LEMUR CONSERVATION FOUNDATION

The Comfort Branch is solar powered, requires no maintenance, and is highly capable. Loadings in excess of nine lemurs are structurally supported with a safety factor of 4.1 and the surfaces are capable of 20-degree temperature differences from ambient, even on the hottest of days. Two on-board batteries provide hours of power on overcast days and work seamlessly with the solar panel and the load seen from the thermoelectric modules. These thermoelectric modules are capable of both heating and cooling and can be used to maintain the desired panel temperature. They are controlled based on both plate and ambient temperature readings.

Waste heat created by the thermoelectrics is rejected via the three forced convection heat sinks attached to the frame which sandwich the thermoelectric modules between the ribs/panels. The Renogy 100-watt solar panel is capable of providing three times the necessary power (on the best of days), but, according to government insolation values, it can be expected to provide approximately 527 watt hours/12 hour day, which exceeds the conservative estimate of 340 watt hours/12 hour day that will be required by the thermal system. A solar charge controller funnels all of the generated power through the batteries where it is either stored or distributed to the thermoelectric modules at the desired voltage. This voltage is controlled by a DC-DC convertor that varies its output based on the controlled digital potentiometer and also a relay which switches the system between heating and cooling.

The frame was constructed entirely out of aluminum angle iron and square tubing, providing an affordable and strong structure. The PVC outer shell provides a branch like surface for lemur lounging and aluminum paneling and ribs that conduct the temperature from the module up to the surface. A hot wire foam cutting technique was used to construct internal insulation which holds the ribs and modules in place while maintaining the temperature differential. Developing an electronics system which agreed with the thermoelectric modules required creativity. The solar panel, welding, and thermoelectric modules were the most expensive parts of this project.

The branch is designed to thermally comfort up to three lemurs reliably without maintenance or an external power supply. The iterative design and analysis process led to a simple and effective plan which was implemented in the form of a fully functioning prototype all within the spring 2013 semester. The team is now in the final stages of building and installing the project.

The project is not yet finished. The team yielded a nice proof-of-concept prototype, but the design needs improvements that include cooling effectiveness, energy usage, control, weather resistance, and aesthetics. In total, $5,000 is needed for the project.

Help the lemurs: You can help this project and help these lemurs! To help fund a Fall 2014 senior design project that will help bring the Lemur Comfort Branch closer to completion, just click the "Donate Now" button on this link to make an online donation to this project. All donations of $20 or more will receive an "I Helped the Florida Lemurs" thank-you gift from us--and from the lemurs! (This crowd raising site is a part of the University of Illinois Urbana-Champaign's School of Engineering site.)

About Lemur Conservation Foundation: Lemur Conservation Foundation (LCF) was established in 1996 by Penelope Bodry-Sanders. LCF is a leader in the conservation and preservation of the primates of Madagascar through programs dedicated to observation oriented research, education, and lemur propagation, with a commitment to infuse art into all of our mission programs. LCF is an American Association of Zoological Parks and Aquariums accredited private, 100-acre facility based in Myakka City, Florida. Our current lemur population of 47 animals thrives in naturalistic free ranging habitats ranging in size from 9 to 13 acres, and smaller enclosures for animals in need of a more specialized environment. LCF is a respected voice for science, conservation, education, art, and lemurs, the iconic image of the conservation challenges and environmental stewardship facing Madagascar and the world.

About the Comfort Branch Team: The Comfort Branch project is developed for LCF by Clay Nesler, with funding from Shell Corporation and patent contributions by Johnson Controls. Mr. Nesler, a part-time Florida Gulf Coast resident, is VP for Global Energy and Sustainability at Johnson Controls, and Alumni Board Member at the University of Illinois Urbana – Champaign School of Engineering. Mr. Nesler is VP of Global Energy and Sustainability for Johnson Controls Building Efficiency. The students developing Comfort Branch technology is a team from The University of Illinois at Urbana Campaign School of Engineering.