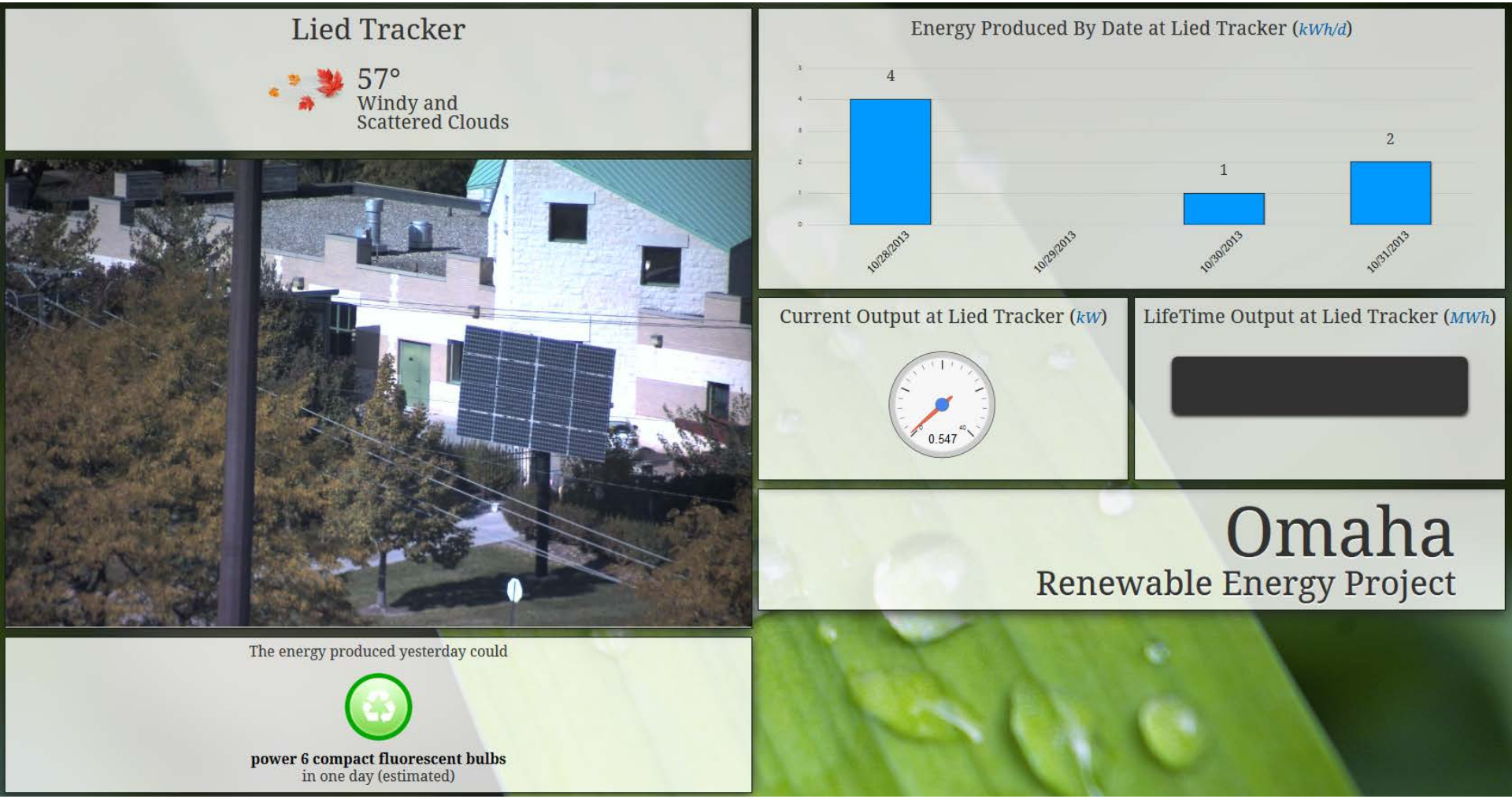
New Research Facilities





- Design and Rapid Prototyping
- Opto-electronic Testing
- Simulations Laboratory
- Photovoltaic Synthesis Laboratory

Outreach



http://www.creighton.edu/green/display/

Outreach

Energy Technology Summer Experiences

For Graduating High School Seniors

If you are interested in engineering, renewable energy or sustainable design, Creighton University's new Energy Technology Program was made for you!

ENERGY TECHNOLOGY MAJORS AT CREIGHTON

BA with a Major in Sustainable Energy - for students who wish to pursue a career in sustainable, energy policy or law.
BS with a Major in Energy Science - for students interested in a science, math and/or engineering career

Summer Course on Convective and Passive Solar Design

June 3-21 : Energy Technology 132. In this 3-credit course you will learn basic thermodynamics applied to solar technology.

Summer Research Opportunities

Energy Technology 495. This program allows students to work with Creighton faculty in their research labs before their freshman year. Students will receive credit toward the Energy major requirements

Summer Non-Credit Study

This program allows incoming freshman to have access to the Creighton Rapid Prototyping Facility, under the guidance of an engineer who specializes in sustainable design.

