

Award-Winning Coverage of Sustainable Construction, Products and Lifestyles

GREEN BUILDER[®]

January/February 2024/ www.greenbuildermedia.com



GREEN HOME OF THE YEAR AWARDS

From net-zero, high-tech wonders to a wide-open “agrihood,” this year’s pick of **the best sustainable homes and communities** embody the best of challenging times.

SUSTAINABILITY SYMPOSIUM 2024: EXISTENTIAL SOLUTIONS

Held Virtually April 17-18 | 12 - 3 PM ET

THE SUSTAINABILITY SYMPOSIUM 2024

will transcend climate rhetoric and dive deep into actionable solutions for our planet's most pressing challenges. While the **Climate Emergency** sets the stage, our focus is on the future—a future where resilience, innovation, and community activism pave the way for a sustainable world.

We have curated a world-class lineup of speakers who are not just thought leaders but 'action leaders'. These acclaimed individuals are in the field taking action, and inspiring others to do the same. Our aim is to arm attendees with knowledge and actionable steps that they can implement in their communities, businesses, and personal lives.

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An aerial photograph showing a residential neighborhood with several houses and a large, vibrant green field. The text "Global change starts with the courage to act" is overlaid on the image in a large, white, sans-serif font.

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What Makes a Place 'Real'?

Creating a sustainable community out of nothing is tough. **Letting go is even tougher.**

I spent a couple of days at Babcock Ranch last month: 17,000 acres of “planned community” in the hinterlands of Southwest Florida. My mind is awirl with observations and questions that go deeper than the sticks and bricks of homebuilding. I’m wondering what drives people like project creator Syd Kitson to burn their life’s candle for so many years on a vast and sprawling epicenter of mixed-use living.

I wanted to sound off about Babcock, because it relates to bigger questions about housing and “place,” in keeping with our annual homebuilding awards issue.

Creating a “town” from scratch is an incomprehensibly complex feat. It’s also controversial, with no guarantees of success, let alone completion. As I sat down with Kitson, I mentioned that on the long drive through the scrub brush of Southwest Florida to Babcock, I thought of the hundreds, perhaps thousands, of meetings and interactions he must have taken, before he poured the first foundation here.

That process took years. A meeting for every road, bridge, storm-water catchment, school, streetlight and restaurant.

But what if the hard part is yet to come: making Babcock a place where people want to live full time.

He’s pushed for greater integration and real-life interactions. There’s a small town center, along with a few blocks of commercial buildings. He’s built schools and opened them up to the poor county in which Babcock nests. They filled up immediately.

Working against him, however, are Florida’s cranky old white guy politics, big builder formulas and human nature. Some neighborhoods by Lennar and Pulte, for instance, feel like fortified enclosures. Kitson says those gates are a sticking point, but they don’t hurt sustainability—which is his red line. He wants people to live and work here, he says, not think of Babcock as a suburb of Fort Myers.

Kitson is quick to admit that Babcock isn’t perfect. At this phase of its buildout (about one-fourth complete), it’s more an interlinked collection of separate neighborhoods than a “town.” Acreage has been carefully plotted and drained. Rental housing is underway. An adjacent eye-popping sea of solar panels, owned and operated by Florida Power and Light, can easily power every foreseeable structure.

Here’s the thing. Real cities have to work out their own story. They



Fast track. Homes, including rentals, are selling briskly at Babcock Ranch, Florida, but the development is still very much in its infancy with regard to whether it will become a self-sustaining city.

may have graffiti, domestic disputes, unruly teenagers, corrupt cops and political friction. Lawns are not always well groomed. An alligator occasionally eats somebody.

Kitson faces the greatest test of his life: Can he steer the ship through the rocks, while at the same time letting natural currents flow?

To actualize the Babcock dream has meant years of compromise with builders, county and state politicians and utilities, and with buyers. Kitson has to sell homes. Many in this first-wave demographic want “Theme Park” Babcock and may not be on board with “Real World” Babcock. *Theme Park* Babcock has cameras at every corner, strict rules about parties and house styles, Christmas tree lightings, a church (currently under construction) and country music concerts. What if *Real World* Babcock wants rap music, large outdoor public festivals, or a mosque?

That’s just a taste of the kind of deep social and cultural tides Babcock will navigate as it evolves into a place people want to stay, not just a resort town like Seaside. Even Epcot started out as Disney’s New Urbanist dream of becoming a real city of the future, only to be “lost” to the theme park zeitgeist.

I’m rooting for Kitson. I believe him when he says he didn’t take on the Babcock Ranch project for economic gain. There are easier ways to make money.

But Babcock is a legacy project. It will thrive or dwindle based not just on Kitson’s work, but on the people who move there. Will the now and future residents rise to the challenge? Will they overcome the state’s official embrace of book bans, racism and gun-crazy fear? Will they eschew artifice, and encourage diversity, equity, neighborliness, artistic expression and actual (versus scripted) freedom?

These are questions that every developer of a sustainable community should ask. But they’re also pertinent to would-be residents. Babcock may evolve into an amazing place to live. But it will need people of courage and conscience. The stage is set. Bring on the players. **GB**



Matt Power
Editor-in-Chief

matt.power@greenbuildermedia.com

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Envelope Sealing Performed For:

Client: Devoe Custom Builders
Address: 1234 Main St.
City: Columbus, OH 43201

AEROBARRIER CASE ID: 1015
HARDWARE: Amplifier (Correct)

DATE: 8/25/2020 BUILDING TYPE: Single Family Detached

Envelope Sealing Results:	Envelope Sealing Progress:																		
BEFORE SERVICE 2817.3 CFM of Leakage, equivalent to a 471.6 Square Inch Hole, or 17.79 Air Changes per Hour (for your 1430 square-foot structure enclosing a volume of 13071 cubic feet)	<table border="1"><caption>Envelope Sealing Progress Data</caption><thead><tr><th>Sealing Time (Minutes)</th><th>CFM Leakage at 50 Pa</th></tr></thead><tbody><tr><td>0</td><td>2800</td></tr><tr><td>20</td><td>2500</td></tr><tr><td>40</td><td>2200</td></tr><tr><td>60</td><td>1800</td></tr><tr><td>80</td><td>1500</td></tr><tr><td>100</td><td>1200</td></tr><tr><td>120</td><td>1000</td></tr><tr><td>140</td><td>800</td></tr></tbody></table>	Sealing Time (Minutes)	CFM Leakage at 50 Pa	0	2800	20	2500	40	2200	60	1800	80	1500	100	1200	120	1000	140	800
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AFTER SERVICE 195.3 CFM of Leakage, equivalent to a 23.5 Square Inch Hole, or 0.86 Air Changes per Hour This corresponds to a 95.0% Reduction in Envelope Leakage Leakage and air-change results are standard pressure of 50 Pa.																			

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AIR SEALING'S ROLE IN NET ZERO HOMES

AeroSeal Envelope's AeroBarrier product helps home builders hit air tightness goals, enabling them to more easily achieve code, Net Zero, or any performance standard while reducing embodied and operational carbon footprints.

BY SAMANTHA CARLIN

In the pursuit of sustainable development, the importance of energy-efficient homes cannot be emphasized enough. It's no secret that reducing the energy consumption of homes makes achieving Zero Energy Ready Homes (ZERH) and Net Zero homes easier and more affordable for builders and homeowners.

AeroSeal, a leader in building envelope and HVAC duct air sealing, explains how "creating an airtight building envelope is the best way to reduce energy usage. Thus, reducing the number of PV solar panels needed to provide the renewable energy required and making Net Zero easier and more affordable for builders."



ENERGY STAR estimates that air leakage accounts for a substantial 25 percent to 40 percent of the energy used to heat and cool an average home in the United States. Therefore, sealing air leaks is one of the most impactful strategies to reduce the energy use and operational carbon emissions of a home.

AeroBarrier steps in as the game-changer, simplifying the process for builders by providing an automated, efficient and affordable solution to significantly reduce air leakage in the building envelope. It works to effectively pinpoint and seal all leaks and cracks with a non-toxic, water-based formula.

The beauty lies in the effectiveness and precision of AeroBarrier's technology, which uses pressurized air and atomized sealant sprayed into the interior of the house to find and seal air leaks, ensuring builders hit their air sealing requirement every time. The air tightness achieved is verified immediately via a continuous blower door test run during



the sealing process.

With a fully sealed, efficient home, the energy needs are greatly decreased. AeroBarrier makes it more feasible and affordable for builders to construct ZERHs and reach net zero goals. Simultaneously, the lessened energy demands make it more affordable for homeowners to implement the use of solar energy and ultimately achieve Net Zero Energy.

By minimizing uncontrolled air leaks, AeroBarrier not only cuts energy consumption but also reduces the operational carbon footprint of single-family homes.

[Click here for more information on the benefits of building envelope air sealing and AeroBarrier's advantages.](#)

Clean, Green Living May Slow Down Aging

Parks, trees and other greenery can make a person's cells happier and longer lived.

New research by international scientists indicates that exposure to parks, trees and other green spaces can slow how fast a person's cells age. [The study](#), published in [Science of the Total Environment](#), found that people who lived in green neighborhoods had longer chromosomal telomeres, which are associated with longer lives and slower aging.

According to study co-author Aaron Hipp, a professor of parks, recreation and tourism management at North Carolina State in Raleigh, N.C., green space promotes physical activity and community interaction, which both contribute to better health outcomes.

Neighborhoods with plenty of trees and greenery are also often cooler, more flood resistant, and have less air pollution, the study notes.

Researchers examined more than 7,800 medical records and responses to a survey conducted between 1999 and 2002. Findings showed that a 5 percent increase in a neighborhood's green space led to a 1 percent reduction in cellular aging. But participants who lived in green neighborhoods that were also plagued by pollution and segregation did not have longer telomeres than similar communities with less greenery. "Green space still matters," Hipp says. "It just shows how important it is that we



Affected DNA. A person's lifeline is tied to the length of a person's telomeres, found at the ends of chromosomes. A greener environment can mean a longer telomere, which can mean slower aging. CREDIT: MD BABUL HOSEN

get to a level playing field first, so that people have the time and space to go out and enjoy them." **GB**

Natural Gas Firms Hope to Use Builders As Their GHG Pushers

Rewards await for contractors and others who keep promoting fossil fuels.

U.S. natural gas utilities are offering builders and contractors incentives to keep fossil fuels in buildings. According to a report in *The Guardian*, the initiatives are part of gas interests' decades-long effort to encourage builders, contractors and real estate agents to continue to promote the merits of natural gas.

Extending a relationship between natural gas producers and the construction sector could be a major impediment to decarbonizing buildings. These account for roughly one-third of U.S. greenhouse gas emissions, according to Karlee Weinmann, research and communications manager for the clean energy watchdog organization Energy and Policy Institute.

Use of natural gas has fallen out of favor in recent years. In 2023, all-electric heat pumps outsold gas furnaces for the first time. The Biden administration is



Still burning. Phasing out natural gas for clean energy would be impeded by gas providers' efforts to buy the support of builders. CREDIT: RICHARD P. LONG/ISTOCK

working toward quadrupling the pumps' use in U.S. homes by 2030. And, more than 100 municipalities have taken action to halt gas expansion.

According to *The Guardian*, at least 27 utility programs serving 17 states offer incentives to builders and contractors for installing gas appliances in buildings. Gas interests also present training programs for builders and realtors, focused on promoting the benefits of installing gas appliances. Incentives range from a \$50 payout to a builder for every gas stove installed, to all-expenses-paid vacations for entire companies. **GB**

U.S. Flood Insurance Has Major Flaws

As floods increase, federal aid is taking longer to help owners rebuild.

A rapidly increasing number of federally insured properties have flooded repeatedly, a sign of the need for state and federal action to improve protections for homeowners, according to an analysis by the Natural Resources Defense Council (NRDC). Nearly 45,000 “severe repetitive loss properties” have flooded five times on average from 2018 to 2022, an almost 20 percent increase since the last analysis in 2020.

According to “[Losing Ground: Severe Repetitive Flooding in the United States](#),” fewer than 25 percent of the repeatedly flooded properties have received assistance to mitigate their flood risks, while many more owners of these threatened homes have just dropped their flood insurance altogether.

States that have been battered by repeated hurricanes—primarily Florida, Louisiana and Texas—have seen the biggest jump in these flood-prone properties. Claims in two states—Texas and Louisiana—accounted for almost half of the total payouts for these properties.

“The bottom line is that the flooding risks to communities are increasing faster than officials are dealing with them,” says Anna Weber, a senior policy analyst at NRDC. “Homeowners desperately need new measures that can



Flooded out. Houses damaged by persistent flooding are an annual thing for many homeowners, who often can't get the help they need to rebuild.

BANKS PHOTOS/ISTOCK

help them afford flood insurance, reduce the risk of flooding, and give those who want it a real opportunity to move to safer ground.” **GB**

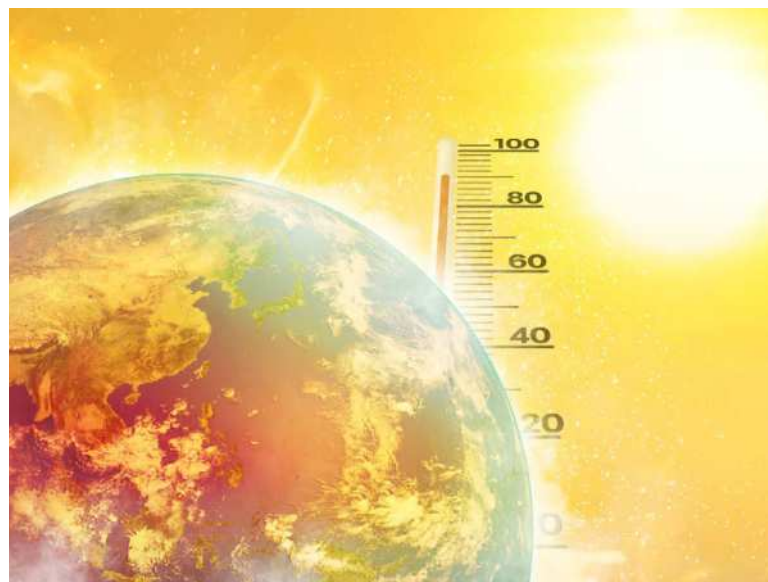
Earth Reached Its Hottest Ever in 2023

Last year had record highs and lows. That's a bad thing when you're talking weather.

Scientists have confirmed what many people already believed: 2023 was the hottest year on Earth on record, due to ever-rising carbon emissions. Temperatures rose by an average of 2.7 degrees Fahrenheit, the most since 2016. And, according to the National Oceanic and Atmospheric Administration (NOAA's) National Centers for Environmental Information, this could be the start of a stretch where annual temperature records aren't just broken but smashed.

Record temperatures began accumulating in June 2023, followed by a new record every month for the rest of the year. There is a 1 in 3 chance that 2024 will be warmer than 2023, and a 99 percent chance that 2024 will rank among the top five warmest years, NOAA notes. The 10 hottest years have occurred in the past decade.

The impacts of the higher temperatures are being seen in the Arctic and Antarctic ice caps, which are shrinking; ocean heat content, which now consists of 90 percent of Earth's excess heat (up from 88 percent



Scorched Earth? Last year was the world's hottest, with its average temperature rising almost 3 degrees. It could become an annual occurrence.

CREDIT: PIVASET/ISTOCK

in the 1980s); sea ice, which was among the 10th-lowest on record in 2023; and the number of tropical storms and hurricanes, which was within the top 20 on record, NOAA reports. **GB**

HERS Scores Set Record in 2023

Nearly 4 million U.S. homes have achieved energy efficiency recognition—and there are more to come.

Despite concerns over the effects of inflation at the beginning of the year, a record-breaking number of homes were Home Energy Rating System (HERS) rated and received a HERS Index score in 2023, according to a report from the Residential Energy Services Network (RESNET).

The HERS Index is the industry standard by which a house's energy efficiency is measured. It's also a nationally recognized system for inspecting and calculating a home's energy performance.

In 2023, 362,265 U.S. homes were HERS rated, up from the previous year's record of 339,927. There are more than 3.9 million HERS homes nationwide. "Homebuilders are increasingly seeing energy efficiency as a major selling point for buying a new home," says RESNET Executive Director Steve Baden. "To take advantage of this opportunity, builders across the nation are presenting their homes' energy performance in a way that every buyer can understand: the HERS Index score. I expect that this trend will continue."

