

***reACT*, adapt, respond**

reACT is an innovative building system designed to adapt and respond to diverse communities and ecosystems. Team Maryland created **resilient Adaptive Climate Technology** to showcase how a sustainable future is more than just designing a better built home; it is a lifestyle system that incorporates a home with its surrounding environment, interacts with its occupants, and strives to give back more than it takes. This lifestyle system is supported by innovations mindful of regeneration that can be seen and explored throughout *reACT* communications. A modular 'kit-of-parts' home is the base of *reACT* as a lifestyle system. The ability to customize a home to adapt to the occupant's unique needs is complimented by the technologies and innovations that increase energy efficiency, power generation, comfort, self-reliance, and overall enhance sustainable living.

Why do we *reACT*?

reACT emphasizes regenerative principles as it strives to promote positive sustainable lifestyles and self-reliance within communities. Traditional Native American knowledge was blended with western scientific thinking to develop a set of regenerative principles Team Maryland specifically recognizes as part of *reACT*'s lifestyle system.

Replace power with knowledge: knowledge is power.

reACT supports sustainability by educating and informing the occupant how to maximize energy usage and minimize waste. The automation developed with virtual house technology learns from its environment. For example, a prediction in heavy rainfall or a peak in energy producing hours is used to suggest to the occupant the best times to perform resource intensive tasks such as washing the laundry or using appliances through the user interface system.

Redefine waste as resources.

Both sustainable and economical, what once may have gone to the landfill, water treatment centers, or lost in the form of heat energy, can be collected, recycled and reused with *reACT*. A micro-ecosystem is created with *reACT*. The water systems that collects greywater and rainwater sending to irrigate the landscaping or through a filtration system that aspires net-zero water balance and production of potable water. The heart of the home, the central Greencourt (both a courtyard and greenhouse) was a key design feature for recapturing resources. Heat is collected at the top of the Greencourt and directed to the mechanical systems for use in several functions. Heat pumps precondition refrigerant lines and the water heater while the ventilation system pre-conditions incoming air temperature. The heat is channeled to a solar oven and dryer accessible in the attic via a lift system. Organic waste can be composited and used to support the landscaping and growth of plants that are an integrated system in the home.

Self-regulating building systems are achieved through automation.

Although the occupants can choose to use the systems in a manual mode or by customizable schedules, the automation ability allows for greater efficiency and independence. Energy modeling and virtual house technology are utilized to give input to the power, HVAC, and water systems to

maximize energy/resource generation and minimize energy/resource loss.

Affordable lifestyles are promoted by *reACT*.

Aside from the customizable modular design, it features disentangled systems, for easier access to all the plumbing, electrical and HVAC systems via removable wall panels throughout the home. The automation system educates and informs occupants of their energy production and usage making suggestions for ways to improve the energy balance. During times of surplus, electrical energy can be sent back to the grid, the utility company pays the home occupant for the power generated. *reACT* allows for greater flexibility in growing food, water recycling, and energy usage reducing the cost of procurement.

Promotes wellness, a good home means good health.

Promotes wellness, a good home means good health. Active and passive systems interact to promote wellness. *reACT* utilizes a ventilation system to circulate fresh air in a home designed to enable intelligent airflow. *reACT* automates temperature and humidity to maximize occupant comfort. Plants grown on the greenwalls contribute to the air quality and the hydroponics systems provides food for consumption. Indoor outdoor connection is important to promoting physical and social wellness which starts with the Greencourt, the central greenhouse courtyard. Serving to not only collect heat used with the energy efficient mechanical systems, the Greencourt increases light and connects living spaces. In this flexible space where indoors and outdoors meet the occupant can enjoy natural sunlight in a transitional space that can store plants or be opened up so living space blends with the landscape and surrounding environment.

Grows nutrient rich foods.

The hydroponics system consists of edible plants that thrive in a soilless nutrient enhanced water solution. The plants are low maintenance and readily available for use and consumption within *reACT*. The green walls and planter boxes offer space for a variety of plant life. *reACT*'s water system regulates irrigation using both rainwater and graywater for all the landscaping components lowering maintenance required to have a diverse selection of plant life. Organic waste can be gathered and used to generate compost that supports growth of nutrient rich foods.

