



Advantage, Vanderbilt: How Vanderbilt Women's Tennis Team has Initiated Unprecedented Campus Wide Renewable Energy Initiatives

By Ford Ainslie

Background

On April 19th, 2015 during match point Marie Elise Cesares sent a forehand passing shot past her opponent to secure Vanderbilt University's Women's Tennis Team their first ever SEC title. The ball didn't stop rolling there as one month later Marie and the rest of the Vanderbilt Women's Tennis Team would march on to secure the school's first ever National Tennis Championship. As much as Marie's actions on the court guaranteed her and her team a spot in Vanderbilt's prestigious history, it was her actions off the court that are having major positive impacts today.

At the same time Marie battled for her SEC and National Championship titles, her application for solar panels on Vanderbilt's Currey Tennis Center had been approved and installation was in full swing. While the women's tennis team battled against UCLA to win their first ever national championship in Waco, Texas, their home courts were in the process of being forever changed as a result of Marie's proposal.

During the winter of 2014 Marie, with the guidance of her head coach Geoff Macdonald, submitted a proposal to Vanderbilt's Green Fund. After some negotiations, logistical evaluations, and structural engineering surveys, Marie's project was approved.

The final installation was completed in the fall of 2016 and contained 67 Solar Laminate PVL panels and four SunMaxx Thermopower panels atop the tennis center.

The installations proved their worth within months. The solar panels have reduced the Tennis Center's natural gas consumption by 40% consistently every month since installation, leading to hefty savings for Vanderbilt according to Geoff Macdonald. Two years later Marie's actions off the court appear to have had a permanent impact on campus, as Vanderbilt has commenced serious discussions on using renewable energy campus wide.

Our story is one of a student initiative that received broad support from students and faculty alike leading to Vanderbilt potentially becoming the most sustainable and environmentally forward thinking school in the SEC. Vanderbilt, a school that prides itself on environmental stewardship, also has their eyes on the financial savings that simultaneously promote social responsibility. As the costs of renewable energy sources continue to decline, Vanderbilt has kept their potential as a campus-wide energy source at the forefront.



The Green Fund is a student and faculty run organization created to reduce greenhouse emissions systematically while improving the sustainability of Vanderbilt energy profile through funding student-initiated projects with both environmental and economic benefits. The Green Fund has an annual budget of \$150,000 and enables students to engage in the process of evaluating and promoting sustainable energy initiatives. Thanks to the Green Fund any Vanderbilt student can propose a project for consideration.

First Renewable Energy Installations at Vanderbilt

Marie's lasting impacts would not have been possible if Vanderbilt was not a front runner in their environmentally based initiatives. The Green Fund, Vanderbilt Student Government's Environmental Affairs Committee, and SPEAR (Students Promoting Environmental Awareness and Responsibility) provided as an avenue for Marie to propose her idea and have this idea flourish into the very real movement that it has engendered. As Simon Silverberg, Green Fund student member and Environmental Affairs Co-Chair, put it "(the Green Fund) has provided students the space to implement their own ideas that are often acted on by administration". Simon has seen Vanderbilt use the Green Fund as one of the many ways that "they implement institutional change to reduce their environmental footprint".

However, it is important to understand how Marie began this large institutional change. Before Marie's proposal, Green Fund projects and the Environmental Affairs Committee projects mainly focused on recycling initiatives and lectures promoting green behavior according to some. Marie changed the game – and set a new bar for all of Vanderbilt.

According to her coach, Geoff Macdonald, "Marie endured a lot of work and adversity to have these solar panels installed, and I have

solar panels installed, and I have witnessed the solar panels lead to a change in behavior on campus by raising awareness" to a more environmentally friendly student body. Geoff alludes to a point heard again and again from various students, faculty and staff at Vanderbilt. Michael Vandenberg, Vanderbilt Law School Professor and Climate Change Research Network Co-director, believes "the tangible outcome that was produced at the tennis center could have easily been the catalyst that has led to a greater interest for renewables on campus". Marie's efforts would not have gained the traction they did if it were not for their broad support and demonstrable financial savings renewable initiatives can create.

It is critical to note that these installations were not seamless, and the problems encountered along the way proved to be a learning opportunity for future solar projects at Vanderbilt and potentially other institutions. The eight month process involved structural engineers, school administration and solar energy companies. Due to the tennis center's structural capacity, it was unclear whether the building could support solar panel installations. As snow is unusual in Nashville, the weight rating for the structure was rather low, and the tennis center's roof was not rated to handle significant weight. Uncertainty rose and structural engineers canvassed other potential installation sites. However, Marie remained determined and with persistence was able to convince

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the administration to re-analyze the tennis center itself.