Fall Semester 2013 Retreat

August 11-16 : This retreat integrates an intensive week of study and work in photovoltaic solar technology. This program allows students to get a jump-start on Fall semester courses, meet fellow students and Energy Technology faculty.

Contact Program Director, Dr. Michael Cherney, to apply for these special opportunities or for more information:
mcherney@creighton.edu

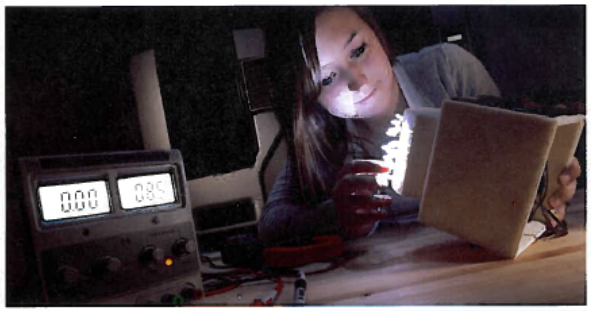
"It was an amazing opportunity to work with my future classmates and professors, getting real experience the summer before my freshman year. It really solidified my decision to come to Creighton. I knew I was in the right place!"

Erin Cheese
Energy Technology Major
CU '15

Creighton UNIVERSITY

Energy Technology Summer Experiences

For High School Students



Are you a high school student completing your sophomore or junior year in May? If so, apply for Creighton University's 3-week renewable energy and sustainable design program.

Creighton University's renewable energy program will teach you basic thermodynamics applied to solar technology. As part of the class, student teams will install two building heating systems that use the sun as their power source.

Under the guidance of an engineer, you will have access to the Creighton Rapid Prototyping Facility. Become familiar with computer-aided design systems that will turn your drawings into reality using 3-dimensional printers.

Creighton University's renewable energy program will let you earn 3 college credits as you study basic thermodynamics applied to solar technology. As part of the class, student teams will install two building heating systems that use the sun as their power source.

Total cost for the 3-week program is $900. In an effort to make this program affordable, a number of partial scholarships are available.

APPLY TODAY

Apply online
admissions.creighton.edu/energy-interest

Questions?
Contact Program Director, Dr. Michael Cherney
mcherney@creighton.edu

"It was an amazing opportunity to work with my future classmates and professors, getting real experience the summer before my freshman year. It really solidified my decision to come to Creighton. I knew I was in the right place!"

Erin Cheese
Energy Technology Major
CU '15

Creighton UNIVERSITY

Program Goals

- Graduates should be life-long learners
- Graduates should have a strong foundation in science and mathematics
- Graduates should work well in teams
- Graduates should be experienced problem solvers
- Graduates should be effective communicators
- The curriculum should reward innovation

Multidisciplinary Perspective

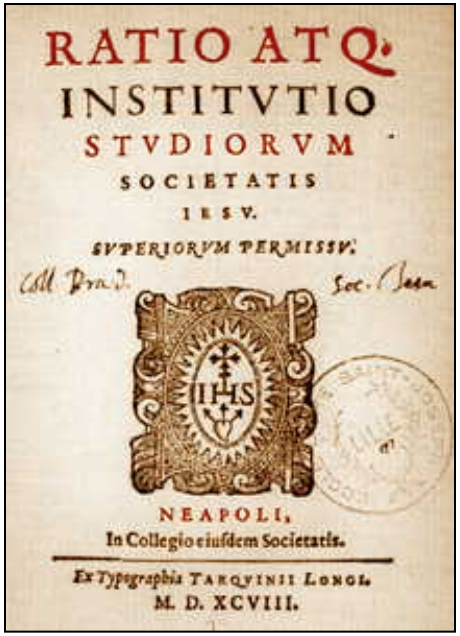
- Core General Education Courses Integrated Into The Program
- Making the Connections Explicit
- Interdisciplinary Teaching
- Looking at the Human Aspects as well as the Technical Aspects
- Problem-Solving in Research Projects
- Research Projects in the Freshman Year

Energy Majors

- B.A. in Sustainable Energy creates policy makers, lawyers and administrators with some knowledge of science and engineering
  - Only BA program requiring calculus and statistical analysis
- B.S. in Energy Science creates applied scientists with communication skills, a knowledge of policy and law, and the importance of the human side for implementing their work
- A Minor in Sustainable Energy is also available

Changing the way education is done

- Experience-Based Curriculum
  - rather than lecture based
- Promoting Innovation, Excellence and Personal Commitment to Learning
  - Identifying what you want from an experience
  - Active involvement in the experience
  - Reflection on the experience
  - Repeating an experience when useful
    - favoring high standards and a willingness to innovate


RATIO ATQ
INSTITVTIO
STVDIORVM
SOCIETATIS
IESV.
SVPERIORVM PERMISSV.
NEAPOLI,
In Collegio eiusdem Societatis.
Ex Typographia TARQVINII LONGI.
M. D. XCVIII.