Generates clean energy, and promotes self-reliance.

reACT has roof mounted PV array oriented to be compatible with various diverse environments depending on the occupant's requirements. Energy storage via an on-site battery is a key component of the power system to enable energy usage at times when energy production is low. *reACT* further empowers occupants to be self-reliant by allowing them to decide if and when energy can be sent back to the grid. During these times of surplus, *reACT* generates income for the occupants. *reACT* supports an urban lifestyle, but has the ability to go off grid and support individuals or communities removed from utilities.

Produces clean water

A net-zero balance aspiring water system intelligently recycles greywater from the sinks and rainwater collected from the roof before filtering and sending clean water back into circulation.

Clean water is an important part of wellness and healthy living. The benefits of producing clean extend far beyond just healthy living. Much like generating clean energy, producing clean water increases self-reliance providing individuals and communities to the flexibility of living off grid if they choose.

Over the past two years, a journey to understand and learn from traditional Native American knowledge, culture and values has guided Team Maryland towards reaching harmony between the built and natural environments. *reACT*'s target market is represented by a young Nanticoke Indian couple starting a family in Denver, CO. Inspiration was found in a well defined market whose members are deeply tied to nature, whose values are ecologically grounded, and whose culture reveres Mother Earth. Team Maryland hopes all American's will ultimately embrace these values, however, we are conscious that currently there is no well-defined cultural, political or ethnic group that is actively seeking sustainability and regeneration as we discovered Native Americans to be. By promoting balance in the natural world with western scientific innovations and design *reACT* developed a unique identity that presented a solution for a more sustainable living model. With this balance in mind, *reACT* promotes a lifestyle which reevaluates what is considered waste while recapturing energy and resources. The modular design allows for change according to the occupants needs. A uniquely *reACT*ive 'DNA' makes it possible to custom the home to meet those needs. Much like a turtle, *reACT* learns from its environment, constantly adapting the regenerative systems to optimize energy use, comfort, and efficiency. In these ways, *reACT* is a solution, a living organism - not a static object, immune to change. As such, Team Maryland communications strategies bring *reACT* to life, in order to eliminate any disconnect between design intent and public perception.

Goals

Ultimately, Team Maryland strives to educate the general public on how *reACT*'s innovative systems model can shift the built environment towards a more resilient future. A future whose benefits can not only enjoyed seven generations from now, but right now. These values are embraced by Native American's through traditional knowledge systems and play a strong supporting role in persuading western thinking throughout *reACT*'s goals and strategies. Empowering individuals through education that is more than theoretical, rather hands-on and experiential, shares a more impactful message increasing the likelihood such a message will be internalized. Both a broad understanding of the importance of resiliency in design - and solutions for aspects of sustainable living are presented in Team Maryland communications. Self-Reliance for individuals as well as in communities is emphasized. Strategies, activities and materials were all developed to engage curiosity and encourage exploration. *reACT* aims to create a shift in the current housing paradigm which has followed a non-sustainable building model for generations by embracing traditional Native American values of living in balance with nature. Team Maryland aims to demonstrate feasibility of innovations & concepts. The Native American tribes identified as *reACT*'s target market, the Ojibwe in particular, serve as proof of concept for plausibility of adaptability to the larger housing market. Developed strategies work to persuade audience to first recognize the importance of developing a more sustainable future and that it is an achievable

reality, then influence audience to develop a desire for such a future. Lastly, strategies utilized are intended to incite audience to internalize their personal ability to achieve the goal of more sustainable future through individual and collaborative action.