Texas (89,207), Arizona (30,389) and Florida (28,047) were the top three states in terms of HERs-rated homes. Meanwhile, the five states with the lowest HERS Index scores—lower being better—were California (21), Hawaii (40), Vermont (40), Maine (44) and Alabama (47). **GB**



Making the grade. A HERS Index score depends on the findings of an independent certifier, who inspects the house and provides feedback on items such as insulation installs and the home's overall air tightness. CREDIT: ARTURSFOTO/ISTOCK

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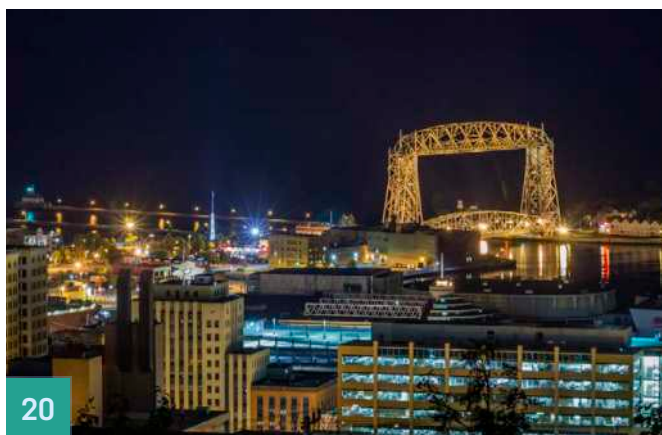
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THE GREATEST EXISTENTIAL THREAT

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"In any endeavor, leadership is everything. It sets the course. And if you're not going in the right direction, everything else suffers." **PAGE 62**

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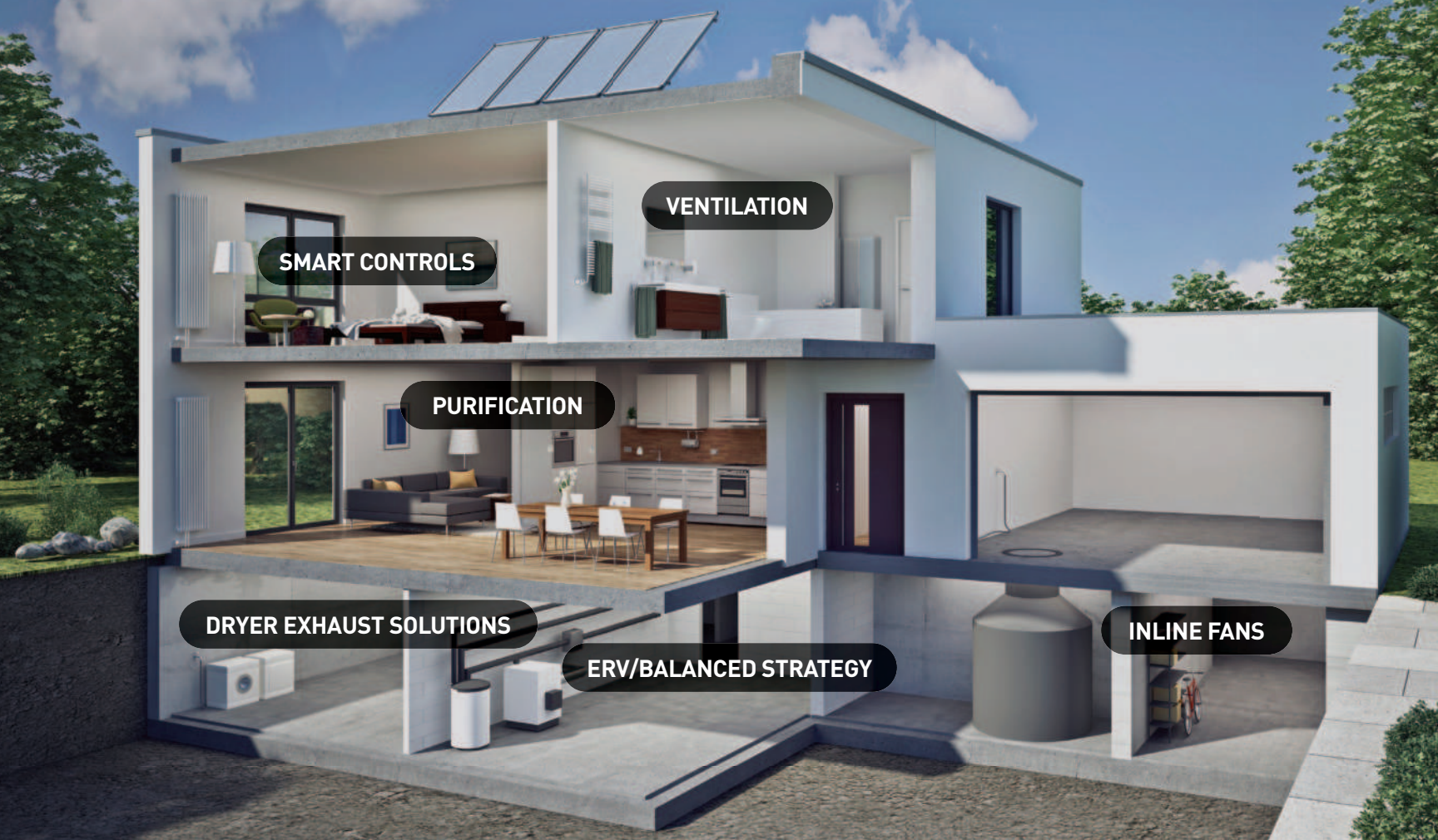


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Green Builder's annual Sustainability Awards recognize people and places that are leading by example when promoting why and how to go green.

GREEN BUILDER
**Sustainability
Awards 2024**

Which people and cities are leading by example when promoting why and how to go green? Here is Green Builder's answer.

This year, we honor Jon Creyts, who has spent decades working to solve climate change, as our Sustainability Superhero. Meanwhile, San Diego, Washington, D.C., and Duluth, Minnesota are our Sustainable Municipalities of the Year, municipalities that really want to “clear the air.” Congratulations to our winners.

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SUPERHERO

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MUNICIPALITIES
OF THE YEAR

CREDIT: YOOVS/ISTOCK

Change Maker

RMI CEO Jon Creyts understands how to implement deep decarbonization solutions and catalyze market transformation.

BY SARA GUTTERMAN

A mechanical engineer by training, with a PhD in circular economy from the University of California, Berkeley, Jon Creyts has been feverishly working on climate solutions for decades.

Creyts began his illustrious career at Lockheed Martin's renowned Skunk Works aircraft prototyping facility. He then went to McKinsey & Co., where he realized in his early days that economics were intricately linked to energy transformation and climate change.

In the early 2000s, he helped launch McKinsey's sustainability consultancy, working with world leaders on global climate change issues. There, he led the team that crafted McKinsey's pioneering **cost curve** for carbon abatement in the U.S., outlining how emissions reductions in buildings, transportation, industry and power would lead to enhanced innovation and economic opportunity.

Creyts was an early and active advocate for a comprehensive set of climate solutions, including strong climate policy and energy efficiency standards, as well as the development of climate technological innovations and low carbon energy infrastructure. He also promoted expedited approval and permitting of renewable energy projects and the creation of exchange

mechanisms, such as carbon trading platforms, offsets, and tax credits.

On the bleeding edge of the market, Creyts already understood that solutions like biofuels, electric vehicles (EVs), and LEDs held the promise of at least a 20 percent reduction in carbon emissions, and that climate action has direct socioeconomic, national security, and global economic implications.

ROCKY MOUNTAIN BOUND

In 2012, Creyts joined RMI (formerly the Rocky Mountain Institute), managing the organization's global research and collaboration strategy, ultimately assuming the position of CEO. Under his leadership, RMI has grown by 1,000 percent, working with businesses, communities and governments to accelerate and scale market-based clean energy and zero-carbon solutions.

Creyts' blend of finance policy, data and technology experience has played an essential role in guiding the development of decarbonization solutions for industry, transportation, buildings and infrastructure.

During his tenure at RMI, Creyts founded RMI's China Program, working on technical and economic solutions in China to peak CO₂ emissions before 2030 and achieve carbon neutrality before 2060. His leadership has positioned RMI to work with governments around the world to accelerate the adoption of market-based solutions that cost-effectively bring about a clean energy transition.

When he returned from China, he plunged into the solar plus storage sector, researching the drivers that would enable microgrids and distributed energy to reach price parity with fossil fuel infrastructure.



ALL PHOTOS COURTESY OF RMI

“We can solve climate and energy poverty together, making a much better world in the process. And we can do this more cheaply than trashing the planet.”

Creyts also played a role in the creation of RMI's e-Lab, designed to bring together stakeholders in the energy efficiency and electrification transition. He also founded RMI's Third Derivative technology, which boasts a portfolio of nearly 200 startup technology companies supported by a network of investors and corporations, with a total market capitalization exceeding \$4 trillion.

MARKET TRANSFORMATION

Today, Creyts is laser-focused on creating market catalysts that drive innovation and help scale transformative technology, advance policy, and expand sustainable finance. He is particularly interested in using big data to understand where emissions are happening in real time “so that we can make decisions and price carbon accordingly.”

He sees opportunity everywhere. “We’re in a moment of climate democratization,” Creyts insists. “We’re on the brink of being free from energy constraints.”

While he is optimistic about the progress that is being made, he staunchly maintains that we’ll need “radical collaboration” to drive enough adoption to move markets at scale. “We are facing a planetary emergency



Clear vision. RMI's Innovation Center, a "living lab" on how to design, construct and occupy an ultra-efficient commercial structure—is Jon Creyts' home base as he helps guide the nonprofit toward its goal of "transforming the global energy system to secure a clean, prosperous, zero-carbon future for all."



[LEFT] Family man. Despite regular travel and demanding hours, Creyts (shown here with his wife, Alicia) still makes family a priority—and vice versa. "My family knows that I have a mission," he says. "And they know that I like to work because I'm passionate about where we're going."



and knocking on the door of a 1.5-degree Celsius temperature increase," Creyts says. "There is no silver bullet solution, so we need to think in systems. We're in a moment when we have to hold two realities—we've never been in a worse situation in terms of climate change, but we've never seen such progress relative to climate solutions."

Creyts is encouraged by the exponential growth in technologies like solar, battery storage, EVs, heat pumps and hydrogen. Some of the projects that Creyts is most excited about include:

- Two- and three-wheel vehicle electrification throughout emerging markets.
- Rapidly scaling solutions to create thermally comfortable, low-carbon buildings.
- Global approaches to accelerate decar-

bonization pathways in heavy industry.

- Use of big data and AI to differentiate products on the basis of climate impact.
- New techniques for developing the talent required for low- and middle-income communities and countries to benefit equitably in the transition.

Economics is now the main driver for the adoption of innovative climate technology, and the numbers are penciling out, Creyts insists. "Countries and companies are moving faster than ever before, which is leading to exponential progress," he says. "The electrification of buildings and transportation and the decarbonization of heavy industry is happening at scale—it's becoming commoditized and affordable."

But the thing that excites Creyts most is the fact that clean energy has never been

better positioned to solve our climate challenge. At the same time that we are hitting negative tipping points in nature, we are hitting positive ones in markets, he says.

"Renewables are now the cheapest form of new energy for about 85 percent of the people on the planet, including the 3.6 billion people who don't have access to reliable, affordable energy today," Creyts says. "This is amazing. We can solve climate and energy poverty together, making a much better world in the process. And we can do this more cheaply than trashing the planet."

Of course, a specific key here is getting the financing assembled to build this better world. Creyts is especially excited about some of RMI's work in catalytic capital, focused on providing the acupuncture needed for public and private capital to flow



Power sharing. Jon Creyts (center) has been involved with numerous RMI clean energy transition collaborations, such as one for development of a solar minigrid in Abuja, Nigeria, which has helped keep electricity available and affordable for residents.

more easily. “Once we get markets more engaged, the pace of change will only accelerate,” he notes.

APPLIED HOPE

Beyond market transformation, Creyts is immersed in developing the next generation of leaders to ensure an equitable transition. “I want to provide future leaders with a sense of hope,” he says. “Not just passive, blind hope, but active, muscular hope that

highlights how we can build a better world together, now.”

He is a firm believer in applied hope. “It’s not enough to be passively hopeful about an outcome,” Creyts says. “We have to will the world that we hope for into existence.”

His advice: be impatient and collaborative. “We need to move faster than we are, and we can,” he advises. “There is no reason to be incremental and slow in our thinking or acting.” **GB**

SUPERHERO STATS

SOME OF JON CREYTS’ CAREER ACCOMPLISHMENTS INCLUDE:

- A doctorate from the University of California, Berkeley for research focused on creating a circular industrial economy, using thermodynamics to evaluate the material and energy efficiency of processes in the design of closed loop systems.
- Foundation council member and chair of the board of [Energy Web](#).
- Member of the board of the [Mission Possible Partnership](#).
- Member of the distinguished advisory group for the [Integrity Council for the Voluntary Carbon Market](#).
- Trustee for the Jeremy and Hannelore Grantham Environmental Trust.
- Commissioner for the [Energy Transitions Commission](#).
- Member of the World Economic Forum [Global Future Council on the Future of Responsible Resource Use](#).



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STONE™

Straight from the sea. Carlsbad Desalination Plant helps San Diego deal with drought by converting 100 million gallons of ocean salt water into 50 million gallons of potable water every day. CREDIT: COURTESY OF SAN DIEGO COUNTY WATER AUTHORITY



LARGE MUNICIPALITY

San Diego, California

Promoting the use of clean energy is old news for Southern California's 'other' giant city.

San Diego is a California metropolis with a modest goal: Become, and remain, "America's Finest City." The Golden State's second-largest municipality has promoted renewable energy since the release of its original [Climate Action Plan](#) (CAP) in 2015, then upped the ante with its [2022 version](#), which calls for net zero carbon emissions by 2035.

In 2015, San Diego became the nation's first city to commit to a 100 percent renewable energy program ("100RE"), which it is currently at 40 percent on. That's a bit ahead of schedule, according to city officials; they're not ruling out hitting the 100RE target by 2030 instead of 2035. Meanwhile, a 15 percent greenhouse gas (GHG) reduction goal was easily met before the 2022 update appeared (24 percent and rising, by that point)—leading to the net zero emissions status sought by 2035.

Other 2035 goals include reducing and diverting 90 percent of waste from the city landfill, restoring 700 acres of wetland as carbon sink, and beginning a mobility network

that converts 50 percent of all trips to walking, biking or transit, and reduces vehicle use. This would be a huge change, as only 1 in 6 commuters are currently considered energy efficient, according to the 2022 CAP.

BROAD RANGE OF IDEAS

To help combat California's frequent and extensive droughts, San Diego has invested in the Carlsbad Desalination Plant, which transforms 100 million gallons of ocean salt water into 50 million gallons of potable water, or about 10 percent of San Diego's water use each day, according to plant officials. San Diego city officials note that because of its extensive process, desalination technology requires three times more energy than basic wastewater recycling, meaning an increase in GHGs. But thus far, the city has been able to more than offset the increase, given its steadily rising carbon emissions reduction success.

Other accomplishments include being one of the first California cities to mandate solar panels on all new construction,



Cleaner fares ahead. The city's Metropolitan Transit System now has a zero-emission, all-electric commuter bus line and plans to replace its entire fleet by 2040. CREDIT: COURTESY OF SAN DIEGO METROPOLITAN TRANSIT SYSTEM

1,381,162
POPULATION

15.9
PERCENTAGE OF ENERGY-
EFFICIENT COMMUTERS
(AS OF 2022)

2040
DEADLINE YEAR FOR
100 PERCENT WASTE
DIVERSION

implement strict regulations pertaining to water consumption, and offer free composting services for residential customers, which means food scraps can go directly from a home into the ground to help fertilize soil rather than sitting in landfills or incinerators.

GOODBYE TO FOSSIL FUELS?

If San Diego lawmakers are successful, fossil fuels will be an endangered species in a few years. The city's Metropolitan Transit System (MTS) recently debuted an all-electric commuter bus line capable of transporting 5,000 people per day. The zero emission buses replace low-CO₂ compressed natural gas models, and they are the first step toward a completely electric public transit fleet by 2040, according to MTS Board Chair and San Diego City Councilmember Stephen Whitburn.

San Diego's public schools are joining in: According to a report in the San Diego Union-Tribune, the San Diego Unified School District plans to phase out all fossil fuels by the end of 2024. The district is also implementing a curriculum designed to prepare

students for careers in electrification and clean energy fields. Another district, in neighboring Cajon Valley, has bidirectional chargers in some of its electric school buses that allow energy stored in the batteries to be directed back to the area's electricity grid during peak demand hours.

Caroline Winn, CEO of San Diego Gas & Electric (SDGE), which provides energy to 3.3 million customers in San Diego and Orange counties, has a straightforward way of summing up the city's sustainability efforts: Where there is a collective will, there is a way.

An SDGE study, "The Path to Net Zero: A Decarbonization Roadmap for California," identifies a path where the city can help California meet its goal of becoming carbon neutral by 2045—10 years later than San Diego expects to reach that same goal. "There is no question our climate is changing, but we are also beginning to get more clarity on what we need to do to transition to a net zero future," Winn notes. "We are heartened by the fact that organizations and individuals across the public, private, nonprofit and academic sectors are coalescing around climate actions." **GB**



MID-SIZED MUNICIPALITY

Washington, D.C.

Government programs have made the nation’s capital into an example of prime green thinking.

The municipality that is home to the nation’s leaders is also one of its most sustainable cities. Over the past 10 years, Washington, D.C. has routinely ranked among the top 10 on surveys for greenest activities—Wallet Hub, the U.S. Green Building Council (USGBC), and the Environmental Protection Agency among them—and that’s not stopping in 2024.

The accomplishments are many. In 2017, D.C. was named as the world’s first Leadership in Energy and Environmental Design (LEED) Platinum city, partly due to having the most LEED-certified buildings in the U.S., according to USGBC.

A big example of this status is the renovated American Geophysical Union (AGU) headquarters, which in 2018 achieved net zero energy status courtesy of 700 solar panels and a roof rainwater-collecting cistern. AGU was also inspired by the [Clean Energy DC Act](#), which aims to eventually have the city powered on 100 percent renewable energy, according to Washington, D.C. Mayor Muriel Bowser. There is also the [Climate Ready DC Plan](#), which outlines a series

of actions to be taken by 2050 to reduce weather-related impacts of more-dangerous heatwaves, severe storms, and river flooding.

“Climate change is no longer a distant threat,” Bowser notes. “In order to prepare Washington, D.C. for the future, we can and must respond to new and substantial challenges.”

D.C. was also the first municipality in North America to launch a bikeshare system, [Capital Bikeshare](#), which currently offers more than 700 stations with a total of 5,400 bikes for people to use across the city. There’s also a sustainably minded public transport network with more than 1,400 buses that run on alternative fuels such as natural gas, advanced technology diesel fuel, and ultra-low Sulphur diesel fuel.

GREEN FOOD SUCCESSES

Sustainable food is a big deal. Many of the city’s restaurants have a “farm to fork” ethos, and businesses such as hotels are green-minded when it comes to their menus. They use



Power less. The American Geophysical Union (AGU) headquarters achieved net zero status after installing more than 700 solar panels in 2018. AGU is a nonprofit organization of earth, atmospheric, ocean, hydrologic, space and planetary scientists, and enthusiasts. CREDIT: APK/WIKIPEDIA/SYSTEM



Food for thought. On their menus, D.C. restaurants use homegrown foods—some resulting from rooftop gardens—to encourage environmentally friendly thinking by customers. CREDIT: DMYTRO SHEREMETA/ISTOCK

712,816
POPULATION

517,000
TONS OF GREENHOUSE GAS
EMISSIONS PREVENTED IN
2022

60
PERCENTAGE OF WASTE
RECYCLED BY D.C.
RESIDENTS ANNUALLY

homegrown foods for soups, salads, pastries, breads and more. Other places grow herbs in rooftop gardens that, when not used in foods, are donated to local cooking programs. Catering services offer filtered water instead of bottled, use biodegradable cutlery and other tableware, and serve locally sourced sustainable food and drinks.

Meanwhile, for the past several years, D.C. businesses, environmental organizations and residents have participated in “The Last Straw,” a program that fines businesses for offering single-use plastic straws and stirrers. Food service products made of expanded polystyrene—a.k.a. foam—have been banned. Such actions “continue to help the city move towards being a leader in sustainability,” Bowser notes.