With Marie's encouragement the school succeeded in finding a brick section off the base of the tennis center that proved to be an ideal location for the solar panels. The journey did not end there as the team had to overcome further complications related to the solar panels themselves. After the solar panels had been purchased a variance in energy capabilities was revealed between the alternate current and direct current readings. However, in keeping with spirit of Marie's tenacity these obstacles were overcome resulting in an installation that has both proven to be an environmental success and encouraged the conversation for much larger scale renewable initiatives on campus.

Key to Success: Strong University and Student Relations

Marie's momentum would have not been possible, if Vanderbilt's administration did not cherish their relationships with their students. Geoff Macdonald played a key role in Marie's development as he believes, "your work as a coach is to foster your athletes interests way past the court. Marie's interests off the court came in the shape of her University reducing their carbon footprint and becoming more socially and fiscally responsible." The relationship that Macdonald was able to create with his players led to "this vision and energy starting

to "this vision and energy starting as this pocket of interest that has slowly expanded across campus faculty and staff".

The Vanderbilt Green Fund enables faculty members to develop relationships similar to those that Macdonald has been able to foster with his athletes, while creating a wonderful learning experience for students. "The Green Fund acts as an opportunity for students to grow their interest and knowledge with sustainability," according to Darren Bevill. Many institutions throughout the United States have efforts similar to Green Fund and some are on a larger scale than Vanderbilt's \$150,000 annual grant. However, Vanderbilt's smaller scale is intentional as they aim to have students recommend projects on a scale that is feasible and practicable to improve the odds that the university can act on their proposals; and so that students can be involved in the actual implementation whenever possible. The very scale of Vanderbilt's Green Fund was arguably the key ingredient to the success of Marie's project.

2nd Wave towards Campus Wide Renewable Energy

The tennis courts' solar installations inspired many students and faculty from all walks of university life. Two students, Fernanda Contreras and Ian Faucher, both Class of 2019, were particularly inspired by the installations and self



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*Andrea George
Director, Sustainability and
Environmental Management Office*

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inquired how they could be a part of this new movement. As a teammate of Marie's, Fernanda finished the 2018 season ranked tenth nationally, is a two-time All-American and a member of Vanderbilt's Environmental Affairs Committee. Fernanda noted "I was witnessing students push the envelope on what we believed our role could be. I was noticing that this push was being followed with support from administration and students alike – and that was something I wanted to be a part of".

Ian and Fernanda replicated and strengthened Marie's proposal into their own for Vanderbilt's Recreation and Wellness Center. Their Green Fund proposal requested the installation of photovoltaic solar panels on the recreation center roof. They argued that such installations would both reduce the University's greenhouse gas emissions and provide strong financial returns. Their proposal also recommended starting an energy saving behavioral initiative on campus that would be led by Vanderbilt professors and students. Their idea was to identify energy saving behavioral interventions that could be enacted upon to decrease campus energy and resource use. To do so, they commenced a study focused on resource intensive behaviors (ex: increasing recycling rates of carbon-intensive items, reducing food waste, terminating unused lights and reducing water use) and then proposed to administration, initiatives that would reduce these behaviors – overall, leading to a decrease in energy consumption.

Fernanda and Ian's proposal was far more impactful than they could have imagined. Mike Vandenberg points out that "all student based efforts will always have a much larger impact on the University's carbon footprint than any faculty or staff could ever have."

Vandenberg's remarks ring true with regards to Fernanda and Iain's proposal. Their recommendation is still under review, and the potential solar panel installation is being evaluated by structural engineers. However, their proposal led to a burst of deeper reflection among the Vanderbilt administration. As Vanderbilt continued to explore individual high cost

student initiated solar panel projects around campus, the University decided to get a big picture view in aims of making sure resources and finances were being used most efficiently. These administrative actions highlight how projects such as Marie's, Iain's and Fernanda's led the administration to develop a clearer long-term strategy.

"Students at Vanderbilt and across the country are not aware of how much power they have on a campus" - Michael Vandenberg, Law School Professor and Co-director of Climate Change Research Network

These student initiated projects created momentum for administration to analyze their long term energy goals and efforts. Not to say that such efforts were not already in place, for they were. However, the high levels of student initiative solidified the importance of sustainability to many Vanderbilt's leaders.