Strategies

The overarching strategy employed in *reACT*'s communications mirrors the concepts emphasized in the home and *reACT* lifestyle system. The approach to communications is a modular, customizable kit-of-parts style of communication. There is a centralized core in which disentanglement - messaging is separated from strategy - comes into play. Team Maryland's messaging is concentrated and integrated with traditional values, regenerative principles, as well as project and communication goals. These centralized messages can be used in conjunction with specific strategies to promote consistency in output communication and reach the array of target audiences. The particular methods or packages of communication identified for the greatest communication potential are Impact Items. Impact Items combine with prepared messaging and strategies to form a module. The combination of communications modules employed is dependent on the differing stages of the project and intended audience. Team Maryland aims to present graphically driven concepts and innovations in a clear and precise manner to be digestible by a broad audience. Accessibility to a wide range of ages and learning is at the forefront of communications efforts. The first level of interaction the general public experience should be quickly recognizable and easily understood. Opportunities for more complex information, as desired, are made available beyond initial content. Customizing the individual experience beyond the group experience is made possible through this strategy. A key communications strategy was the creation of a brand rather than a name or a product.

Brand

reACT's messaging is rooted in the development of a strong brand identity - allowing us to deeply understand the DNA of what we have created, and to effectively convey this identity to the public eye. Creating a strong Brand is a way to insure *reACT*'s balanced identity and messaging remains constant beyond it's time at the U.S. Department of Energy Solar Decathlon 2017. Much like a product brand, the brand for *reACT* is applied to different areas of the communications package, referred to as Impact Items. Impact Items are the communications platforms determined to have the greatest ability to convey *reACT* identity to the public. Digital communications, audiovisual presentation, public exhibition at Solar Decathlon 2017, media interaction, and education & outreach.

Team Maryland brand begins with the name: *reACT*, or Resilient Adaptive Climate Technology. The name, although intended to incorporate layered symbolism along with the logo, was developed to recall readily identifiable concepts. *ReACT*: To adapt, or respond to change. The *reACT* identity reflects the outlined goals Team Maryland hopes to achieve while conveying and the messages of resilience, adaptability, and regenerative principles needed to respond to the call for more sustainable living. Innovation is presented in a stylish and welcoming 'home' environment. In the public realm sustainability is often viewed as having a negative connotation. All too often

consideration focuses on what must be given up in order to live 'green'. This misconception is addressed by carefully considered presentation; perception drives behavior and communications are employed to direct those perceptions. The regenerative principles and innovations illustrate the positive impact *reACT* offers. This lifestyle system addresses "what's in it for me" while cultivating an attitude for community and beyond. *reACT* highlights the overwhelming positives of and gains available through 'sustainable living' while demonstrating how the system can easily *reACT* to each individual's, family's, or community's specific needs, cultures, and aesthetics.

Logo

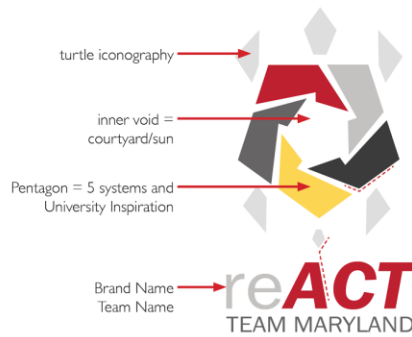
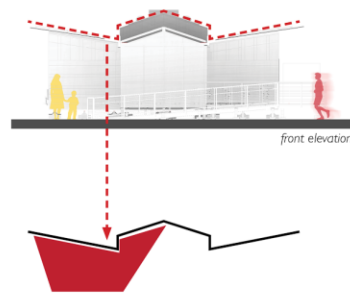
The *reACT* logo is comprised of elements which are inspired by the prototype house, the brand identity of the University of Maryland, and traditional Native American cultural elements. The goal was to develop a logo which could have multiple readings. Much like an Escher drawing, the logo incorporates multiple readings and represents *reACT*'s integrated systems.



The mascot for the University is a terrapin. Native American's know North America to be 'Turtle Island'. *reACT*'s logo incorporates this iconography in the general form of a shell, with the turtle shell being broken up into five pieces separated by negative space. The form of the pieces was inspired by the prototype house's front elevation, and is assembled in a cyclical manner. Cycles represent items working together and *reACT*ing to one another, and so the logo thus represents the idea of *reACT*.