CITY GREEN ACCOMPLISHMENTS

Over the past decade, D.C.’s waste policy and practice have focused on reducing, reusing and recycling. There is a five-cent charge for disposable paper or plastic bags, in an effort to encourage people to utilize reusable versions. Money

generated goes toward a river cleanup and protection fund.

The city has also taken steps toward reducing water waste. The D.C. Department of Energy & Environment (DOEE)’s [RiverSmart Homes](#) program offers property owners free and low-cost green infrastructure products such as rain barrels, green roofs and rain gardens to capture water. Such infrastructure also keeps pollutants like litter, fertilizers, pet waste and sediment from damaging local rivers, according to DOEE. RiverSmart accounts for about 1,500 features on residential homes per year and has led to installation of more than 20,000 features since the program’s inception in 2009.

And, there is the city’s [Resilient Design Guidelines](#). This document provides a methodology for conducting a climate resilience needs assessment and suggests steps for planning, designing and constructing projects to support resilient outcomes in the built environment. “[Overall], Washington, D.C., is proud to serve as a model for building greener, more resilient cities and creating a better quality of life for all,” Bowser says. **GB**



City living. Duluth's Climate Action Work Plan gives the city and its residents some climate goals to shoot for—such as cutting carbon emissions by 50 percent by 2030 and 80 percent by 2050. CREDIT: SAM WAGNER TIMELAPSE/STOCK



SMALL COMMUNITY

Duluth, Minnesota

The 'Zenith City' eyes cleaner skies and green power by midcentury—and is well on its way.

Small city, forward thinking, healthy air. That sums up Duluth, which for the past seven years has successfully balanced the needs of a growing population against an ever-more-fragile environment.

The city of about 87,000, in alignment with its [Climate Action Work Plan](#)—designed to help it reach 2050 climate control goals—has cut carbon emissions by 32 percent since 2016, largely due to energy efficiency and conservation efforts on city buildings, utility operations and its municipal vehicle fleet. Duluth is on track to hit a 50 percent carbon emissions reduction goal by 2030; the city could even reach 80 percent by 2050, according to (now former) Mayor Emily Larson.

In 2022, the city agreed to move from a coal-only fired steam system downtown to, by 2035, a hot water closed loop system—one where water is heated at a remote facility and transferred to businesses, eliminating the need for individual water heaters. This process will ultimately save 20 million

gallons of water from Lake Superior annually, which, although it is the largest freshwater lake in the world, is also one of the world's fastest-warming. There are also plans to add 700 megawatts of wind and solar renewable energy generation over the next 15 years. Duluth will also invest in grid batteries that by 2026 will store up to 500-MW of energy, according to the city's sustainability office.

GREEN FOR GREEN THINKING

Over the past two years, more than \$40 million in funding has been awarded for projects that focus on sustainability, including transportation, infrastructure, and renewable energy planning. According to a report by Minnesota Cities, one such example is Duluth's effort toward creating and adopting internal energy efficiency policies for city buildings and fleets. Electric or hybrid vehicles are prioritized; employees must justify a nonelectric purchase and show there's no



Aqua fresh. The city's planned switch from a coal-only fired steam system to a hot water closed loop system will save 20 million gallons of water from Lake Superior annually. CREDIT: HELENA JACOBA/FLICKR

86,372
POPULATION

80%:
PLANNED REDUCTION IN
CARBON EMISSIONS BY
2050

11,000
ACRES OF GREEN SPACE
THROUGHOUT CITY

sustainable option.

It's not an easy process, according to Duluth Sustainability Officer Mindy Granley. "To replace all vehicles with more sustainable options will take time—perhaps 10 to 20 years," Granley notes. "But the new policy is a start. You have to set the flag in the ground now so you can make changes over time."

CHARGING AHEAD

There is also the Canal Park charging station, 45 kilowatts of solar panels that shade parking spaces and provide access to electric vehicle chargers. By the end of 2023, the structure had saved the equivalent of 23,000 gallons of gasoline, 5,215 trees and 148,000 gallons of water. Each year, it powers the equivalent of 13 vehicles or 7 average-sized homes and prevents 130,952 pounds of CO₂ equivalents.

A similar project, a community solar garden, was purchased in part by the city of Duluth "to give citizens the option to participate in solar power without having installations on their

own homes or property," according to a report by garden partner Minnesota Power (MP). "The city saw an opportunity for a stable investment into solar power for the next 20 years, and at a better rate of return than the federal reserve's offers, where money was being kept," MP notes. "By reinvesting this money from reserves into purchasing 40 percent of the community solar garden output, Duluth ultimately will fully pay back in around 8 to 9 years, leaving 11 to 12 years of savings that are estimated at over \$2 million."

A recent grant will map future solar power efforts in Duluth, starting with a community-wide conversation about how excess energy should be stored. According to Granley, the informal meetings could identify community needs that city officials haven't considered. Examples include a solar-powered location that integrates batteries in order to support community members during a grid outage, to charge phones or provide ice or food; and a solar planning toolkit to share with other Midwest cold-climate communities. **GB**

GREEN HOME OF THE YEAR AWARDS 2024



BY GREEN BUILDER STAFF

The more you learn, the more you grow. Green Builder's Green Home of the Year winners know exactly what they're doing when it comes to being top-notch builders of great sustainable homes. But they're also taking time to help the entire industry grow, making sure others know how to build for the future. Our 2024 class showcases ways to make homes smarter, stronger and innovatively designed.

Our expert panel of judges evaluated projects in terms of overall sustainability, resilience, synergy with the environment, affordability, creativity and the depth of science employed. Here are their choices for the most exemplary and imaginative green homes of 2024.



THE JUDGES



ERIN BORDELON is the national sustainability manager at D.R. Horton, America's Builder. She has more than 17 years of industry experience and extensive knowledge in sustainability, high-performance buildings and building science. Having worked with a wide array of green building and energy programs, and holding more than a dozen sustainability-related licenses and certifications, Bordelon leverages her technical knowledge, ability to create alignment, and deploy market-focused solutions at scale.

In her role with D.R. Horton, Bordelon works with internal and external stakeholders to develop and deliver policies, guidelines and strategy related to home performance, code changes, energy ratings and certifications, sustainability and energy-related incentive programs, building science and ESG initiatives. Prior to joining D.R. Horton, she managed certification processes on multi-family, single-family and commercial construction projects. Bordelon currently serves on the Leading Builders of Americas' National Quality Council and is an active member of the Women in Housing Leadership (WHLG) group.



JENNIFER CASTENSON currently serves as the vice president of ambassador and industry partner programs at construction management software maker Buildxact. She provides leadership and collaboration across the various verticals involved in custom homebuilding and remodeling, and the industry stakeholders involved, in order to guide relevant product solutions.

Previously, Castenson served as the vice president of programming at national media and data group Zonda. Castenson is also a contributing writer to Forbes, reporting on innovative solutions in the built environment. Currently, she serves on the environmental issues committee for NAHB, and on the events committee for the National Lumber and Building Materials Dealer Association. She also is a board member for the Home Improvement Research Institute, and the nonprofit Miracle Travel Works. She is also part of the ESG Working Group to define and implement industry ESG improvements.



BETH GOULD is the design studio manager at Jagoe Homes, based in Western Kentucky. She is passionate about helping homeowners design their dream homes and educating them on energy efficiency. All Jagoe Homes are built EnergySmart, providing year-round comfort and reducing carbon and greenhouse emissions. Jagoe Homes also employs lean construction methods to minimize waste and facilitate project completion on time.

Before moving to Kentucky, Gould was the director of finance and operations at sustainable building nonprofit Southface Institute in Atlanta. Southface collaborates with other nonprofits, businesses, builders, developers, universities, government agencies, and communities to deliver practical solutions with tangible results for the planet and all its inhabitants.

From the Judges

"I applaud bringing LEED Zero certification to the community level."



ALL PHOTOS COURTESY OF PEARL HOMES

Sustainability in Stride

At Hunters Point, achieving net zero status is just another day in the neighborhood.

Developers of Hunters Point Resort and Marina have a rather modest goal: to create the first United States Green Building Council (USGBC) LEED Zero-certified, sustainable community in North America.

According to Marshall Gobuty, founder and president of project builder Pearl Homes, such an undertaking is not only possible, it's one that is perfect for today's market.

The Cortez, Fla. community includes 86 net-zero, solar-powered houses, and 47 boat slips on a nearby 18-acre property. The homes of Hunters Point were developed with help from the Florida Solar Energy Center (FSEC), a research institute at the University of Central Florida in Orlando.

"The goal was to do something that hasn't been done before: build a home that has a positive carbon footprint that would generate more power than the owner can consume," Gobuty says.



Above the bay. Hunters Point homes are three-story, with the bottom level serving as protection against flooding.



Storm ready. Houses are built to withstand hurricane-class weather, floods and power outages. A total of 86 homes is expected to be completed by the end of 2025.

Project Stats

NAME: Hunters Point Resort and Marina, Cortez, Florida

BUILDER: Marshall Gobuty, Pearl Homes Development,
www.pearlhomesfl.com

ARCHITECT/DESIGNER: BSB Design, Inc. – Tampa, Architect,
www.bsbdesign.com

LANDSCAPE ARCHITECT: Robert C. Gause, Gause and Associates,
www.gauseandassociates.com

INTERIOR DESIGNER: Meg Carson, EMCY Design,
www.emcyinteriordesign.com

PHOTOGRAPHER: Pearl Homes

“The goal was to do something that hasn’t been done before: build a home that has a positive carbon footprint that would generate more power than the owner can consume.”

—**Marshall Gobuty, president, Pearl Homes**

FLOOR PLAN



COURTESY OF BSB DESIGN

“After years of implementation, we have achieved just that.”

The houses generate 35 percent more power and consume 25 percent less energy than Pearl Homes initially aimed for. This is in part due to features such as ENERGY STAR-certified appliances, six inches of foam insulation throughout the walls, and dual-pane windows. The project’s overall Home Energy Rating System (HERS) Index rating is minus 13—a light year below the typical score of 80 for a new home built to code. And, overall carbon emissions are declining by 8 tons per year.

Word of the project’s success has gotten around: The company is developer of this year’s Green Builder Home of the Year winner in the Sustainable Communities category, and the 2024 Grand Winner overall. In 2023, Pearl Homes was included in Fast Company’s Innovation by Design Awards, and it was named a USGBC LEED Power Builder for the fourth time in six years.

STATE OF INDEPENDENCE

According to Gobuty, Hunters Point is the first community of its kind that can function off the state power grid, if needed. “Residents at Hunters Point have peace of mind knowing that their homes are equipped with an intelligent backup power system providing clean, carbon-neutral energy,” he says.

Each of the homes built or planned at Hunters Point relies on 14 solar panels to self-sufficiently power up. There’s also a 12-kWh battery to ensure uninterrupted energy, even under extreme conditions. In 2022, Hurricane Ian knocked out power to millions of Florida residents; in 2023, Hurricane Idalia put more than 500,000 utility customers in the dark. But the lights stayed on at Hunters Point. A home can operate for up to two





ENERGY ALLY.
The home features
ENERGY STAR-certified appliances,
including the refrigerator, oven and
stove.

CLEAN COVERAGE.
Cabinets and walls are
coated with non-VOC paint.

POWER (ALWAYS) ON.
Electricity throughout the house is
generated by a rooftop solar array, with
a backup battery for adverse weather.



Staying in control. A sonnen power system keeps electricity needs in the hands of residents, via solar panels and a battery backup.

Key Components

APPLIANCES: GE (stove, refrigerator, washer, dryer)
BUILDING ENVELOPE: Huber ZIP Systems
CABINETS, SHELVES, MILLWORK: Timberlake Cabinets
CAULKS AND SEALANTS: DAP, BEHR
DOORS AND HARDWARE: Therma-Tru doors
ELECTRICAL: Leviton; Lutron Electronics
EXTERIOR FINISHES: James Hardie siding
FLOORING: Shaw Floors
GARAGE DOORS: CHI Overhead Doors <i>Model 2250Z5</i> ; LiftMaster
HOME CONTROLS: Guardian Protection; IQ Panel
HVAC/DUCTS: Mitsubishi Electric mini split system
INSULATION: Icynene foam insulation (R-20)
LIGHTING: Topaz LED Slim Fit
PAINTS AND STAINS: Sherwin-Williams
PLUMBING/PLUMBING FIXTURES: MOEN
RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Solar system 7.2kW
ROOF: Metal roof
VENTILATION: Broan-NuTone
WATER HEATING: 40-gallon electric water heater
WINDOWS, SKYLIGHTS, PATIO DOORS: PGT windows

Waste not. Water-saving fixtures and WaterSense faucets from Moen contribute to each home’s net zero, environmentally friendly status.

weeks off the grid, Gobuty notes.

There are also cash benefits for owners. In addition to a federal tax credit of about \$30,000 one year after purchase of a Hunters Point home, residents on average save \$1,800 per year in electricity costs, based on current energy prices.

CONSTRUCTION CRITERIA

Homes are very likely to stay upright during storms and are less likely to flood. Walls are designed to withstand 150 mph winds. Meanwhile, since the development lies within a flood zone, the structures are about 3 feet off the ground, with actual living spaces about six times as high when the garage is accounted for.

All homes are built with materials that are sustainably sourced, as well as of a highly sustainable quality, using a process specifically designed to reduce construction site waste while increasing indoor air quality and enhancing many other health benefits for their residents, Gobuty adds. Materials chosen are local, which cuts down on shipping costs and helps the local economy. And, Pearl Homes partners with contractors “who act and think just like we do when it comes to the environment.”

Seamlessly handling all of the criteria was no simple task, Gobuty notes. Coordinating various sustainable systems such as solar panels, onsite energy storage, energy-efficient HVAC systems, and advanced insulation



Leak guards. Dual-pane windows, premium caulking and weatherstripping minimize air leakage.

required meticulous planning and collaboration with experts in the field. Additionally, ensuring that the construction materials met sustainability and quality standards was a major challenge.

“Building Hunters Point taught us the importance of flexibility and continuous learning in sustainable construction,” Gobuty says. “We learned valuable insights about adapting green technologies to overcome obstacles. Collaboration with experts and staying informed about the latest advancements proved to be crucial in achieving our sustainability goals.”

FUTURE GOALS

Construction of Hunters Point also

demonstrated that there is always room for improvement. “In future projects, we will prioritize implementing highly efficient water conservation strategies and explore cutting-edge technologies, including reducing the carbon footprint during construction and the overall carbon offset during the house’s lifespan,” Gobuty says. “These measures will undoubtedly reduce the ecological footprint and help us create a more sustainable future. Additionally, fostering stronger community engagement and education on sustainable living practices would be a priority to inspire broader adoption of green building principles.”

Gobuty also hopes that other builders will use Pearl’s success as an

example of what can be done when a real emphasis is placed on sustainability. His vision of the future includes communities that “work together in harmony with nature and technology to create sustainable living for all people.” That effort means focusing on sustainable materials and practices that ensure a future for the next generation, he adds.

“We like to think of it as ‘generational sustainability,’ because without a healthy planet, generational wealth is useless,” Gobuty says. “We plan to grow with the technological advancements as they improve, and continue to build upon the betterment of the way people live and communicate within their community.” **GB**



Returning investment. Renewable energy sources include a solar array with photovoltaic panels and a SolarEdge residential inverter.



Hard facts. Decking is made of Trex Enhance Basic composite board, a high-performance product that is fade-, stain-, scratch- and mold-resistant.

Let the River Run

This Asheville, N.C. project covers the checklist (and more) in sustainable traits.

What makes a perfectly green house? If you're Red Tree Builders, it's the project known as "River Run."

According to Brandon Bryant, Red Tree's president and owner, this home in Asheville, N.C. is "a testament to harmonious living with nature." Positioned along the tranquil riverbanks near the charming agrihood community of Olivette, it offers not only a place to call home but also a gateway to a lifestyle that celebrates the great outdoors.

It wasn't an easy build. Bryant notes that the project—Green Builder's Green Home of the Year in the Mainstream Green category—broke ground during the height of the pandemic in 2021. The timing resulted in many challenges, including material delays, labor shortages, and price fluctuations. "We learned to be adaptable and overcome unexpected

obstacles within the building industry," he says. "Our clients were fantastic to work with—they were very flexible and understanding throughout the entire build process."

The result was a custom build for a client wanting a beautifully designed home that was energy efficient, one that "exemplifies a commitment to sustainable living."

SUSTAINABLE ATTRIBUTES GALORE

Strategically positioned solar panels harness the power of the sun, generating clean energy that not only reduces the property's environmental footprint but also contributes to lower energy bills. Meanwhile, an efficient geothermal heating and cooling system ensures year-round comfort, utilizing the earth's natural energy to maintain an ideal indoor climate

From the Judges

"Gorgeous location with amazing performance—what's not to love?"

Project Stats

NAME: River Run, Asheville, North Carolina

BUILDER: Brandon Bryant, Red Tree Builders, www.redtreebuilders.com

DEVELOPER: Elliott Nailen, Olivette, www.olivetterealty.com

PHOTOGRAPHER: Darrell Cassell, Darrell Cassell Photography, www.darrellcassell.com; Red Tree Builders, www.redtreebuilders.com

A grand view. Natural lighting keeps energy needs at a minimum on sunny days—and emphasizes the area's natural beauty.



SAFE TO USE.
Cabinets and walls feature non-toxic, zero-VOC paints and stains.

COMMON "CENTS."
LED bulbs provide low-cost and emission-free lighting throughout the house.

POWER MISERS.
Kitchen appliances are ENERGY STAR certified.

THINKING LONG TERM.
Countertops and the kitchen island consist of quartz and quartzite, respectively. Both are designed for years of use with minimal care.



[LEFT] Solid as a rock. Kitchen countertops made of naturally developed quartzite provide a striking and durable surface that can be easily cleaned with a wet cloth instead of chemicals.

with tasteful natural wood siding, it blends seamlessly with the idyllic surroundings, "reflecting the spirit of the agrihood community that values the preservation of nature," Bryant says.