According to Dr. Andrea George, Vanderbilt's Director of Sustainability and Environmental Management, "the students at Vanderbilt have played an important and expansive role in pushing the question how do we use our resources on campus most efficiently and have dug deep to bring forth many new and innovative sustainable practices on campus." To maintain such significant interest Dr. George enlisted a group of students to analyze every roof on campus with GIS technology and used solar software systems to determine every building's potential for renewable installation. More specifically, the Office of Sustainability enlisted seven student interns to determine each roof's (more than 250 VU buildings) solar panel accessibility. To do so, a list of criteria was formulated, including but not limited to: roof size, shape, sloping, shading and space taken up by mechanical equipment. The student's then developed a written protocol on how to use ArcGIS and Google Earth to determine how each building met the criteria. The student analysis took the entire

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spring semester of 2018. After all information had been gathered, the information was sent to a contractor who then used a solar software package to determine how much solar technology could be placed on each roof. The contractor also assessed initial costs and how long payback periods would take. As Vanderbilt is in the midst of concluding their assessment phase, the tiered analysis and most recommended buildings will then be passed to school administration. This initiative has exemplified how impactful the student efforts on campus have become. Marie's proposal planted the thought seed that ultimately led to Vanderbilt launching two energy studies as part of the larger FutureVU initiative.

Vanderbilt's Next Steps Towards Renewable Energy

By 2015, Vanderbilt administration decided it was time to be proactive in developing on-campus student initiatives. Since then Vanderbilt launched the FutureVU initiative. FutureVU is a high level, holistic vision for the physical development of the campus over the next 20 to 30 years. In addition to providing a vision for building growth and change, FutureVU includes studies on mobility and transportation, accessibility, and sustainability. Throughout the initiative, engagement with the campus community, including students, faculty and staff, has been an integral part of the development of the vision.

Sustainability is a key theme throughout FutureVU, and initial analysis and guidelines that were developed as a

as a part of the vision are now being studied more closely through two key studies, the Blue-Sky Energy Vision study and the Large Scale Renewable Energy study. These studies consider the impact of reducing greenhouse gas emissions, highlight potential carbon reduction targets, and lay out processes to achieve such targets.

The Blue-Sky Energy Vision Study commenced in November of 2017 and illustrates significant potential for Vanderbilt to reduce their carbon footprint and decrease energy consumption on campus. The Blue-Sky Study focuses on on-site energy reduction through improved building energy efficiency and the use of renewable energy such as solar panels.

The Large-Scale Renewable Energy Study commenced in September of 2017 and is assisted by Customer First Renewables. The study examines potential off-campus, large-scale (greater than 2 Megawatts) renewable energy sources that include distributed solar and wind projects. The study evaluates the viability of renewable potential options on the basis of key criteria that included financial, social and environmental benefits as well as risk mitigation. The goals of the study and any subsequent actions are to: maximize environmental benefit, offset a portion of Vanderbilt's electric supply, increase renewable energy capacity (if feasible within the TVA energy grid), and enhance Vanderbilt's ability to achieve future carbon reduction goals.

The three studies combined have led to meaningful discussions regarding the possibility of renewable energy taking

Administration Changing Their Energy Goals

“Three years ago, I would have told you I had one driving charge – reduce energy consumption - and any project that I proposed to reduce energy consumption aimed to have a three year return on investment. However, today return on investment is no longer the primary concern. I now evaluate projects on three different scales: Social, Economic and Environmental. This enables us to consider projects that would not have been considered before.”

*Darren Beill,
Campus Energy
Manager*

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over as the primary energy source at Vanderbilt. The studies have proved so promising that Vanderbilt is having substantial discussions around what Vanderbilt's energy future might look like if the sky was the limit, hence the term "Blue-Sky Energy Vision Study". Many schools have committed to becoming carbon neutral by a certain year in the future (six out of fourteen SEC schools), but Vanderbilt's discussion of no limits, no holds barred energy visioning is exciting. The focus of Vanderbilt's leadership to be responsible environmental stewards reflects both their concern for the planet's future as well as the shorter-term potential for significant financial savings that renewable energy presents.

"The BlueSky Energy Study is determining what no limits would look like, we are thinking out of the box, open-minded and towards the future." - *Andrea George*

Why Vanderbilt is Taking Renewable Energy Seriously

Currently, across the nation, renewable energy is as an affordable electricity source and appears the most promising avenue to reduce energy prices in the future. Renewable energy production requires an initial investment to implement, but they operate at very low costs and require little maintenance. Solar energy has been on the rise in the US, as the average cost of solar installation dropped more than 70% between 2010 and 2017 (SEIA. Solar Market Insight Report 2017 Q2). Wind energy, another form of renewable energy, has also grown dramatically as the cost of generating electricity from wind dropped 66% between 2009 and 2016 (AWEA. U.S. Wind Industry Annual Market Report: 2016).