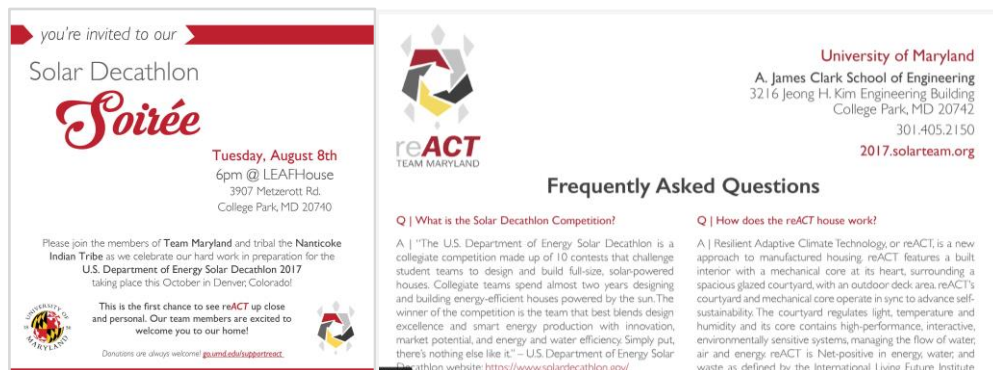
Each of these five pieces represents the innovative systems of the house: water, power, living systems, HVAC, and automation, tied all together by architectural design. Additionally, the five pieces can also represent the five modules of the house: east, west, mechanical, bathroom, and attic; each of these five modules is linked together by the Courtyard, represented by the negative space. This reading of a linked cycle is representative of the concepts of disentanglement and modularity - showing how different units can be woven together to create a whole. The resulting figure is a turtle with an interwoven shell, which represents itself in the signage and way-finding. As a way to engage younger audiences, *reACT*'s turtle logo becomes a mascot for Team Maryland itself, and can be used in engaging manners during the public exhibition period.

Shape Development



Team Maryland's *reACT* logo is used on many different components of the project, including videos, event invitations, promotional materials, website, social media, and more. Modularity is a driving design feature of the project, which is reflected in the communication designs. The website is developed using a modular system, allowing for customized pages based on narratives and graphics package.

The ability to apply the brand identity to the identified Impact Items allows for effectively communicate the strengths of *reACT*. Brand identity supports the continued development and success of the regenerative model for the general public.



Communications Items employed by Team Maryland

Impact Items:

Digital Communications

Audiovisual Presentation

Public Exhibition at Solar Decathlon 2017

Media Interaction
Education and Outreach

Digital Communications

Website

One of the first opportunities the public has to interact with Team Maryland is with a visit to *reACT* website. Websites are easily available for public access, and can be a powerful tool in selling an idea or a project. Creation of a clean, interactive website is a clear way to support the concepts embodied by *reACT*. Team Maryland has been hard at work crafting a website which reflects the key messages. The format is developed through a modular, multi-purpose template. Utilizing a template allows the website to evolve and change with the *reACT* concept, and will also ensure continued communications as we continue development post-Decathlon. The template also allows for rapid changes and personalized solutions, which supports the individual needs of each topic and sub-team. User experience drives conversion on *reACT*'s website to ultimately influence the visitor why they should *reACT*.

The structure of the website is designed in a cycle, which leads visitors through the narrative of the design and messaging. The home page provides a first impression of *reACT* through text, logo, and image. A walkthrough of the *reACT* home prototype is available, and support for Virtual *reACT*, a virtual reality walkthrough is under construction. Content tabs lead to an understanding of how key systems link together in the house – for example, HVAC works with the Architecture pages to show how passive heating design strategies can decrease energy expenditure of the HVAC system.

reACT's exhibit program includes compatibility of the website. The page will provide 'bonus content' to guests, who may want more time with or information regarding a specific sign than tour time permits. NFC-compatible tags through the tour incorporates URLs, QR codes, and NFC-touch technology for guests to have instant access to more information.

Social Media

Intended to grab their attention and encourage visitors to move into *reACT*'s website. We use Social media accounts spread the word, show the public recent accomplishments, and connect *reACT* to the world beyond the Solar Decathlon.