GREEN LIVING IS ASSURED

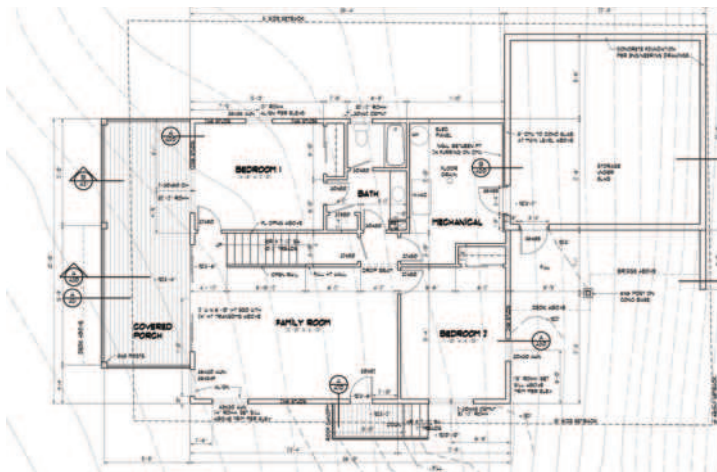
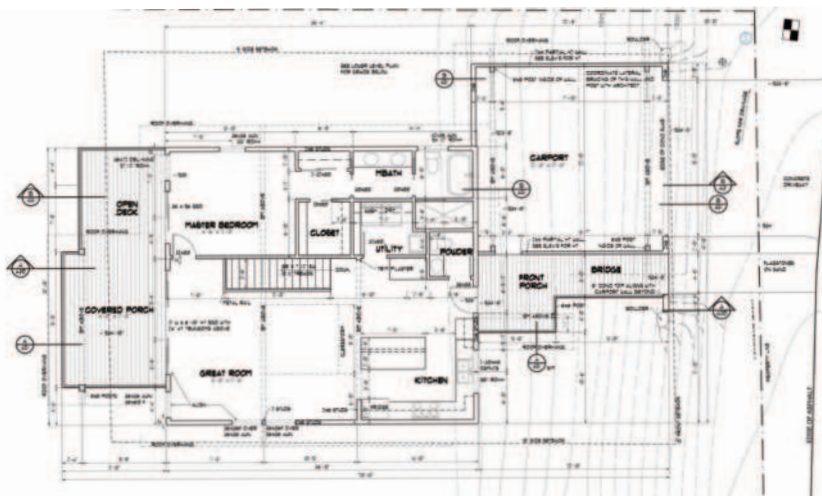
The home has been meticulously planned to minimize its environmental impact, making efficient use of space while maximizing the interior living areas, Bryant adds. Every square foot is thoughtfully considered,

ensuring that residents have ample room to enjoy the comforts of home while leaving a light footprint on the Earth.

"Residents here enjoy the privilege of easy access to an array of walking trails that wind through the pristine surroundings, inviting leisurely strolls amidst the beauty of the landscape," Bryant notes. "The soothing presence of the nearby French Broad River offers opportunities for boating or simply savoring the peaceful sounds of gently flowing water, creating a serene escape just steps from your

without the reliance on fossil fuels. This home received a Home Energy Rating System (HERS) Index score of minus 8.

Meanwhile, the exterior of the home is a testament to thoughtful design. Adorned



COURTESY OF RED TREE BUILDERS

"In the midst of an industry that is rapidly expanding, we take a unique approach to green building. Because we build only a select number of homes annually, we can prioritize craft and client's desires to build homes that are as artfully crafted as they are enduring and livable, as well as innovative and inspired by nature."

—Brandon Bryant, president, Red Tree Builders

doorstep."

In addition to these natural wonders, residents have the distinct advantage of a community garden, an oasis where they can cultivate their green thumbs and connect with their neighbors. "This shared garden space fosters a sense of community and encourages a deeper connection with the land, as residents come together to nurture the earth and share in the joys of harvesting fresh produce," Bryant says.

"In essence, this residence in Olivette embodies a harmonious and sustainable way of life, seamlessly integrating with the beauty of the agrihood community and its natural surroundings," Bryant says. "It offers not just a house but a lifestyle that cherishes the environment, encourages community engagement, and prioritizes the well-being of its residents in a setting where nature's wonders are cherished and celebrated every day." **GB**

Key Components

APPLIANCES: Bosch refrigerator, Café Range dishwasher and microwave, GE washer and dryer

BUILDING ENVELOPE: Pine lap board and batt sizing, ZIP System sheathing, Icynene spray foam insulation, gypsum board, air sealing with liquid ZIP. Sealed crawlspace, cast-in-place walls

CABINETS, SHELVES, MILLWORK: Wellborn Forest cabinets. Millwork and shelves—primed pine

CAULKS AND SEALANTS: Liquid ZIP, liquid flash, DAP caulk

COUNTERTOPS: Kitchen island and master bath: Fusion quartzite; Kitchen perimeter, laundry, and lower-level bath: granite; Powder bath: quartz

DECKS: Trex Enhance Basics composite

DOORS AND HARDWARE: Schlage door hardware

ELECTRICAL: Builders lighting, 100 percent LED, Kichler (lighting), Capital Lighting Innovations, and Minka

EXTERIOR FINISHES: Pine

FLOORING: LVP Karndean, Crossville Tile

HOME CONTROLS: Programmable, touch screen, Wi-Fi/smart thermostat.

HVAC/DUCTS: Two-speed Bosch geothermal

INSULATION: Open cell spray foam, fiber glass batts, foundation walls R-11, above-grade walls R-19, ceiling R-26

LANDSCAPING: Native plantings, natural hardscapes

LIGHTING: 100 percent LED

PAINTS AND STAINS: Sherwin-Williams and PPG, 0 VOC

PLUMBING/PLUMBING FIXTURES: Kohler, Pro Flo, Delta, American Standard, Jaclo, Signature Hardware and Elkay

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Solar photovoltaic panels, Silfab solar panels and SolarEdge inverter; Electric vehicle charger – 50 amp 240-volt outlet; ENERGY STAR-certified appliances and fans; 9.5 kilowatt solar array, Hanwha 340-watt system

ROOF: Standing Seam metal roof from Best Buy Metals

VENTILATION: Broan ERV, Panasonic WhisperGreen bath fans vented to the exterior; Castlewood whole home media air cleaner

WATER HEATING: Rheem heat pump water heater

WINDOWS, SKYLIGHTS, PATIO DOORS: Lincoln aluminum clad, Rouge Valley entry door, Masonite fiberglass entry side door, Window U value 0.29

OTHER: Indoor airPlus Certified, Energy Star certified, DOE Zero Energy Ready Certified, HERS minus 8; annual savings (relative to an average U.S. home) \$3,078



FROM LEFT:

Weather walls. The Samish Solar Home features durable walls with pre-painted siding, metal flashing and a timber-framed entry.

Home field advantage. Whenever possible, locally sourced products were used, such as locally grown fir, structural insulated panels (SIPs) and under slab expanded polystyrene (EPS) foam insulation.

H₂O aplenty. Samish Solar Home's rainwater cistern supplies the house and its fire suppression system with up to 28,000 gallons of filtered water.

Degrees of value. The internal environment is maintained by a hydronic radiant floor heating downstairs and a fan coil unit upstairs.



Climate Haven

No water? No problem for this clean energy-driven, H₂O-accumulating solar home.

“**S**amish Solar Home” is a highly efficient, drought-resistant, Net Zero Plus home designed by Powerhouse Designs and built by TC Legend Homes. It’s another classic Green Builder Green Home of the Year winner—this one’s in the new Extreme Heat Ready category—making TC Legend a two-time champion.

Located in Bellingham, Wash., Samish Solar Home is also a certified U.S. Department of Energy (DOE) Zero Energy Ready Home (ZERH), ENERGY STAR and EPA Indoor airPLUS certified, and anticipated Built Green 5-Star

certified.

The green elements are overwhelming. Samish Solar Home includes 2,345 square feet of heated living space and is built using SIP walls and roof, and an ICF foundation for superior insulation and airtightness. It was also constructed using TC Legend’s tried-and-true clear-story design with extended eaves to allow for passive heating, cooling, and lighting. The house received a Home Energy Rating System (HERS) Index score of minus 20, and is a Net Zero Energy home with a 10.8kW solar array, Enphase micro inverters, and is battery ready.

Project Stats

NAME: Samish Solar Home, Bellingham, Washington

BUILDER: Ted Clifton, TC Legend Homes, www.tclegendhomes.com

ARCHITECT/DESIGNER: Talia Dreicer and Jake Evans, Powerhouse Designs, <https://powerhouse-designs.com>

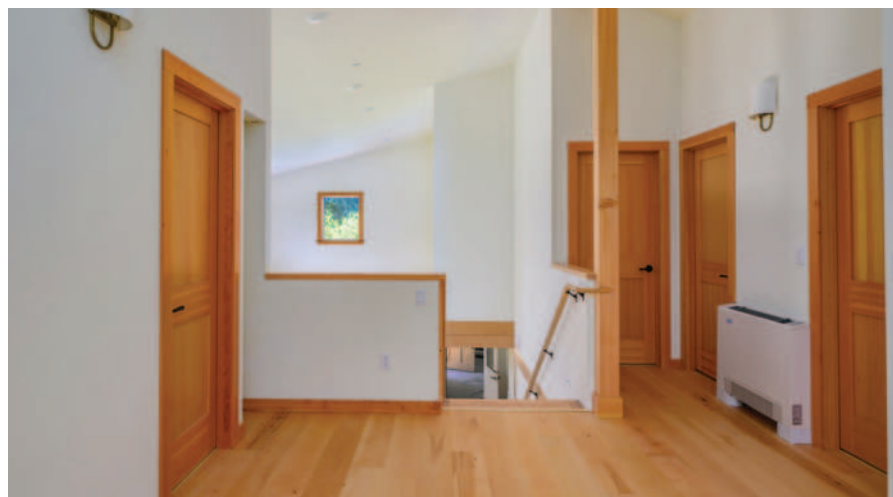
INTERIOR DESIGNER: Michelle Banks, Spiral Design Studios, <https://spiraldesignstudios.com>

PHOTOGRAPHER: John Trax, Zigzag Mountain Art, www.zigzagmtart.com

From the Judges

“The Samish Solar Home checks all the boxes—Building Science, Energy Efficiency, IAQ, and Water Efficiency, with innovative design.”

ALL PHOTOS COURTESY OF JOHN TRAX/ZIGZAG MOUNTAIN ART



Key Components

APPLIANCES: All ENERGY STAR-rated appliances, including LG washer/dryer set, GE Café range and fridge, Zephyr range hood, and Bosch dishwasher

BUILDING ENVELOPE: R-20 foam under slab, Nudura ICF foundation (R23), Neopor SIP panel walls and roof (R29 and R59 respectively), above-grade walls air sealed to ACH 0.27 with SIPs tape, and AeroBarrier

CABINETS, SHELVES, MILLWORK: Locally made cherry cabinets

CAULKS AND SEALANTS: Milk Paint Co. *Outdoor Defense Oil* for the front door. Alex Plus low-VOC caulking throughout the house.

COUNTERTOPS: Quartzite from Creative Stoneworks

DOORS AND HARDWARE: Fir doors and trim, clear coated in a low-VOC sealant. The door hardware is all lever-style handles for accessibility.

ELECTRICAL: Pre-wired for a backup battery system and (2) electric car chargers

EXTERIOR FINISHES: James Hardie pre-painted lap siding, metal flashing over exposed ICF foam and a timber framed entry

FIRE PROTECTION: Standard sprinkler system by XFire, fed by rainwater catchment and filtration system

FLOORING: Abode Flooring *Maple Greenguard Gold* flooring

GARAGE DOORS: Wayne Dalton *8500 Series* (R16.22)

HOME CONTROLS: Fantech *ECO-Touch Auto IAQ* control that detects temperature, humidity, and VOCs

HVAC/DUCTS: Chilltrix CX-34; hydronic radiant floor heating downstairs and a fan coil unit upstairs

INSULATION: R-20 foam under slab, R29 SIP walls and R59 SIP roof, R19 between floor and sound wall fiberglass insulation, R21 exterior wall and roof fiberglass insulation where SIPs are not used (breezeway and sunroom)

LANDSCAPING: The site is mulched to prevent erosion while clients landscape themselves

LIGHTING: All LED lighting

PAINTS AND STAINS: Sherwin-Williams zero-VOC paint

PLUMBING/PLUMBING FIXTURES: All WaterSense-certified plumbing fixtures. The first floor shower is zero-threshold for aging-in-place.

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): 10.8kW solar array made up of 36 Hyundai HiA S300-HG solar panels, with an Enphase micro inverter on each panel to maintain maximum solar output even with shaded or damaged panels. The system is battery ready.

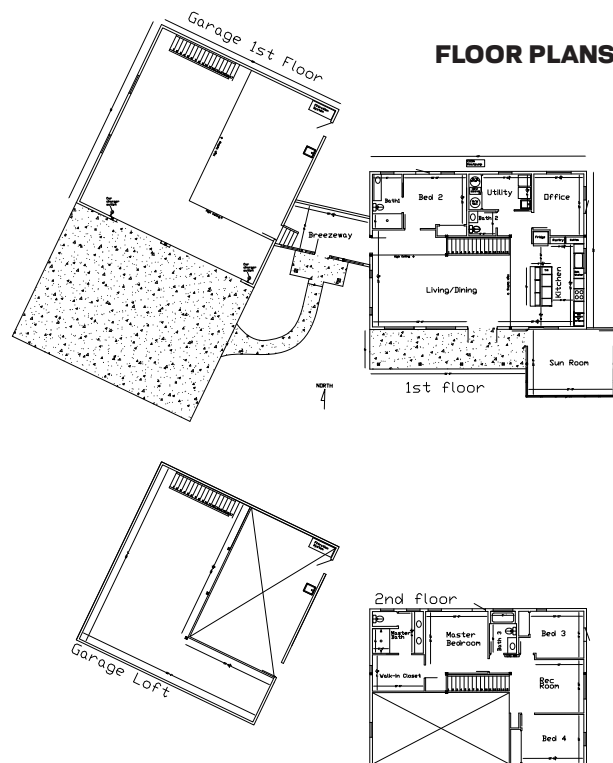
ROOF: Certified ENERGY STAR metal cool roof from ASC Building Products with an SRI of 32

VENTILATION: Fantech *Hero 250* with built-in HEPA filter. Built-in humidity, temperature, and CO₂ sensors.

WATER HEATING: Air source heat pump heats and cools domestic hot water. Backed up with a small on-demand electric unit for extreme use circumstances.

WINDOWS, SKYLIGHTS, PATIO DOORS: Vinyltek triple pane, low-e3 coated, argon-filled windows, with U-values averaging 0.16-0.18. There are no skylights to prevent possible leaks in the building envelope.

OTHER: A 28,000-gallon rainwater cistern that supplies the house and its fire suppression system with water.



COURTESY OF POWERHOUSE DESIGNS

According to TC Legend owner and project builder Ted Clifton, Samish produces enough energy to completely sustain the home and an electric vehicle (EV). The annual energy cost savings for this home is \$2,432.

“Samish Solar Home was designed for clients who have a growing family and want their home to be resilient in a world where our climate is gravely impacting our day-to-day lives,” Clifton says. “It was important to [the clients] that they be able to harvest their solar energy and water, so that they don’t have to rely on the city or their well for utilities. This also aligned with our standard building techniques and goals which include creating a highly energy-efficient, healthy home that is built based on the principle of solar-guided design.”

It wasn’t a simple project. When the clients purchased the lot, there was already an old permit and plan set in place. “We started out hoping to modify that plan set, but it would have resulted in too many adaptations and changes, so we had to scrap the whole thing and start from scratch,” Clifton says. “It was an important but challenging moment to recognize when it was time to start over versus trying to make the old plans work.”

To make the home as energy efficient as possible and create the best indoor air quality (IAQ), TC Legend utilized hydronic radiant floor heating using a Chilltrix CX-34 heat pump and additional fan coil unit, a Fantech *Hero 250* HRV with integrated HEPA filtration, all ENERGY STAR-rated



OPTIMIZED LIGHTING.

All fixtures are LED only, and daylighting was added wherever it would not lead to excessive heat gain.

ELECTRIC ONLY.

All appliances, such as the refrigerator, stove and dishwasher, are ENERGY STAR-rated.

LOCAL LUMBER.

Cabinet doors are made from locally sourced wood and clear coated in a low-VOC sealant.

GRANITE FREE.

Countertops consist of durable, easy-to-maintain quartzite.

appliances, LED lighting, and triple-pane windows. Aerobarrier air sealed the home down to 0.27 ACH50. A certified metal cool roof was installed to help with temperature regulation.

Samish Solar Home has an added level of resiliency with its 28,000-gallon rainwater cistern that supplies the house and its fire suppression system with water. The rainwater is filtered through a sediment filter, activated carbon filter, and UV filter to ensure it is fit for domestic use.

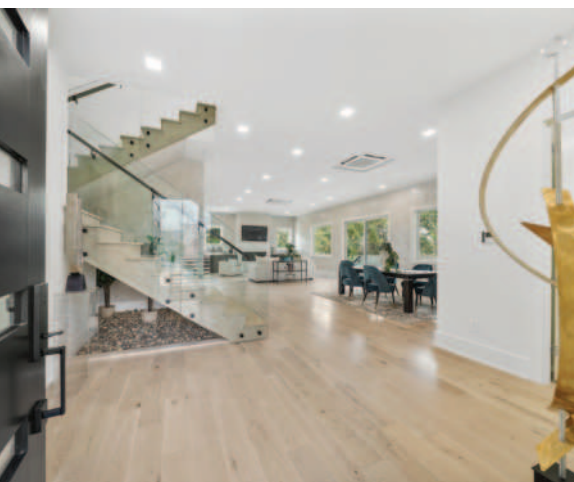
But even with the cistern, TC Legend wanted to make the

home water efficient, and did so using all WaterSense certified plumbing fixtures. IAQ was ensured as top notch with installation of Greenguard Gold certified flooring, using low- or zero-VOC paint and finishes, installed humidistats and CO₂ sensors that automatically boost the ventilation system. A separate Awair IAQ monitor measures CO₂, humidity, VOCs, particulate matter, and temperature.

Clifton adds that it was important that the finishes be locally sourced where possible. Cabinets were made locally and the interior doors and trim are

locally grown fir. The home's Hardie siding, Vinyltek windows, Insulspan structural insulated panels (SIPs) and under slab expanded polystyrene (EPS) foam insulation are also made just a short distance away.

The company did learn a lesson from this project. "We started construction during the wet season which meant we ended in the dry season," Clifton says. "In the future, for a build this size, it would have been more advantageous to start construction in the dry season and ending in the wet." **GB**



Indoor decor. Solid wood core doors, 7.5-inch-wide engineered wood flooring, and water-based paints reduce both short- and long-term offgassing.