Market trends suggest these costs will continue to decline as more companies continue to

take advantage of renewable sources and the market for these products continues to develop. These developments have led to Vanderbilt's intense exploration of the transition towards renewable energy. Another factor promoting a transition in energy sources is the volatility of fossil fuel prices. For example, traditional energy sources suffered dramatic price fluctuations in 2008, as coal prices rose rapidly from increased demand before 2008 and then fell rapidly after 2008 when global demand sharply declined (UCS. 2011. A Risky Proposition: The financial hazards of new investments in coal plants). Such price fluctuations are nearly impossible to foresee, which makes budgeting energy costs very challenging. By contrast, the reliability of the costs of renewable energy is very attractive to Vanderbilt and other institutions around the nation.

Vanderbilt's leadership in responsible environmental stewardship is driven both by their long-term concern for the health of our planet and the short-term financial benefit to the institution's energy bills. Given the magnitude of the potential savings from renewable energy, Vanderbilt has undertaken two different studies focused on the longer-term impact of different energy sources in the future. Renewable energy appears to be the clear front runner in both studies.

Vanderbilt Is Not Alone – Other SEC Schools' Renewable Initiatives

Vanderbilt is not alone in the SEC, as other SEC schools have begun to recognize the potential economic benefits of renewable energies. The University of Florida has set a goal of achieving carbon neutrality by 2025. Since 2010 the University of Florida has undertaken three large scale, solar panel installations. While using renewable energy reduces both costs and carbon dioxide output, like Vanderbilt, the University of Florida is making significant investments to improve the energy efficiency of buildings across their campus to reduce their overall energy consumption. The University of Arkansas has also followed suit by

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Installed Solar Panels at the
University of Missouri



Installed Solar Panels at the
University of Tennessee

setting a carbon neutrality goal of 2040. The University of Arkansas is taking this goal very seriously and achieved their 2021 mid-term goal four years ahead of schedule by reducing greenhouse gas output to 1990 levels by 2017.

The University of Missouri has proven to be a role model for many in the SEC, as currently renewable energy makes up more than 34% of the total campus energy supply. In doing so, University of Missouri has experienced meaningful financial benefits. As a result of their renewable energy usage, the university's annual cost avoidance was \$9.1 million last year and has totaled \$78.1 million since 1990. Missouri's achievements have granted them national recognition as they were placed on the Top 30 On-Site Generation List alongside institutions such as Apple, Walmart and the U.S. Department of Energy. The university has also been ranked fourth nationally in terms of on-site production by the EPA's Green Power partnership.

Vanderbilt's renewable initiatives are not alone in Tennessee. The University of Tennessee has been recognized by the EPA as the top Green Power Purchaser of colleges and universities in the nation. In 2005, the university began purchasing renewable energy through the Tennessee Valley Authority's "Green Power Switch Program". This program has allowed the University of Tennessee to increase demand for renewable energy in the southeastern US and also to

demand for renewable energy in the southeastern US and also to offset a portion of the campus' fossil fuel consumption. Overall, the University of Tennessee has been able to purchase large amounts of certified renewable energy credits (REC), in the form of both solar and wind energy, totaling 94% of the university's overall energy use. The University of Tennessee also has a carbon neutral goal for 2061.

Vanderbilt also receives power from the Tennessee Valley Authority, and the school is currently exploring the Green Power Switch Program. This program allows any household, business or institution to purchase RECs – symbolizing a concrete interest in environmental issues and minimizing environmental impact. The Green Power Switch Program does not provide the individual or company with renewable energy but instead allows them to offset their fossil fuel energy with renewable energy that powers other interests. Vanderbilt is exploring the option of using renewable offsite energy for RECs, as the University of Tennessee does. Vanderbilt remains optimistic about creating renewable energy that directly serves their campus and the Nashville metropolitan area. Vanderbilt views onsite renewable energy as more beneficial to the Nashville community and thus has kept both avenues open during this time of evaluation. Auburn University, Mississippi State University and the University of Mississippi have respectively committed to 2050, 2042 and 2050

carbon neutral goals. It is important to recognize why Vanderbilt and these seven other SEC schools are viewing renewable initiatives opportunities with such enthusiasm. Clearly the reduction of greenhouse gas emissions reduces a school's carbon footprint, improving their environmental stewardship. However, the primary driver for most institutions is the savings that renewable energy can provide. Studies by NY ISO, Synapse Economics, and NREL all concluded that renewables cut energy costs system wide - and that the more fossil fuel plants that are eventually replaced the greater the savings is. Vanderbilt and the aforementioned SEC schools are well aware of these economic benefits and aim to increase such savings even further in the future.