Team UMD has Instagram (<https://www.instagram.com/umdsd2017/>)

Twitter (https://twitter.com/umd_sd2017?lang=en)

Facebook (<https://www.facebook.com/UMDSD2017/>)

Social media is an excellent tool to relate *reACT* and its principles to other projects, initiatives, and the greater world. It is a prime outlet to give updates on project development: Using social media to prove *reACT*'s relevance.

Public Exhibition at Solar Decathlon 2017

Graphical Materials

Communications strategies at competition include OCC training, media training, and mock tours. The communications team has given considerable thought to the tour and the unique experience offered by face-to-face interaction with the public and media. Supporting materials have been carefully crafted to educate a diverse audience on the importance of a sustainable future, empower the individual in such a cause, while demonstrating feasibility of concepts in *reACT*.

As the touring patrons approach Team Maryland's home *reACT* they are greeted by a welcome sign. This sign gives a compact and quick introduction on Team Maryland, the *reACT* home, and why *reACT*. Featured low on the board is a white turtle challenging young visitors to "find me" throughout the home with kids facts to engage the younger audience. Sharing why *reACT* has value opens a dialogue between *reACT* the tour patrons that continues throughout the tour. Walking up the ramps architecture, engineering, power & automation are each posted sequentially. Each sign correlates to the physical location on the tour and its associated conceptual introductions.

Architecture is the first visual element the audience will experience. Notable features such as the roofline and Greencourt, courtyard greenhouse, are introduced. Engineer signage follows to open up curiosity for what is within the home. The integration of HVAC, power, water and automation plays an important role in the performance and appeal of *reACT*. Due to its prominence in the name of the competition, the solar aspects of *reACT* will be among the first topics presented in the signage. Power and Automation signage delves into the basics of solar, adding what differentiates Team Maryland's system. Part of this uniqueness is the automation using virtual house technology that is based on predictive modeling, learning from and educating the occupant.

Construction is the next sign that comes into view at the top of the ramp. The process of construction and design decisions of the *reACT* home are presented before the touring public enter the structure. Signage lays out the process of taking the architecture and engineering designs and turning them into a tangible reality.

Approaching the landscaping planter boxes cultural connection and regenerative systems are presented. Indigenous knowledge systems of Native Americans are outlined emphasizing the blend of these values with western scientific thinking. Regenerative design signage touches on the guiding regenerative principles that fuses all *reACT*'s designs and systems together to create a better home and lifestyle system. Urban Agriculture signage educates on the principles of food sovereignty and the benefit food production that extends beyond the individual. Wellness signage showcases greenwall, hydroponics system, landscaping and the ventilation system working in concert for the wellness of the home and occupant.

After passing the landscaping areas there are signs on either side of the mechanical room hung on the doors. Water signage diagrams the design of the filtration system, clearly labeling and describing each component. Similarly the mechanical signage diagrams and labels HVAC

components in a numbering system that can be seen on the diagrams as well as in the mechanical room. Both signs strive to simplify information, educate the audience on the meanings of each component and their importance to *reACT*. The last sign featured on the tour is in the Greencourt. The Greencourt plays such a literal and conceptual central room to *reACT* that this feature is highlighted multiple times during the tour. Greencourt signage illuminates the immeasurable importance of lighting on top of the other functions it performs.

Tour

The personalized tour reflects the messaging that is representative of *reACT*. We took a modular approach to customize each tour to the specific group experiencing the home. We promote both a community connection as well as building an individualized interaction during the tour. The *reACT* home supports both the community and the individual and can change to meet the needs of its occupants. The pace of the tour matches the group dynamic; if a group has many questions the pace slows down to accommodate answering those questions in the most relevant area. Areas of interest to a group can receive more time while areas less of interest to the group experience a briefer presentation. Throughout the home positions are chosen to present information in a setting conducive to demonstrating the topic and stimulating the senses. Graphical representations of information supplement hearing information shared by team presenters. Each area encourages the individual to explore their surroundings. Unique features in the home are highlighted in red accents. Labels, NFC, and QR allow patrons to instantly access information on individual features of the home. Some labeled and accented features are presented in tour, while many others are available as bonus content to create an individualized and modular tour. Engaging a younger audience, white turtles with kids facts are displayed subtly throughout the home. Children are encouraged to find these interest points placed lower to the floor than signage intent for an older audience.