Energy in reserve. A 48-volt whole house, energy-saving LED lighting system runs on one 20-amp breaker and a battery backup.



ALL PHOTOS COURTESY OF GEORGE MOCK/EVERLASTING HOMES BUILDING GROUP

Houston Hospitality

Here's a home designed for minimal maintenance and energy consumption in its harsh climate.



Houston residents endure some extreme weather. The city's subtropical climate results in basically two seasons: rainy and dry. Rainfall averages about 50 inches per year, making it one of the nation's wettest cities. A highly humid atmosphere generates more than 100 days per year of temperatures of 90 degrees or higher, placing Houston within the top 20 of hottest U.S. cities, according to the National Oceanic and Atmospheric Administration (NOAA). And, although hurricanes and tropical storms are rare, they are not uncommon.

From the Judges

"A beautiful house."

Project Stats

NAME: 4903 Braesvalley Drive, Houston, Texas

BUILDER: George Mock, Everlasting Homes Building Group, www.everlastinghomesgroup.com

ARCHITECT/DESIGNER: : Franck Boursier, Everlasting Homes Building Group, www.everlastinghomesgroup.com

DEVELOPER: Franck Boursier, Everlasting Homes Building Group, www.everlastinghomesgroup.com

INTERIOR DESIGNER: Madelyn Kilkeny, Madhaus Co., www.madhausco.com

PHOTOGRAPHER: George Mock, Everlasting Homes Building Group, www.everlastinghomesgroup.com



Pro-stone zone. Durable quartz countertops and flooring are easy to clean without harsh and toxic cleaners.

Key Components

APPLIANCES: Miele (refrigerator, freezer, coffee maker, speed oven, dishwasher); Bertazonni (range and hood)
BUILDING ENVELOPE: RSG 3D SCIP structure (stucco and brick siding, plus wood-looking siding that is concrete)
CABINETS, SHELVES, MILLWORK: Custom made (mix of paint grade and European style)
CAULKS AND SEALANTS: MasterSeal NP1 (polyurethane sealant)
COUNTERTOPS: Quartz
DECKS: RSG 3D/concrete
DOORS AND HARDWARE: Solid wood core doors (Kwikset brand)
ELECTRICAL: Standard 200-amp service with low voltage lighting system
EXTERIOR FINISHES: Stucco/concrete, brick, simulated wood
FIRE PROTECTION: Smoke detectors and alarm
FLOORING: 7.5-inch-wide engineered wood floor
GARAGE DOORS: 16-foot-by-8-foot flush design, black with windows
HOME CONTROLS: Control 4
HVAC/DUCTS: Ductless and ducted, all in conditioned space by structural design; Toshiba <i>Carrier VRF</i> system, 35-40 percent smaller due to tightness of the shell building and the energy efficiency of the R-20 insulation in the walls, floors and roof.
INSULATION: Built-in SCIP panel (5-foot EPS - R=20)
LANDSCAPING: Low water volume plants and grass
LIGHTING: 48-volt whole house LED lighting system on one 20-amp breaker, battery backup
PAINTS AND STAINS: Water-based paints by Kelly Moore
PLUMBING/PLUMBING FIXTURES: Grohe
RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): House is solar ready with charger in garage, pipe from roof area to garage. HERS rating is 42 and certified to Zero Energy Ready Home (ZERH) by HERS Checker.
ROOF: Concrete plus acrylic membrane
VENTILATION: Whole home with Toshiba <i>Carrier VRF</i> system
WATER HEATING: Navien gas tankless water heater
WINDOWS, SKYLIGHTS, PATIO DOORS: Andersen <i>100 Series</i>
OTHER: House is elevator ready, emergency generator ready. Bottom floor is designed with six drains in the floor connected to the storm drain system. Flood gates open automatically if pressure builds inside. All electrical items are at plus 6 feet. Since the floor and walls are concrete, after flooding simply power wash walls and floor down drains.

FLOOR PLANS



COURTESY OF EVERLASTING HOMES BUILDING GROUP

All of this means that any new homes must be designed to withstand very harsh conditions—which is why Everlasting Homes Building Group (EHBG) opted to use the innovative *RSG 3D Structural Concrete Insulated Panel (SCIP)* construction system when building the 4903 Braesvalley Drive project. EHBG is the only Texas builder to use the SCIP technology, according to EHBG General Manager George Mock.

According to Mock, the SCIP system consists of high strength, load bearing, industrially prefabricated 3D modular panels covered with shotcrete, as well as with a layer of galvanized mesh on either side of an expanded polystyrene Styrofoam (EPS) core. These are welded together by galvanised steel diagonals which penetrate the core, resulting in a lightweight, three-dimensional truss system with a high inherent stiffness and great thermal properties. These panels are used for structural walls, intermediate floors and roofs.

BUILT TO LAST

Braesvalley—the Wildfire and Flood Ready category winner of Green Builder’s annual Green Home of the Year competition—contains 20,000 square feet of *RSG-3D SCIP* with built-in R-20 insulation, and 1.5-inch, 4,000 psi concrete sprayed on both sides of the *RSG-3D* panel. These, plus 1,500 tons of concrete and 15 tons of grade 60 steel rebar, make the house energy

efficient and weather resistant. The 4,700-square-foot, five bedroom and five-bathroom home has a HERS Index of 42, which makes it competitively energy efficient for dwellings of its size. It’s also a Department of Energy (DOE) Zero Energy Ready Home (ZERH).

RSG-3D SCIP has a strong history behind it. The product is ICC evaluated and certified, Miami-Dade Notice of Acceptance (NOA) approved, exceeds CA Title 24 Energy Code, reduces British thermal units (BTUs) by 60 percent, and has had zero damage in 20 years in 20 countries, Mock adds.

Meanwhile, in the durability department, the completed, monolithic home can withstand 200-plus mph winds, would survive an earthquake measuring 9.0 on the Richter scale, has a 2-hour fire rating, and is mold, wood rot and termite resistant.

MASSIVE RAIN, NO PAIN

The home’s crown jewel is its flood resistance. Houston’s location within a storm zone—and its mere 43-foot elevation above sea level—results in flooding somewhere an average of four times every year, according to NOAA. On top of that, Houston is in a 100-year flood zone, which means there is a 1 percent chance annually of flooding, and that there will be at least one major flood during that period, according to the Federal Emergency Management Agency (FEMA).



LUMBER ALTERNATIVE

The home's structural concrete insulated panel (SCIP) structure includes stucco and brick siding, plus simulated wood concrete siding, which provide super durability against inclement weather.

DESTRUCTION PROOF?

The roof, exterior walls and floors are fire, flood, hurricane, tornado and seismic resistant thanks to RSG 3D qualities.

POWERFUL STUFF.

Energy efficiency is boosted by R-20 insulation and 1.5 inches of 4,000 psi concrete sprayed on both sides of the RSG-3D panels.

DRAIN GAME. A series of floor drains and vents easily remove flood water from the bottom of the house, making it easy to clean and minimize damage.

In recent times, Mother Nature hasn't been kind: 17 inches of rain during the "Tax Day" flood of 2016; 61 inches from Hurricane Harvey in 2017; 30 inches from Tropical Storm Imelda in 2019; 15 inches from Tropical Storm Beta in 2020.

Residents kept those figures in mind as they designed or rebuilt homes. But EHBG takes a different approach.

"Others in this neighborhood jacked their existing houses up 3.5 feet," Mock notes. "If they built new, they raised their lot with 3.5 feet of structural fill, then built on top of that. We designed a

9-foot-high bottom floor that could flood and be repurposed."

At Braesvalley, the bottom floor is basically non-living space—i.e., the garage. There are six floor drains connected to the city storm drain system; another 11 flood vents are in the walls and open automatically from water pressure. "After any flooding event, simply power wash your concrete walls and floor down the six floor drains and you are back in business," Mock says. "No mold, no sheetrock, no big deal!"

Additional benefits include reduced sound transfer and an anti-allergenic environment, which helps provide healthy, comfortable living and working; better-regulated and reduced temperature swings due to the home's concrete thermal mass; and an extremely low life-cycle cost due to reduced operating cost of energy, insurance and maintenance. "Operational savings can easily reach 50 percent of the original investment in 30 years," Mock notes. "[Add in] solar, and homes can contribute energy sales to produce positive cash flow." **GB**



Extra-strength exterior. Wood siding consisting of rough sawn green hemlock (left) and Gendai Shou Sugi Ban (right) offer resistance to mold, dry rot and insects.

CREDIT: © MARCUS BROOKS/THE HELIOGRAPH PROJECT

[FAR TOP RIGHT].

Multipurpose glass. Dual- and triple-pane windows fill the house with natural lighting and temperature control throughout the year. CREDIT: © PAVEL BENDOV/ARCHEXPLORER



Panel power. Community houses are all-electric, with onsite solar and storage to ensure a clean, renewable energy

SOURCE. CREDIT: © THE CATSKILL PROJECT

An Airtight Case

There's more to this Passive House than just great environmental control.

The Catskill Project (TCP) is a planned 90-acre community of 25 Passive House-designed, carbon-neutral homes, meeting rigorous design standards for exceptional air quality and consistent, comfortable indoor temperature year-round. TCP homes are high-quality, high-performance homes, with air-source heat pumps, induction stoves, and energy-efficient appliances.

The Livingston Manor, N.Y.-based community is Green Builder's Green Home of the Year for 2024, in the Offsite Construction category.

From the Judges

"The Catskill Project demonstrates the scalability of using prefab components. The focus on embodied carbon is outstanding."

Project Stats

NAME: The Catskill Project, Livingston Manor, New York

BUILDER: Dariusz Chiach, Professional Construction Group of New York, www.pcgnycorp.com

ARCHITECT/DESIGNER: Buck Moorhead, Buck Moorhead Architect, www.buckmoorheadarchitect.com

DEVELOPERS: Greg Hale and Peter Malik, Manor Falls Associates, www.thecatskillproject.com

LANDSCAPE ARCHITECT: Michy McCreary, Mittsu Landscape Architecture, <https://mittsu.work>

PHOTOGRAPHER: Marcus Brooks, The Heliograph Project, www.theheliographproject.com; Pavel Bendov, ArchExplorer, <https://archexplorer.com>; Sergio Saade, Sergio Saade Photography, <https://sergiosaade.com>

All systems go. ENERGY STAR-certified appliances, such as an induction range and refrigerator, and locally sourced white oak kitchen cabinetry offer environmental and economic advantages. CREDIT: © THE CATSKILL PROJECT



CREDIT: © PAVEL BENDOV/ARCHEXPLORER

According to Greg Hale, co-founder and principal of project developer Manor Falls Associates, all homes are airtight, with continuous insulation, triple-pane windows, no thermal bridging, and energy recovery ventilators (ERVs) with MERV 13 filters for superior indoor air quality (IAQ). Houses in the community are all-electric, with onsite solar and storage to ensure the power source is clean. The homeowner also has the option to obtain power through a community solar subscription.

By partnering with homebuilder Bensonwood and utilizing its Tektoniks offsite, panelized construction system, TCP benefited from its prefabrication capabilities. A typical example: a stringent airtightness standard (0.6 ACH@ 50 Pa). “The precision possible in Bensonwood’s factory makes Passive House performance a replicable outcome instead of an exceptional achievement,” Hale says. “Because of this approach, developers can apply these principles to an entire

development versus one home at a time.”

While some people may have doubts about how efficient Passive House really is, TCP often alleviates them. “We have confirmed for ourselves that Passive House really works,” Hale says. “The average monthly utility bill for our first house is \$69 over two years of operation, while the indoor temperature is consistently comfortable. We also conducted a test in the winter, switching the heat off for a week in mid-January when temperatures dipped below zero. The indoor temperature never dropped below 50 degrees during the entire test period.”

WHAT PLEASES A HOMEBUYER?

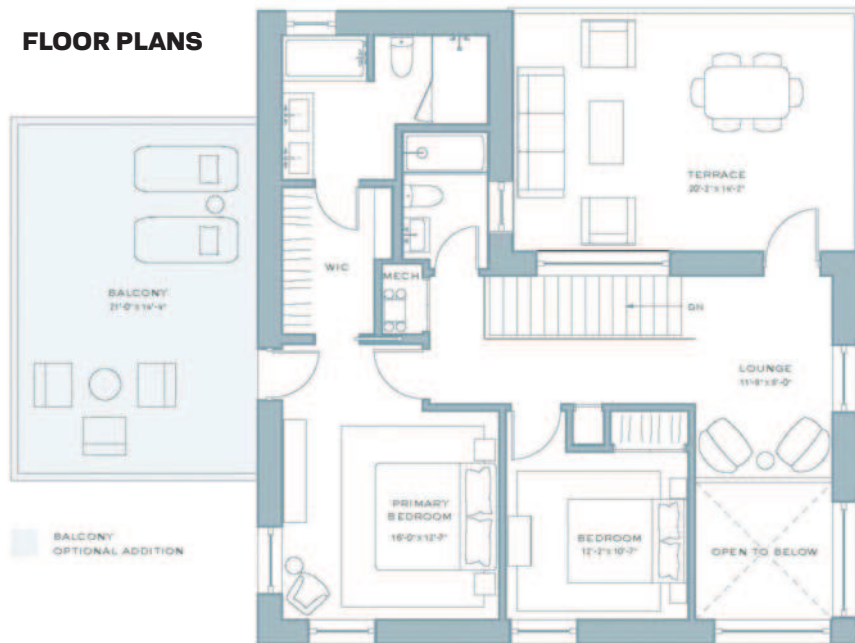
For today’s buyers, a healthy home is important—and perhaps more so—than an energy-efficient one. TCP demonstrated its resilience in 2023, when Canadian wildfires resulted in New York state being draped in smog as the wildfires drifted south. “Thanks to our airtight

homes...the air quality inside the model home wasn’t compromised and remained particle-free unless you opened the door or window,” Hale says. “This is an important reason why we are building more-resilient homes, and it helps us to explain to those who might not ‘get it’ why we build to higher standards.”

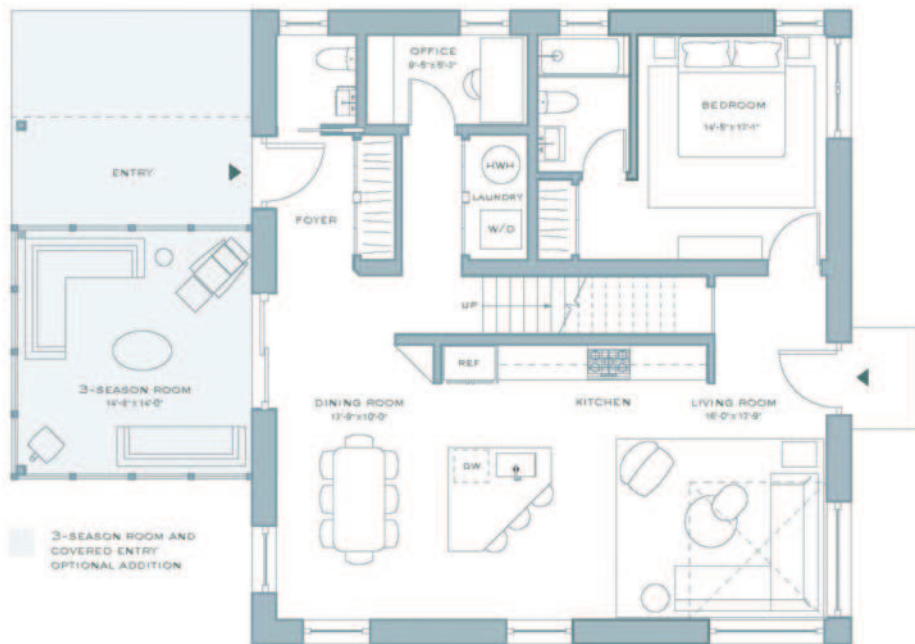
In addition to zeroing out operational carbon through the community’s design process, the TCP team has prioritized minimizing the community’s embodied carbon from the very beginning. From the selection of ethically sourced building materials and key project partners, to the paper used for marketing collateral, the team is constantly strategizing on the best products to use to reduce embodied carbon, Hale notes.

An important extension of TCP’s values is to show others how carbon neutrality can be achieved, thereby making an impact on one of the primary carbon emissions sectors in the economy, he adds.

FLOOR PLANS



SECOND FLOOR



GROUND FLOOR

COURTESY OF BUCK MOORHEAD ARCHITECT

The Catskill Project is the only single-family residential carbon neutral community under development in the Northeast. TCP's developer and architect prioritize the importance of including embodied carbon in the definition of carbon neutrality when thinking about strategies to use and hurdles to overcome in TCP's quest for carbon reduction.

"The Earth's resources are finite," Hale notes. "Using fewer resources leaves more to

go around for everyone and everything else."

People are getting the message. "Dozens of people have come to tour the project — and it is in most cases immediately obvious that those who 'get it' are interested in exploring it further," Hale says. "The bifurcation at a very early stage of the visits is quite remarkable. People who understand high performance buildings respond very positively to the home and community design." **GB**

Key Components

APPLIANCES: Bertazzoni and LG induction ranges, Bertazzoni dishwashers and refrigerators, Whirlpool washer/dryers

BUILDING ENVELOPE: Slab-on-grade foundation with Warmform insulation; prefabricated wall and roof panels from Bensonwood, Keene, N.H.; Tektoniks WFB10+ Wall Panel System; Tektoniks Ventilated Roof Panel System. Rockwool insulation for interior service cavities. Final wall system R-47+; final roof system R-60+.

CABINETS, SHELVES, MILLWORK: White oak custom kitchen cabinetry and millwork by T&M Custom Furniture, Narrowsburg, N.Y.

CAULKS AND SEALANTS: Brands vary by location, including Sika, GE, DAP.

COUNTERTOPS: Richlite *Black Diamond* (100 percent post-consumer recycled paper) from Ecosupply.

DECKS: Natural cedar (untreated); Trex *Select* and *Enhance* composite decking; varies by location.

DOORS AND HARDWARE: Exterior doors: Unilux *ModernLine* (triple-glazed, U-value 0.15); Interior doors: 8-foot solid core slab doors; Baldwin *Reserve* and Emtek hardware

ELECTRICAL: Various electrical contractors, including Eastern Electrical Contracting, Liberty, N.Y.

EXTERIOR FINISHES: Rough sawn green hemlock by Ghent Wood Products; *Gendai Shou Sugi Ban* by Nakamoto Forestry; Cupaclad *Natural Slate Rainscreen Cladding* (building skirt); *Black Locust* from Locust Lumber Co. (alternative building skirt material).

