UT Zero is a multidisciplinary team with the goal to develop new technologies for zero energy building for the University of Tennessee and the state of Tennessee. Our desire is to promote zero net energy consumption and zero carbon emission technology. Our mission is to bring students and faculty from various programs together to collaborate on UT Zero Energy projects.

OUR VISION

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The S.P.E.E.D. Project at the University of Tennessee is proposed for a 375kW photovoltaic solar panel array to be mounted on the rooftop of the Art & Architecture Building.

The project’s mission is to incorporate the most innovative and sustainable design elements with the leading photovoltaic modules manufactured for clean, energy efficient grid-tied solar power generation, while allowing for student involvement across multiple disciplines.

The SPEED Project will provide lasting environmental benefits for the warranted life of the system (25 years) by offsetting dangerous greenhouse gases by the following amounts:

- 16,846,875 lbs of CO₂ – the leading greenhouse gas attributable to global warming and climate change
- 25,313 lbs of NO₂ – detrimental to human health, main ingredient in smog.
- 77,813 lbs of SO₂ – causes acid rain and destroys plant and animal life.

The proposed system will provide a comparable offset to planting 2,344 acres of trees. The result will create collaborations between schools in the university, opportunities for student and faculty research, and an iconic symbol of UT’s commitment to sustainability.
S.P.E.E.D.
(Solar Platform for Excellence in Energy Design)

Investment
This budget for the solar design and installation of PV Panels and systems includes labor to set the panels. The cost of the S.P.E.E.D. Project is estimated to be $3 million. Structural steel, roofing and consulting fees are not included, due to on going analysis.

Revenue
With a fixed-position system, the solar array will generate approximately 450,000 kWh of annual energy output. The generated energy from this program is estimated at $.22 per kWh for a total of approximately $99,000 annually. Along with the revenue, there will be available research opportunities so that students will have a greater connection to other fields of study.

The Facts
- 373 kWh PV Panel Array
- 450,000 kWh Annual Energy Output
- 305 Fixed Solar Panels, Efficiency 18.7% (Sun Power)
- Roof Area Covered 373,000 SF
- 16,846,875 lbs of CO2, Green House Gas Offset
- Annual Estimated Revenue $99,000 ($.22 per kWh, May 2009, TVA Rate)
- Cost for S.P.E.E.D. Project Estimated
  - $3M PV System including Installation
  - Structural Steel, Consulting Fees (Cost Estimation in Progress)

Potential Funding Resources
- American Recovery & Reinvestment Act of 2009
- Stimulus Package for Tennessee
- Stimulus Package for UT
- Third Parties
- Tax Break Incentives
- TVA Green Switch Partnership

Solar and Federal Stimulus
America Recovery and Reinvestment Act of 2009 (ARRA) is aimed squarely at expanding renewable energy and will establish U.S. leadership in clean technologies. The State Energy Program has $3.1B in grants to State Energy Offices, however preliminary plans were due late March 09.

Conservation Block Grants have $3.2B in grants to states, counties, and cities with categories of eligibility broadly defined. The goals of these grants are directly in line with the S.P.E.E.D. project. City and County plans are due June 25.
Green^2

Our proposal for S.P.E.E.D. is formatted to not only include room for a green roof, but Green^2 facilitates both the green roof’s growth and solar array’s productivity. Because of the translucency of SANYO HIT Double™ bifacial photovoltaic modules, the reflectivity of the plants increase the PV efficiency. Green roofs reduce the heat island effect, while the panels will prevent more direct solar gain. A solar array shading a roof garden in this way is a new opportunity for research.

SANYO HIT Double™

SANYO HIT Double™ has an increased power generation compared to conventional single-sided panels at any angle and any direction. In vertical installations, faced south, power generation is increased 34%. SANYO HIT Double solar panels are a double-glass structure with aesthetics that allow brilliant light and shadows to shine thru the panels. HIT Double panels can capture additional back side ambient light, and increase system performance up to 10% or more. Costs using fewer support materials, wiring, and spend less time installing.

SPEED. Project Energy Estimation

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The S.P.E.E.D. project is composed of an enthusiastic team. Everyone is encouraged to press goals within their own field, but aware of the future of sustainable moves that can be made in our community.

Edgar Stach   Architecture Faculty
James Rose   Architecture Faculty
Leon Tolbert   Engineering Faculty
Faete Filho   Electrical Engineering Ph.D. Student
Wyn Miller   Masters of Landscape Arch. Student
David Chen   Master of Architecture Student
Alan Reece   Graphics and Communication

Support:
McCarty Hosaple McCarty Inc. Architecture, Knoxville, TN
LightWave Solar Electric LLC. Nashville, TN
Ross Bryan Associates Structural Engineering Nashville, TN

Potential Projects in the Future

- Design Team moving towards a Solar Decathlon Entry
- ORNL Research with Moonis Ally Energy Calculations (D.O.E. Funding)
- UT Zero China with Tsinghua University
- Collaborative Team Light & Space Academy at Helsinki Metropolia University of Applied Sciences, Finland

Teaching
- Architecture
  Undergraduate & Graduate Design Studios
  Materials Methods and Construction
- Mechanical Engineering, Stan Johnson
- Electrical Engineering, Leon Tolbert
  Graduate Studies
- Landscape Architecture

UT Zero Current Projects

UT Zero is continually trying to pushing new projects. The SPEED project strives to be a blueprint in which UT can move forward in making this campus a landmark for sustainable energy in the U.S.

Future Structures for S.P.E.E.D.:
- Sports Facilities
- On Campus Offices and Labs
- Parking garages
- Shading canopies
- Energy Plus Facades
- Retrofitting Facades

Contact: Edgar Stach, Associate Professor | Email: utzero@utk.edu
The University of Tennessee, Knoxville | College of Architecture + Design
1715 Volunteer Boulevard | Room 457 | Knoxville, TN 37996
Phone: 865.974.6713 | Fax: 865.974.0656 | Web: http://utzero.utk.edu