Brochure

reACT brochure represents the logo, and folds out to create an interactive experience. The turtle logo design folds out to create a bowl with interlocking tabs. The handout conveys design ideas, why *reACT* principles and goals, features the five systems categories, and client relations/target market. This tangible, interactive, and visually stimulating brochure is appropriate to educate and engage a diverse audience.

Outreach and Education

Team Maryland has been working directly with the A. James Clark School of Engineering and the School of Architecture, Planning & Preservation Communications Offices, as well as University Communications to promote *reACT*'s message to alumni, potential students, parents, friends, and media. We have also been working directly with the A. James Clark School of Engineering, Corporate and Foundation Relations Office and the School of Architecture, Planning & Preservation Development Office to raise awareness and support for *reACT*. Beginning in the Spring of 2016 *reACT* posted a blog which informed the community of Team Maryland's progress. We also began a practice of holding periodic *Design Reviews* to which all friends and donors were invited to, which

were very popular with some attracting over 100 attendees. The Kick-off event in September 2016 attracted an audience of over 400. Also in Fall 2016 the sponsorship team began to apply for grants and was successful in being awarded a \$60K campus Sustainability Grant and two Pepsi Enhancement Grants (combined funding at nearly \$5K). Team Maryland also participated in two crowd-funding campaigns: UMD Giving Day and Launch UMD, in which we were able to raise over \$5K. All donor contacts were kept and used for subsequent invitations and solicitations.

The outreach team has participated in a number of campus outreach events such as the First Look Fair, GreenFest, and by far the most popular Maryland Day. Team Maryland had separate booths in four of the six *learning neighborhoods*: Engineering, Architecture, Terp Town Center, and at LEAFHouse, Team Maryland's Solar Decathlon 2007 2nd place winner. Maryland Day attracted nearly 75,000 visitors of all ages. To kick-off Maryland Day and raise interest in *reACT* and Solar Decathlon 2017, a student Team were interviewed for the local TV station WUSA9 for their Wake Up Washington segment. *reACT* and Team Maryland were also featured in Terp magazine, campaign edition, the University's Alumni Magazine and HGTV spotlighted us on their website.

In Fall 2016, Team Maryland travelled to attend the bi-annual MCX Spotlight Pop-up Event at the Material ConneXion Materials Library in New York City. Students were able to Take home samples of the most innovative materials in their collection and network with valuable industry contacts. Team Maryland has made presentations to the Ford Motor Co., Tesla Inc., Johnson Electrics, Whiting-Turner Construction Co., Clark Construction Co., Maga Designs (virtual reality designers) and Panasonic Corporation. Internal to the University, we've been invited to make presentations to the Provost and Deans Council, the Institute for Systems Research Research Day, the Civil and Environmental Engineering Board of Visitors, and the University Board of Trustees. Other presentations to the scientific community include: American Institute of Chemical Engineers Annual Meeting, UMD Engineering Sustainability Day, UMD Sustainability Conference, University of Maryland Energy Research Center.¹ Two of the team members, Emily Goo and Liz O'Keefe presented their research on *reACT*'s Water and Waste systems at American Ecological Engineering Society Conference. Five students received scholarships to attend the Earth Optimism Summit. The team also traveled to make a presentation to 6th and 7th graders at Our Lady of Sorrows Grammar School. Lastly, we have travelled and presented to the tribal councils and assorted committees of the San Carlos Apache Indian Reservation (Bylas, AZ) and the St. Croix Chippewa Indians (Webster, WI). Outreach to the Nanticoke Indian Tribe has been by far the most successful by forming an Alliance for Sustainability with them

¹ The University of Maryland Energy Research Center was started by a grant from the Provost to the sustaining Departments of WaterShed and it was awarded the grant by way of WaterShed winning first place in Solar Decathlon 2011.