FIRE PROTECTION: Hardwired smoke and CO₂ detectors throughout

FLOORING/TRIM: Site-harvested ash (flooring, trim) and cherry (stairs, ceiling); V3-engineered wood flooring from Shafer Hardwoods, Tecumseh, Mich.; Polished concrete slab in open plan kitchen/living/dining space

GARAGE DOORS: Raynor from Dutchess Overhead Doors.

HVAC/DUCTS: Fujitsu 1.5-ton air source heat pump; Mitsubishi 2-ton air source heat pump (varies by location); EZ Air Flow

INSULATION: Densepack cellulose, Rockwool *Comfortbatt*, Steico wood fiberboard, Siga membrane (cellulose and fiberboard included in Bensonwood panel/roof systems, Rockwool for interior service cavities)

LANDSCAPING: Beaverkill Landscaping, Livingston Manor, N.Y. (finish landscaping); Mountaintop Landscaping, Livingston Manor, N.Y. (excavation and grading)

LIGHTING: Can, strip and optional cove lighting, all 100 percent LED; Decorative LED lighting by Stickbulb

PAINTS AND STAINS: Benjamin Moore and Sherwin-Williams zero-VOC

PLUMBING/PLUMBING FIXTURES: Watermark *Brooklyn*, Kohler *Purist*, TOTO (toilets), Duravit (sinks and vanities). Various plumbers including Spriggins Mechanical, Hurleyville, N.Y.

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): LG *Neon 2 389AC* roof-mounted PV (9.12 kW, 24 panels), Tesla *Powerwall 2* Battery Storage (27.00 kWh); installed by SunCommon, Kingston, N.Y.; Estimated solar offset: 100 percent

ROOF: Standing mechanical seam metal

TILE: Fireclay, Nemo, Porcelanosa

VENTILATION: Zehnder Q350 *Energy Recovery Ventilator*, AAA Flanders *EZ Flow* air filters.

WATER HEATING: A.O. Smith

WINDOWS, SKYLIGHTS, PATIO DOORS: Unilux *ModernLine Wood-Aluminum Clad* (triple-glazed, U-value 0.15); Marvin dual-pane for three-season rooms (outside thermal envelope).



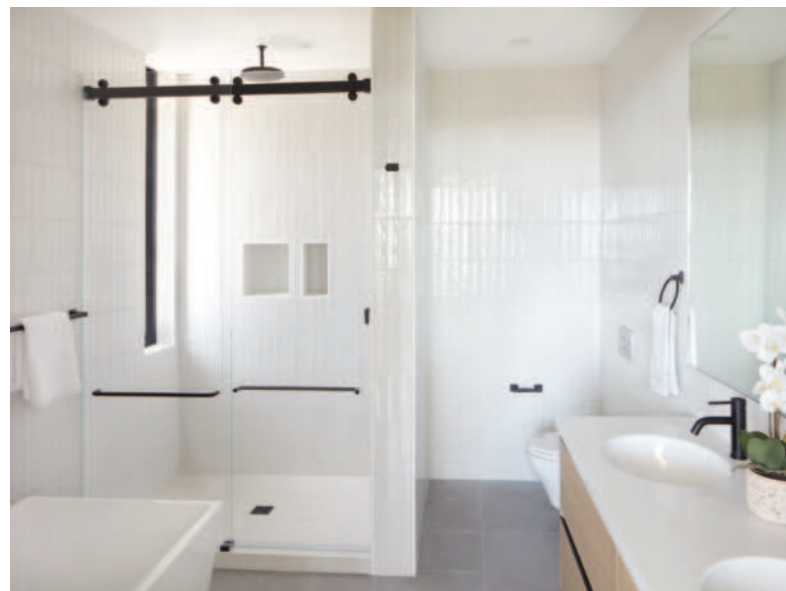
ALL PHOTOS COURTESY OF MUFFY KIBBEY/MUFFY KIBBEY PHOTOGRAPHY AND DENISE HALL MONTGOMERY ARCHITECTURE

A Plan for Perfect Placement

Building a small sustainable custom house became a lot easier using SIPs.

Structural insulated panels (SIPs) have their merits. For owners of the “ENERGY STAR SIP House,” also known as the “Mohsenin/Sackett Residence,” SIPs were the perfect lower-cost way to build a house in a difficult-to-access area.

According to builder Greg Koepf, president and CEO of Shell Building Systems, the four bedroom, four bath, 2,600-square-foot house in Berkeley, Calif.—Green Builder’s Green Home of the Year, in the Alternative Building category—was on a very difficult upslope, which made it nearly impossible to get equipment and materials to the project site.



Extra storage. Custom-made wooden cabinets and shelving are attractive, and they store carbon that would otherwise go into the atmosphere.

Crowd pleasers. Local, custom-made stone countertops, water-saving fixtures and LED lighting contribute to the owners' overall satisfaction.

From the Judges

"The use of alternative/unconventional means of delivering and installing home components is excellent."

Project Stats

NAME: ENERGY STAR SIP (Mohsenin/Sackett) Residence, Berkeley, California

BUILDER: Greg Koepf, Shell Building Systems,
www.shellbuildingsystems.com

ARCHITECT/DESIGNER: Denise Montgomery, Denise Hall Montgomery Architecture,
www.dhmararchitecture.com

MANUFACTURER: Premier Building Systems

PHOTOGRAPHER: Muffy Kibbey, Muffy Kibbey Photography, www.muffykibbey.com



"SHOW" TIME.
Dual-pane windows on walls and doors allow natural lighting during the day, and reduced heat loss overnight.

TOUGH PERFORMER.
Structural insulated panel (SIP) walls and roofs are praised for being about 50 percent more energy efficient than traditional timber framing.

BRANCHING OUT.
Natural plant landscaping, such as trees, shrubbery and grass, offer shade, exterior beauty, and atmospheric CO₂ filtering temperature.

BETTER THAN WOOD?
Sustainably manufactured composite decking is durable, easy to maintain and attractive to the eye.

The company was brought in by the owners and the architect, Denise Hall Montgomery Architecture, to discuss whether SIPs would be a good option.

"The owners were very cognizant of building their home using sustainable, energy efficient, green products to keep within their mode of design and exceeding Berkeley Building regulations, CALGreen and Title 24 requirements," Koepf says. "And [they wanted] to keep the cost down because of a very difficult lot to build on, which would have been extremely costly if built with conventional means."

This residential structure was built around the views of the San Francisco Bay. With many windows for outside viewing, and a lush surrounding natural landscape and fauna that helped

beautify the home, keeping as much of the area as possible intact was a necessity, according to Koepf. "Hitting all the high points with the design, it's truly a piece of artwork," he says.

CONSTRUCTION DIFFICULTIES

Getting to work—to get to work—was a challenge. The lot was a steep up-slope in Berkeley Hills; streets were extremely narrow and there was nowhere to stockpile construction materials. "The only way we could bring SIPs to the actual building area was utilizing a walking path along the property line that was above the lot," Knoepf says. "We had to actually build a 200-foot slide to push the panels to the site because we could not bring in equipment to hoist the panels into

place. We became very creative moving panels around the building site, [especially] with manpower, pullies, hoists and other means to get the panels around, especially on the roof."

The efforts resulted in 35 percent savings in overall construction cost as builders used floor, wall and roof SIPs to construct the home. Using SIPs also allowed Title 24 to achieve a higher energy rating which enabled the architect to allow for large glazing to take advantage of the view of the Bay Area, Knoepf notes.

Also, because SIPs weigh a lot less than conventional methods, they made up only 25 percent of the project's structural cost. "The overall project remarkably made the SIP panels the absolute best choice, both cost-wise



Meeting standards. Windows throughout the house are California Building Standards Commission Title 24 compliant, which makes them 53 percent more efficient than ones manufactured in 2016.

FLOOR PLANS



COURTESY OF DENISE HALL MONTGOMERY ARCHITECTURE

and for the time in building out this project,” Knoepf says. “It would have taken months longer if done conventionally.”

OTHER POSITIVES

With the house construction now complete, the owners are enjoying a number of sustainability-related benefits. Temperature-controlling wall and roof thickness—6 inches and 10 inches, respectively—are a natural result of SIPs, as was HVAC usage. Its

use was reduced by 65 percent.

ENERGY STAR-certified appliances, LED lighting, a 99 percent energy efficient electric hot water heater, and an 8kW solar system on the roof have led to low utility bills.

And, there are cosmetic green elements, such as low-VOC paint, flooring made of recycled hardwood that was taken out of an old local mansion, and naturally designed landscaping using local and indigenous species with low-water requirements. **GB**

Key Components

BUILDING ENVELOPE: SIP: walls 6.5 inches, floors 9.5 inches, and roof 11.5 inches

CABINETS, SHELVES, MILLWORK: Custom hand built

COUNTERTOPS: Stone, custom

DECKS: Composite

DOORS AND HARDWARE: Western Window Systems

ELECTRICAL: LED, CALGreen Title 24 Compliant

EXTERIOR FINISHES: Stucco

FIRE PROTECTION: Fire suppression sprinkler throughout

FLOORING: Hardwood

GARAGE DOORS: Typical roll-up

HOME CONTROLS: Smart House – Google and NEST

HVAC/DUCTS: Radiant hydronic floors

INSULATION: SIPs EPS core

LIGHTING: LED CALGreen Compliant

PAINTS AND STAINS: Sherwin-Williams non-VOCs

PLUMBING/PLUMBING FIXTURES: Other manufacturers

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Solar

ROOF: 3-ply modified bitumen roof with granule cap; half-inch perlite cover board

VENTILATION: Continuous fan flow per CALGreen

WATER HEATING: Domestic hot water (DHW) system boiler for hot water and radiant floor

WINDOWS, SKYLIGHTS, PATIO DOORS: Western Window Systems windows and doors, per Title 24



From the Judges

"Kudos for designing this retrofit with the House-as-a-System approach."



Sun block. Older windows were replaced with higher-performing, triple-glazed versions; the others were repurposed for other projects.



Eight-Year Endeavor

Rebuilding a mid-20th century house took patience, but the learning curve was worth it.

When architect Carri Beer and Passive House consultant Michael Hindle began the restoration of what they now refer to as the “CarMic 1954 Net Zero Retrofit,” they knew it was going to be a challenge. Taking a beaten-up, enormous, outdated, 50-plus-year-old single-family home and transforming it into a modern, stylish, healthy, and energy efficient dwelling—without losing any of the charm that attracted them to the place—would be a multi-year task. The house needed so much work, the project took eight years to complete. In that time, the term “money pit” would come to mind. So would the word “crazy.”

Project Stats

NAME: CarMic 1954 Net Zero Retrofit, Catonsville, Maryland

OWNER: Carri Beer, Common Ecology Radical Architecture, www.commonecology.com; Michael Hindle, Passive to POSITIVE, www.passivetopositive.com

ARCHITECT/DESIGNER: Carri Beer, Common Ecology Radical Architecture, www.commonecology.com

PHOTOGRAPHER: Jennifer Chase, Jennifer Chase Photography, www.jenniferchase.com; Carri Beer, Common Ecology Radical Architecture, www.commonecology.com



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Cleaner greenery. Dirt displaced from remodeling efforts was used to create a berm with native perennial flowers and other wildlife-attracting vegetation.



Wall art. Carbon-negative cork is used as cladding and for flooring, acting as insulation and offering a unique appearance.



PROPER PLANTING. Various vegetation receives ample sunlight, courtesy of broad-pane windows throughout the house.

EXTENDED LUMBER LIFE. Wood from areas of the house that were demolished was reused elsewhere, such as for window frames.

NATURAL CHOICE. Walls are lined with retardant-free Thermacork instead of foam insulation.

A CLEAN FLOOR. Instead of an oil-based product, flooring is caulked and sealed with Safecoat, a non-toxic emulsion compound.

But there is enough common sense to make the project Green Builder's Green Home of the Year in the Net Zero Plus Energy category. The Catonsville, Md. home's original footprint clocked in at what in 1954 was a pretty-good-sized middle-class dwelling: single story, 1,524 square feet, three bedrooms, two bathrooms and a two-car garage. But over the years, various owners made numerous haphazard modifications, such as an ill-advised covered porch, a three-seasons room over the garage, and a poorly refinished basement and two extra bedrooms. These tripled the home's size (now 4,519 square feet) and its waste potential.

Beer is principal architect at [CommONEcology](#), which provides net-zero and passive-house services. She once referred to the house, in a blog from Green Building Advisor, as "a never-ending nightmare of things falling and breaking." There was a natural gas leak, gutters falling off, copper piping with pinhole leaks, two macerating ejector pumps leaking sewer gas, and numerous

overloaded circuits. There was a dual furnace with a single-zone duct system rated for a total of 160,000 Btu/h and a 5-ton A/C, along with another 50,000 Btu/h and 2.5 tons of A/C in the seasons room, which were incapable of adequately cooling or heating the house. The yard was overgrown, the pool had a leaking, chemical-guzzling pump, 1990s fixtures, and even some time-warped, now-concave windows that were actually melting the home's vinyl siding.

Air leakage was ridiculous: According to Beer, an audit revealed that the house leaked about 1.3 times more than it should; proper air sealing would only reduce the air infiltration to about 4,200 cfm. She notes that they have designed and delivered houses of nearly this size that tested out at only about 5 percent of that total.

So, why undertake such a massive, futile-sounding rework?

"As practitioners in the industry, we were inspired to retrofit this home in an effort to show what is possible to anyone that owns a home," Beer says.

"Knowing that deep energy retrofitting our existing building stock is critical to the health of our planet, we wanted to provide a story and a guide—provide others the inspiration and instruction, to retrofit their homes to be healthy, low energy and resilient."

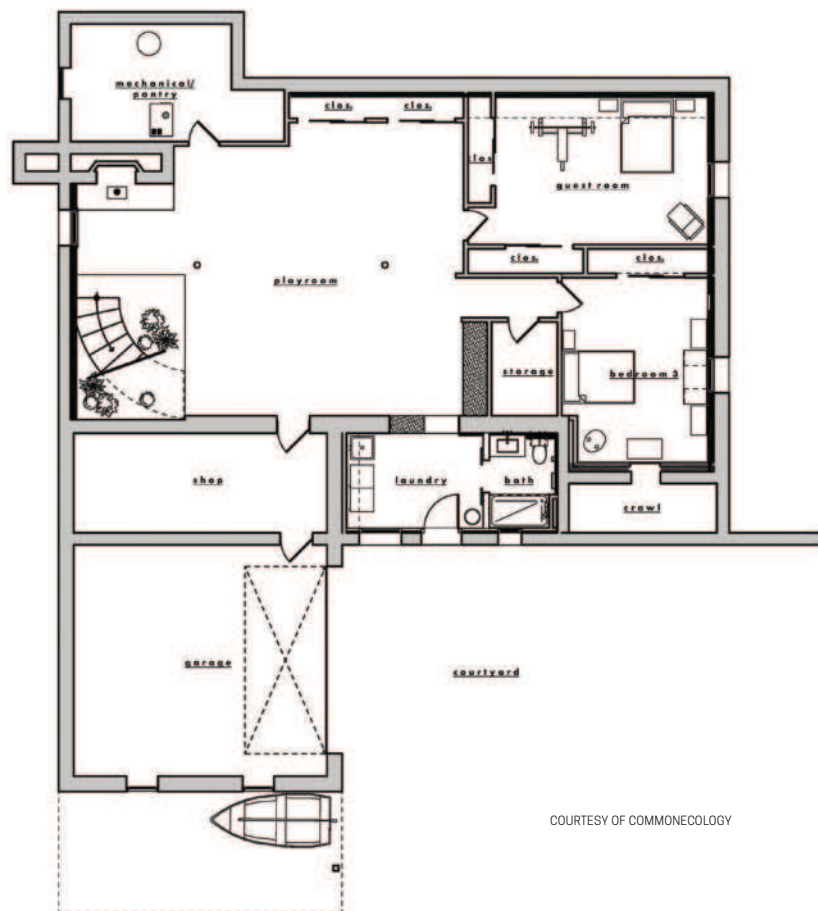
ANYBODY INTERESTED?

Naturally, Beer and Hindle—co-owner and principal of [Passive to POSITIVE](#), a high-performance energy design consulting firm using the foundation of Passive House design—interviewed licensed contractors and repair personnel to do the bulk of the work, but most people they spoke to were unenthusiastic. Plus, there were budgetary constraints.

The basement was a good example. A previous owner had remodeled the space into a two-bedroom, one-bath living area. But due to poor planning and choice of materials, the area turned into a moldy, stale-aired, bug and snake-infested mess.

"Asking [contractors] for a safe, moisture-proof, insulated and air-sealed basement wall was beyond anyone's

FLOOR PLAN



capabilities,” Beer says. “This lack of knowledge and interest filtered all the way to installing a heat pump water heater, ‘deconstructing’ rather than demolishing, using alternatives to foam, and properly installing airtight, triple-pane windows.”

So, Beer and Hindle made a lot of the repairs and upgrades, which meant lots of late nights and weekends of working. This challenge also led to creativity and ingenuity in the reuse and salvage of materials, sourcing used and vintage products, and taking the time to make conscious decisions, Beer notes.

LIFE LESSON

CarMic 1954 was also a great experience for their three kids (at that time, ages 4, 11 and 14), who were recruited into the project. “They helped lay cork floors, tape membranes, and install windows while learning why having a zero-energy, healthy house was important to the planet and to humans,” Beer says. “They lived firsthand the experience of moving in and breathing toxic, mildewed air, not being comfortable, and not feeling integrated

with their natural surroundings toward contributing to the transition to comfort, safety, health and beauty in their home.”

All three would later give presentations about the home. They can answer most questions people might have. They have a definite desire to “educate everyone on how basic it can be to help save the planet and live in a net zero home,” Beer says.

To her, education is the most-important thing that can come out of a home-building project. “It’s a huge part of the process—the education of contractors, other homeowners, and friends and neighbors around the importance of conscious change and thinking beyond the normalized corporate responses,” Beer says. “Once people get a glimpse into this life, people crave the knowledge of change and ultimately want to know what they can do to make a difference.”