Call to Action: Students

As this article has illustrated, the role of students was the key ingredient to the change Vanderbilt is currently experiencing. Simply put, colleges and universities will always prioritize their students and their student's desires. With this, students are the frontline for the environmental movements taking place on campuses nationwide. If what is going on at Vanderbilt is something you want to be a part of at your institution, there are a few steps you can take:

1) Determine your goal or vision

Did this article inspire you? Do you think what happened at Vanderbilt could happen at your institution? Could you lead the charge? If yes, to any of those questions, determine what could be feasible at your school and begin to think of how you could advocate and go about achieving your vision.

2) Green Fund or Environmental Clubs on campus

After you have determined your vision - it is important to find people who can help. Does your school have a Green Fund? Many institutions have their own version of Vanderbilt's Green Fund. If not, what Environmental Clubs or movements already exist on your campus? Determining these answers and getting involved with whatever exists at your school - is the best way to unite and find students that have similar visions as you.

3) Find your administrative allies

After you have found students to help carry out your vision - it is important to find faculty and staff that will advocate for you. Your school will have faculty and staff that are advocates for the environment. Determining who those faculty are and then enlisting their aid is a crucial first step. Your institutions Environmental Department is a good first place to look. Also, check if your institution has a Sustainability Office.



“With the recently plummeting costs of solar panels, I believe going green and using renewables has become less political and more of an intelligent economic cause.”

*Geoff Macdonald
Head Coach of Vanderbilt's
Womens Tennis Team*

**Macdonald played a vital role in the VU solar panel installations by providing support and guidance to Marie and Fernanda. Macdonald has since headed an unofficial on campus renewable advocacy meeting, acting as a think tank for renewable on campus potential that is attended by VU faculty and staff.*

4) Plan and submit a project

With your newly formed partners (students and faculty) determine what the final vision and goal is. Realistically, with new input from others, this goal or vision may have changed. Determine if you are going to use certain clubs or funds at your institution to push your agenda. Take the necessary steps and submit your proposal to the appropriate administrative office at your institution.

Call to Action: Faculty and Staff

As a faculty or staff member at your institution you play a vital role in the community of your institution. If what is occurring at Vanderbilt is something that interests you, you can take certain steps to replicate what is occurring in Nashville. As the article illustrated students would not have had the success they did, if it were not for the help of faculty and staff at Vanderbilt. There are a few steps you can take to start a movement on your campus:

1) Interested Offices and Departments

A crucial first step, is determining if there are any departments or offices at your institution, run by staff in charge of planning sustainable practices or environmental management at your institution. Does your university or college have an Office of Sustainability or an office of Environmental Management? If so, either are a great first step to determine what initiatives are currently underway at your institution. If not, what faculty or staff sponsor student run environmental groups on campus? These faculty and staff may be best plugged into the environmental initiatives on campus – and will act as a good starting point for you to determine what your potential role could be.

2) Faculty Interest Group

Is there a space for a potential faculty interest group at your institution? Geoff Macdonald, Head Women's Tennis Coach at Vanderbilt, was able to start an informal solar interest group. The power of such a group, even if it is informal, is that it provides a forum for faculty to discuss environmental issues and concerns they have on campus. Such a group can lead to brainstorming, the sharing of ideas and act as an avenue for concerned faculty and staff to approach fellow colleagues that are in positions to implement change. A united front among faculty and staff, or even a group of faculty of staff from different departments and parts of the institution, demonstrates to administration that this is something the institution should take seriously.

3) Aiding Students

As seen at Vanderbilt, students play a crucial role in initiating change at any institution. However, students assisted and guided by faculty and staff usually have a much stronger impact. Are there any clubs or groups you could become a faculty sponsor or member of to support students? Do students find you approachable? Have you demonstrated to students that you are a viable resource to help students on any ideas or visions they encounter? A faculty or staff member may never be able to predict when a student could approach them about a certain vision or idea – however, always maintaining an approachable character is important.

Who To Contact

Any university or individual that is interested in learning more about Vanderbilt's success with renewables and how to begin renewable initiatives at their school should contact:

Vanderbilt Office of Sustainability
SustainVU@Vanderbilt.edu