Beer and Hindle have since created a “Homeowner’s Field Guide to a Regenerative Deep Energy Retrofit,” at www.radicalretrofits.com to provide more insight into green construction. **GB**

Key Components

APPLIANCES: Fisher-Paykel refrigerator; GE *Profile* induction range; Bosch convection oven; Blomberg heat pump clothes dryer and clothes washer

BUILDING ENVELOPE: Existing stone with 2-by-4 frame walls; existing 2-by-6 wood frame walls; concrete block foundation walls; all existing walls, bandboards, slabs, and attic fully air-sealed and insulated

CABINETS, SHELVES, MILLWORK: IKEA cabinets with a small selection of Scherr’s drawer fronts; salvaged wood open shelving kitchen; Draftwood Design primary bath vanity

CAULKS AND SEALANTS: AFM *Safecoat* caulk

COUNTERTOPS: Soapstone combined with ash butcher block from The Hardwood Lumber Company; salvaged Paperstone primary bath

DOORS AND HARDWARE: Reeb solid birch interior doors; Emtek knobs; ZOLA exterior doors and hardware

EXTERIOR FINISHES: Restored cedar siding; salvaged beadboard for siding at back porch; Sherwin-Williams *Duration* paint; Thermacork siding and trim; Vermont Natural Coatings penetrating waterproofer

FLOORING: APC floating cork floor upstairs bedrooms, hallway and dining; Forbo *Marmoleum* floating floors kitchen; existing wood floors living room; quartz tile sunroom and mudroom; plywood panels lower level

HVAC/DUCTS: American Standard variable speed heat pump; Mitsubishi wall mounted mini-split

INSULATION: Cellulose; Rockwool rigid mineral wool; Knauf batt insulation; Thermacork

LIGHTING: Etsy; Graypants

PAINTS AND STAINS: ECOS paints and primer; Bioshield clay paint; Bioshield *Hard Oil*

PLUMBING/PLUMBING FIXTURES: Kohler faucets; Kohler dual-flush toilet; salvaged sink

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): (36) 300-watt Peimar solar panels

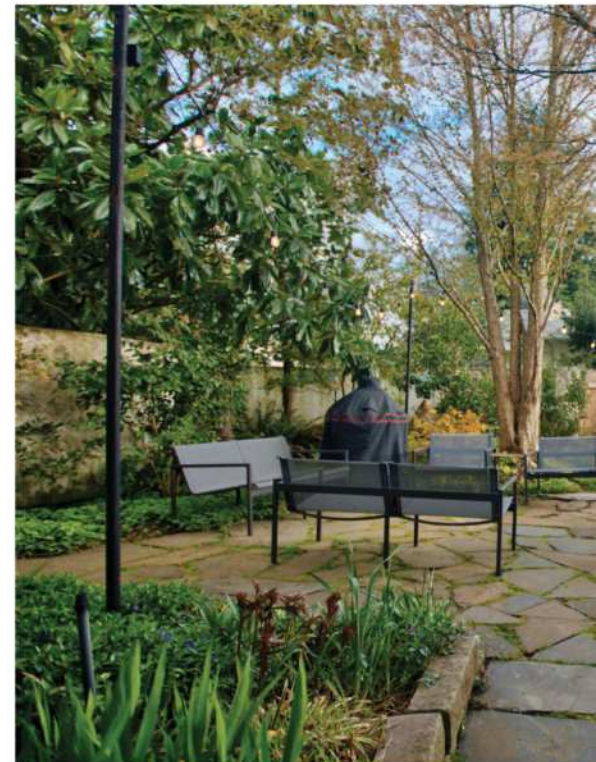
VENTILATION: RenewAire *Energy Recovery Ventilator*

WATER HEATING: Steibel Eltron *Accelera* heat pump water heater

WINDOWS, SKYLIGHTS, PATIO DOORS: ZOLA windows and exterior doors; VELUX skylight replacements

OTHER: All kitchen and bathroom tile and backsplash salvaged from various resources; windowsills, kitchen tile, and porch floor are salvaged slate from neighbor’s roof

Pint-sized



Powerhouse

Convincing people that it's easy to cut energy bills can be a case of show and tell.

When it comes to energy usage, smaller can be better. That was certainly the case when it came to “Coradu,” this year’s Green Builder Home of the Year in the General Homes category.

According to Dan Allison of Abode Home Builders (AHB), the Seattle-based project was designed to reuse the existing foundation of an abandoned structure, one that was on a tight building site—a place to live where a non-descript shed was. It wouldn’t be the first time AHB would take on such a job.

“We already have two high-performance structural insulated panel (SIP) houses that use about a quarter of the energy used by conventionally built structures,” Allison notes.

Project Stats

NAME: Coradu, Seattle, Washington

BUILDER: Dan Allison, Abode Builders, <https://abodebuilds.com>

ARCHITECT/DESIGNER: John Novak, Velocipede Architects, www.velocipede.net

PHOTOGRAPHER: Chuan Photography

From the Judges

“Remarkable use of SIP panels and building science principles for an ADU! Outstanding delivery!”



ALL PHOTOS COURTESY OF CHUAN PHOTOGRAPHY



Chemical-free air. Non-VOC paints are used throughout the house to preserve healthy indoor air quality.



WHITE HOUSE. All trim, walls and ceiling are clad in environmentally friendly non-VOC paint.

SILENT SENTINELS. Triple pane windows control heat and outside noise for occupants.

LOW IMPACT. LED lighting throughout the house helps cut the monthly electric bill to zero.

Key Components

APPLIANCES: LG induction range, LG ENERGY STAR refrigerator, washing machine and dryer

BUILDING ENVELOPE: SIPs, Benjamin Obdyke hydrogap fully adhered WRB, 2-inch cork facade grade insulation

CABINETS, SHELVES, MILLWORK: IKEA

COUNTERTOPS: IKEA Caesarstone

EXTERIOR FINISHES: Unfinished 2-inch cork and Douglas fir windowsills

FLOORING: Polished concrete

HVAC/DUCTS: Fantech ERV

INSULATION: SIPs, 2-inch exterior rigid cork, spray foam rim joist

LIGHTING: All LED

PAINTS AND STAINS: Home Depot non-VOC eggshell custom white (all trim, walls and ceiling)

ROOF: Snap-Loc standing seam metal roof

VENTILATION: Fantech ERV

WATER HEATING: Sanden/SANCO air-to-water heat pump

WINDOWS, SKYLIGHTS, PATIO DOORS: PLYGEM triple pane

“Being able to quickly and efficiently build on a tight site in a wonderful residential neighborhood allowed us to show the neighbors what they didn’t know was possible.”

The project was also inspired by a 700-square-foot detached accessory dwelling unit (DADU), which used more electricity than a 2,000-square-foot SIPs home on the same property. “It was insane to think that a building one-third the size used three times the energy,” Allison says.

In contrast, AHB’s new 900-square-foot building exceeds net zero and produces all of the owners’ energy needs, including for two electric vehicles (EVs), courtesy of features such as solar panels, thick SIP walls and roofing (6-inch GPS and 10-inch GPS, respectively), all LED lighting, ENERGY STAR appliances, triple-pane windows (U-values of 15 and 17, depending on location within the house), and even cork siding. “Now,” Allison remarks, “we have a super-efficient backyard cottage!”

For an HVAC system, a radiant concrete slab is warmed with an air-to-water heat pump water heater. The water heater uses carbon dioxide as its refrigerant, which Allison notes is ozone friendly and doesn’t contribute to global warming. Both domestic water and heat are produced by the same unit.

“We couldn’t love this cottage any more than we

do,” he says. “The inside temperature is so even you really can’t tell the heat is on. It’s quiet, and large window openings bring in tons of natural light.”

The structure is also sustainably designed. Non-VOC paints were used. Siding is thermally modified wood which is rot- and pest-resistant, and never needs painting or staining. Even better, upon replacement, old product can be put into the city’s yard waste bins and made into compost or mulch, Allison adds.

The design is nature friendly in another way. AHB was able to reuse the existing foundation as well as protect a large tree that would have prevented new construction. “We didn’t need to touch a branch or a root,” Allison says. “We still met Seattle’s stringent earthquake requirements.”

A Japanese maple planted by the previous owner helps keep the house cool in the summer and bright in the winter, Allison adds. “We love the tree,” he says. “The bright green new leaves in spring, shade in summer and fall colors all reinforce our affection.”

Coradu has become quite the conversation piece around the neighborhood. “The response was overwhelmingly positive to this project,” Allison says. “Telling someone that a home can be so efficient that there are no energy bills is mind blowing to most passersby. Showing them how quickly it can be built is equally impressive.” **GB**

Honorable Mention

Here are four more homes worthy of a callout for sustainable design.



Project Stats

NAME: Hickory Top Overlook

LOCATION: Asheville, North Carolina

CATEGORY: Above and Beyond:
Net Zero Plus Energy

BUILDER: Red Tree Builders,
www.redtreebuilders.com

This home features strategically placed solar panels to ensure that a significant portion of its energy needs come from a renewable source and minimize carbon emissions.



Project Stats

NAME: River Drive House

LOCATION: Kerikeri, New Zealand

CATEGORY: General

BUILDER: Circle D Construction,
www.circledconstruction.co.nz

The design and construction of the house is based on environmental design principles, such as optimal northern sunlight orientation, natural airflow and relationship to site.



Project Stats

NAME: ERTH Discovery Home

LOCATION: Caledonia, Ontario

CATEGORY: Sustainable Community

BUILDER: Empire Communities,
www.empirecommunities.com

Features a network of sensor-monitored indoor environmental quality metrics and smart home systems, such as enhanced outdoor air ventilation, sensor-controlled exhaust fans, and added operable windows.



Project Stats

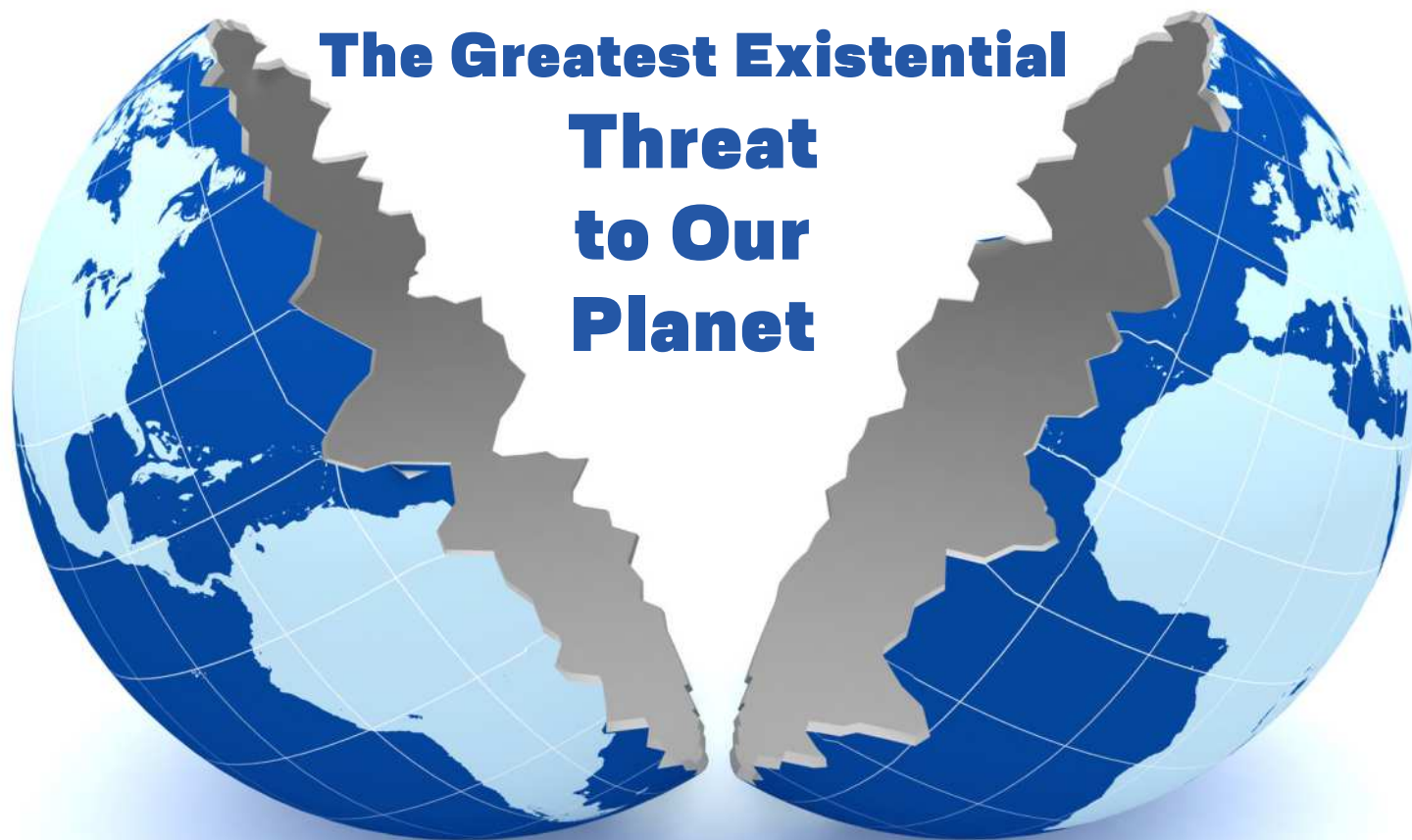
NAME: Net Zero Eco Home—Echo Haven

LOCATION: Calgary, Alberta

CATEGORY: Mainstream

BUILDER: Melcom Homes,
www.melcomhomes.ca

A 6-kilowatt solar panel system, electric water heater, triple-glazed windows and more combine to generate and control use of clean and renewable energy, significantly reducing electricity bills.



The Greatest Existential Threat to Our Planet

The great (growing) divide. Earth's challenging future is split between navigating an embattled environment and overcoming a feeling of lost well-being among its residents. CREDIT: ALEXSL/ISTOCK

SPOILER ALERT: IT'S NOT CLIMATE.

BY SAM RASHKIN

Green Builder is dedicated to supporting the climate movement. I'm proud to be a regular contributor to this mission. After all, we are confronted with compelling empirical evidence that climate change is in fact a growing existential threat to our planet. Disturbing findings include:

- **Atmospheric CO₂:** Since the onset of industrial production in the 18th century, human activities have raised atmospheric carbon emissions by 50 percent, equivalent to 150 percent of its value in the year 1750.
- **Global warming:** The magnitude and rate of warming over the last 150 years far surpasses the magnitude and rate of changes over the last 24,000 years.
- **Ocean warming:** With about 90 percent of global warming occurring in the oceans, the last 10 years were their warmest decade since at least the 1800s.
- **Biodiversity:** Species are going extinct at 1,000 to 10,000 times the normal background rate. Estimates say that 30 to 50 percent of all species will be extinct by 2050.
- **Sea level rise:** Three-times faster sea level rise is estimated in the next 30 years (about 1 foot higher) compared to the past 100 years.

- **Extreme climate:** Six times more billion-dollar, climate-related severe storms occurred from 2001 to 2022 than during the previous two decades.

I assume the severity of climate change is not a news flash to GB readers, who probably agree that more-aggressive actions are needed to drastically reduce carbon emissions. Nonetheless, I'll suggest climate is not the greatest existential threat to life on this planet. Not even close. Hopefully, this point will become clear with two maps I'll introduce later and stimulate beneficial discussion.

Please note that I'm not suggesting we take our foot off the climate action pedal. Instead, this article is a plea to recognize the elephant in the room. None of our climate protection efforts have a chance of achieving their intended goals if we don't address the biggest threat to our planet: the huge and widening disparity in well-being here in the U.S., and globally. This article will examine this disparity, why it eliminates any chance of persistent climate actions, and suggest how to integrate it into the larger climate movement to ensure success. Our lives depend on it.

THE GREAT GLOBAL DISPARITY: WELL-BEING

The Social Science Research Council launched a metric called "well-being" in 2008 that augments how we measure economic and social

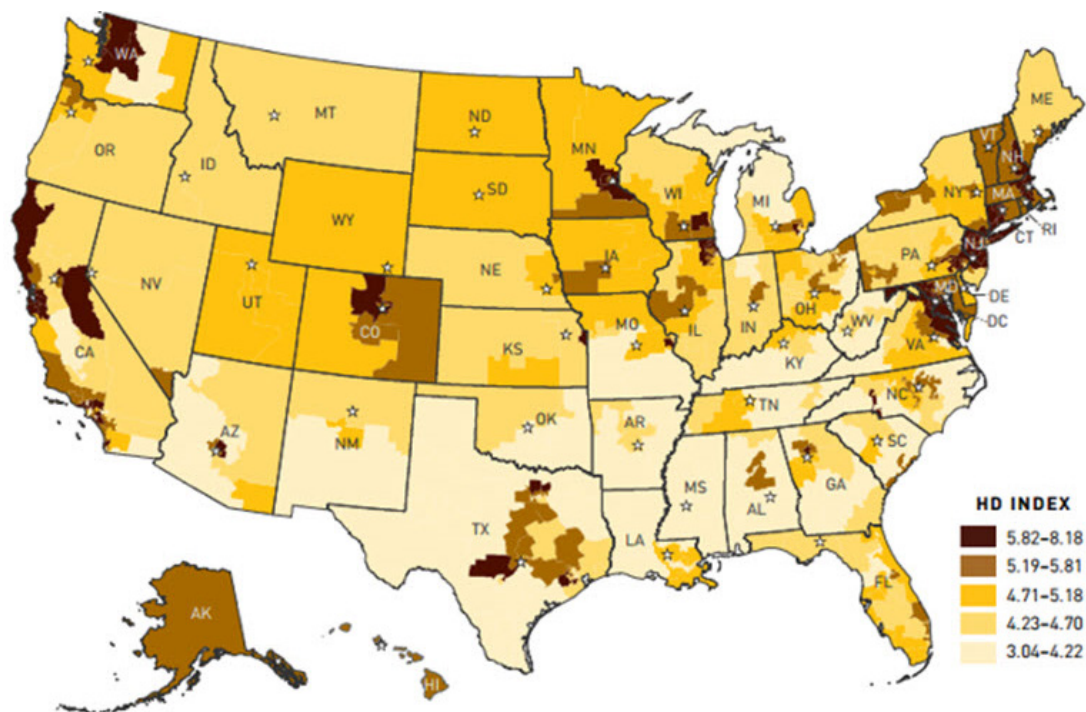


Figure 1: American human development index by congressional district

progress. This metric is based on measurements for three key indicators in America's 435 congressional districts and Washington, D.C.:

- **Life expectancy:** measures likelihood of a long and healthy life from birth
- **Education:** measures access to knowledge based on school enrollment of people ages 3 to 24 (weighted 1/3) and educational degree attainment for those 25 and older (weighted 2/3)
- **Median earnings:** measures standard of living for full- and part-time workers aged 16 and older.

A report published in 2015 includes individual maps with measured results for each of these well-being indicators. It also includes a map combining the measured results for all three indicators into a single human development index (see Figure 1).

According to the graphic key, the darker the color, the higher the human development index or overall well-being. Among detailed findings in the report, I'll suggest that the key takeaway is that there is a dramatic discrepancy geographically in well-being across the nation, with up to two times or greater regional variation in the human development index score.

A major revelation occurs when the American human development index map is shown side-by-side with a map of 2020 presidential election voting results (see Figure 2). The huge disparity in well-being is highly correlated to the historically polarized political divide in this country. Specifically, Democratic voting regions highly supportive of climate protection policies have significantly greater well-being than Republican voting regions that substantially reject climate protection policies.

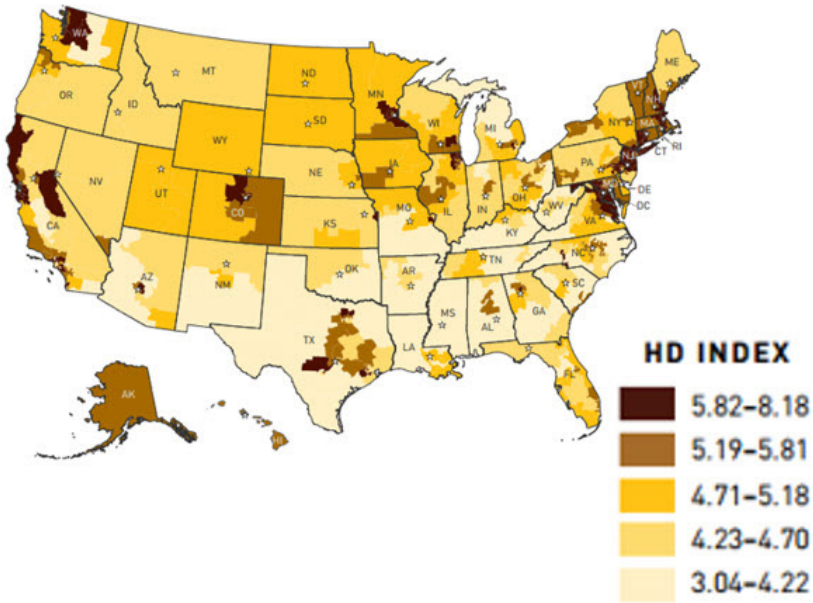
This observation is highly relevant to the success of the climate

movement. If people are experiencing vastly worse health, education and earnings, it is incredibly challenging to get their support for climate policies advocated by government leadership and institutions that have ignored their well-being for the past 50 to 75 years. This demographic can't get past its day-to-day struggles; finding any form of affordable housing, achieving meaningful savings, avoiding defaults on automobile loans, paying inflated prices for necessities, and disproportionately confronting the burdens of increasing crime.

Messages inciting fear and blame are magnitudes easier to hear than scientific communications about the risks of combusting fossil fuels, whether they describe severe weather events, extreme temperatures, or rising oceans. The age of the internet compounds the challenge of communicating the importance of climate protection. Disparate political groups have locked into their own silos of information to the point where we are no longer dealing with common sets of, trusted sources of information, and exposure to the same news content.

Looking beyond our borders, the exponentially growing gap between "have" and "have-not" populations is, in fact, a worldwide phenomenon. Rising inequality affects two-thirds of the globe. Many attribute the rise of global authoritarianism over past decades to exploding inequality, with fewer than one-fifth of the world's population now living in fully free countries. In other words, the growing demographic groups suffering from low well-being can be easily attracted to vote for leadership promising to blow up the established government rules, norms and institutions that have badly failed them for extended periods of time. The ability to convert this underserved demographic into a majority voting block is fueled by exponentially growing tools to deliver propaganda and conspiracy theories that

American Human Development Index by Congressional District



2020 Presidential Election Results by County

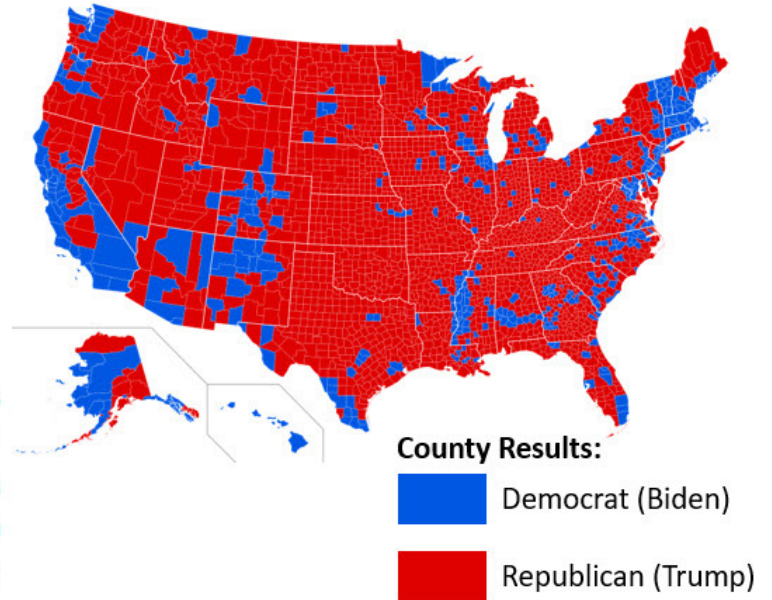


Figure 2: High correlation between well-being and political affiliation

effectively tap into anger, frustration and desire to assign blame.

Decades of failure to ensure well-being are coming to roost. Without democracies, it will be impossible to have any persistent and coherent policies and actions to address the climate crisis. Disparity in well-being is the greatest existential threat to our planet. It trumps climate and can no longer be ignored.

A PATH FORWARD: INTEGRATING THE DISPARITY IN WELL-BEING WITH THE CLIMATE MOVEMENT

Leadership is everything. It sets the course. And if you're not going in the right direction, everything else suffers. I've seen too many examples of this principle over my long career, starting when I transitioned my career from architecture to climate protection in the 1980s. I had joined the California Energy Commission (CEC) and was carpooling with the director of the Transportation Office. Under his leadership, the decision was made to go all-in on methanol as the only clean fuel alternative to gasoline. This singular focus applied to all of his approximately 50 staff, research investments, consulting contracts, methanol car fleet, and methanol fueling stations.

During this time, I was moonlighting as an architect, and the chairperson of the CEC was a client. General Motors had given him a concept electric car called the *GM Impact*. When he let me take it out on a test drive, I couldn't believe the superior comfort, acceleration, handling, quiet, and technology displays—innovations that would ultimately arrive on the scene decades later.

Inspired by this experience, I made the mistake the next morning of asking the Transportation Office director if he was considering including electric vehicles (EVs) in his program. He responded with



Misnomer? The term "climate change" doesn't mean the same thing to everyone. For some people, living in a different world environment would be an improvement. CREDIT: PEOPLEIMAGES/ISTOCK

the most verbally abusive attack I have ever experienced in my career. When the shouting was over, it was clear he thought my comment was "inexcusably naïve" and didn't believe EVs had any possible future deserving of his program's attention.

Fast forward to today. History shows California wasted hundreds of millions of dollars and lost decades of time investing in the wrong direction. Methanol-fueled cars have had no meaningful impact on the transportation sector in the state or nation.

With that leadership story in mind, I'd like to suggest we need a new direction in how we engage the world about climate. Any near-term wins with climate policies and actions are at grave risk of being short-lived in absence of broad support from the growing disenfranchised voting block not experiencing well-being. They don't recognize the existential threat posed by climate and are not voting for leaders who do.

Once again, I'm fearful that more new thinking may invoke anger; this time among so many of my climate community friends I admire for their diligent work on such a vital issue. However, I'm concerned there will be inadequate impacts managing climate risks if leadership doesn't make a mid-course correction.

It's time to integrate all climate messaging, policies and actions with the much-larger existential threat: disparity in well-being. This can only happen if we know the people who struggle with well-being much better, see them more deeply, and then in turn become deeply seen by them. As a great start, I'll refer readers to a special new book on this subject by David Brooks ("How to Know a Person: The Art of Seeing Others Deeply and Being Deeply Seen"). For purposes of this article, I recommend the following three steps to get the climate movement on the path of being heard.

STEP 1: SHIFT THE FOCUS OF ALL CLIMATE MESSAGING TO WELL-BEING.

I teach that effective communication is dependent on leading with your "why" following Simon Sinek's groundbreaking work on the subject ("Start with Why: How Great Leaders Inspire Everyone to Take Action"). However, I find that sustainable building and climate messaging is too often focused on the "what" or "how," which are at best only interesting to those in the choir (e.g., climate community). In contrast, effective "why" messaging inspires by speaking to the core reason you exist—and we badly need to inspire everyone when it comes to climate. The four criteria I have developed for effective "why" messaging are:

- **Simple:** to optimize clarity
- **Short:** to optimize retention
- **Emotional:** to optimize inspiration
- **Universal:** to optimize resonance

While all these criteria badly need more attention by the climate community, the one most critically lacking may be messaging that resonates universally. And this starts with the name "climate change" and all of its variations. That's because the word "climate" immediately negates support by half or more of our population—those who are suffering from well-being. If we deeply understand them, we will know this. Their information silos have effectively convinced them that the science is a hoax by countering dire scientific predictions with other carefully curated experts, challenging facts linking environmental impacts to human activity, and tapping into the common perception that there is nothing you can do about the changing weather. The concept of climate change excludes the vast population of the country underserved by well-being. It is not a universal message; it is the opposite.

A more universal "why" would leverage a concept that resonates with virtually all who hear it. For example, I might suggest "home-grown energy" as a more universal message than climate. It may not be the right answer, but we can probably all agree it is much harder to object to policies and actions that leverage our vast home-grown

natural resources as the solution to lower energy costs, higher-paying jobs, cleaner air and greater national security. If not, we can work together to come up with a far superior message. Any effective climate communication has to be based on seeing those suffering from well-being more deeply to be heard much more deeply.

STEP 2: FILTER REGULATIONS AND POLICIES TO ELIMINATE UNFORCED ERRORS.

One of my passions away from work is tennis, both as a spectator and a player. An indicator of a player's skill and success in this sport is the absence of "unforced errors." Unforced errors occur when a player takes an unnecessary risk going for too good a shot in returning a neutral ball, and the result is the ball in the net or off the court. In other words, it's a point that didn't have to be lost.

Market transformation is hard enough without making unforced errors. I built a whole career with ENERGY STAR Certified Home and Zero Energy Ready Home (ZERH) trying to avoid these. One of the most egregious unforced errors in climate advocacy is imposing regulations and policies that offend half or more of your audience. A good example is the policy to ban gas cooking in new construction. The science is clear that cooking increases health risks in homes. However, regulating against choice is an unforced error that validates claims that climate advocates are trying to take away your freedoms. Moreover, it is an aggressive shot that is not worth the risk because:

- Gas cooking can easily be replaced with electric cooking at any point in the future with minimal cost penalty or disruption. This is especially true when alternative electric-ready policy is used to ensure a high-amp outlet is provided, along with gas cooking facilities.
- Electric induction cooking can be effectively promoted as a far superior user experience to natural gas cooking with significantly better safety, speed, clean-up and control.
- There are significant cost savings for developers who eliminate gas supply infrastructure installation solely for gas cooking, due to the growing movement to advanced heat pump technology for space and water heating.



Menu for success. Communicating the superior user experiences of induction cooking, solar systems and electric vehicles can be more for everyone than the typical mandate approach. CREDIT: BALOON111/ISTOCK



A deadly combination. The planet's fresh water is being increasingly contaminated by fossil fuel extraction and processing, including with substances such as arsenic, lead, chlorine and mercury. CREDIT: ILDAR IMASHEV/ISTOCK

Similarly, the case can be made that unforced errors were made with California's policies mandating solar rooftop systems on new homes and all electric vehicles by 2035. There are much easier ways to achieve the desired climate goals than adding the significant solar energy system costs to the least affordable housing market in the country and removing freedom of choice for preferred personal transportation. For example, there is much less burden and cost to implement policies that rely on communicating the superior user experiences of induction cooking, solar systems, and electric vehicles along with providing appropriate incentives to offset the massive taxpayer subsidies allocated to providers of fossil fuels. These subsidies include:

- **Environmental cleanup:** It costs hundreds of billions of dollars to clean up contamination from fossil fuel spills and mining processes.
- **Freshwater contamination:** Less than 1 percent of the water covering three-fourths of the Earth's surface is available for human consumption. This dwindling resource essential to life is being increasingly contaminated by fossil fuel extraction and processing (e.g., each fracking well uses between 1.5 million to 16 million gallons of water containing substances such as arsenic, lead, chlorine and mercury, which can leach into groundwater and drinking water).
- **Military expenses:** Approximately \$81 billion per year is spent by the U.S. military to protect global oil supplies and more than \$2 trillion, or roughly \$8,000 per taxpayer, has been spent on the Iraq War, which many political analysts have

linked to protecting our nation's oil interests in this region.

- **Tax incentives:** Roughly \$20 billion per year of U.S. direct subsidies go to the fossil fuel industry (e.g., expensing exploration, development, and intangible drilling costs; use of percentage depletion instead of cost depletion to recover drilling; development costs of oil and gas wells and coal mines; and numerous smaller incentives for production and distribution).
- **Strategic petroleum reserve:** Approximately \$228 million was spent by the U.S. government in 2022 for reserves that ensure energy and economic security tied to our dependence on refined petroleum and crude oil.
- **Health costs:** More than \$820 billion a year are incurred for health costs attributed to fossil fuel-generated air pollution and climate change. This burden falls heaviest on vulnerable communities.

One study estimates a total cost of \$5.3 trillion globally in 2015 for negative externalities from the adverse environmental, climate, and public health impacts of fossil fuels. This is a *really* big number. It's time for climate policy to stop taking the unnecessary risk of restricting freedoms, and instead demand a level playing field in subsidies for all fuel options. This aligns with the strong preference for free market principles in regions suffering the most from well-being. It eliminates ability to link climate policies with top-down regulations on how households prefer to live. The movement is too important to make this unforced error.



Medical vulnerability. More than \$820 billion a year are incurred for health costs attributed to fossil fuel-generated air pollution and climate change.

CREDIT: RAPIDEYE

STEP 3: IMPLEMENT A COLLECTIVE IMPACT PROCESS THAT LINKS CLIMATE AND WELL-BEING

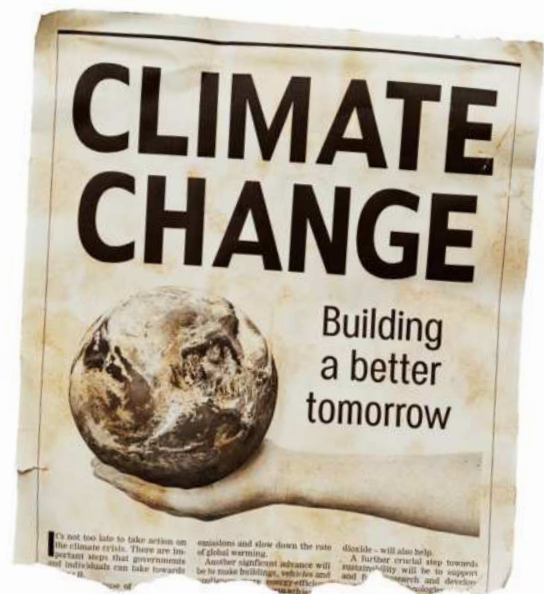
If climate issues can be repackaged into much more effective “why” messaging, and discipline can be applied successfully leveraging pro-planet policies that do not offend those suffering from well-being, then the last step is to organize a fully coordinated movement instead of incremental and disparate policies and actions. This can be accomplished using a successful market transformation tool reported in a University study called “Collective Impact.” Following extensive research on highly successful market transformation initiatives (e.g., reversing pollution in the Elizabeth River in Virginia, fixing a failed education system in greater Cincinnati and northern Kentucky), the authors were able to identify five conditions associated with successful transformation:

- Common agenda
- Shared measurement systems
- Mutually reinforcing activities
- Continuous communication
- Backbone support organizations

It is time the climate movement employed this type of proven solution for effecting change.

DISCUSSION TIME?

It’s critical that all climate programs and policies are effectively aligned with the greatest existential threat to our planet: disparity in well-being. This entails a commitment to ensuring the growing majority of Americans struggling with well-being issues know they are being heard, feel there is genuine empathy for their suffering, and believe new policies help solve their problems. Nothing less has



a chance of bridging the vast polarization between those passionate about addressing climate risk and those who deeply distrust norms, institutions, and government.

The good news is there are huge opportunities for common ground. That’s because climate responsive policies can lead to dramatically enhanced health, education and earnings.

Let this be the start of the discussion—but we need to act fast. The well-being of the planet cannot be protected if the majority of the world’s population significantly lagging in well-being is not vested in the policies and actions needed to address this existential threat. The right climate movement leadership will deeply see this underserved demographic and be deeply seen by them. **GB**



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STRANDED ASSETS



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When I was introduced to the term “stranded assets” a few years ago, it was generally applied to resources that were the targets of the fossil fuel and mining industries: minerals, ore deposits, oil, coal and so on. At the time, certain assets were losing value mostly due to tightening environmental regulations and, to some extent, the emergence of new technologies and forms of renewable energy.

If you have any past experience in the sustainability arena, you are familiar with what used to be called the “three Rs”: reduce, reuse, recycle. More recently, a fourth leg has been added to that stool: “repurpose.” The idea is to find legitimate uses for products and resources that have become obsolete or have otherwise lost their original market value.

For example, we have all seen images of clever projects made from repurposed gym floors and bowling lanes. But there is actually an almost endless list of items, from structural steel to vinyl billboards to containers of every imaginable shape and size—plus thousands more we could name that are just waiting for a person or company with the right needs and a little imagination to come along.

It makes absolute sense. Why should perfectly good items all end up in landfills when they still have value? It makes financial sense, environmental sense and just plain common sense to extend the usable life of the things we need.

Of course, there is another “R” that we haven’t mentioned so far. It was most eloquently, though quite facetiously, suggested on a sign mounted on the back end of a tractor trailer rig zooming down the highway. It read, “Don’t Like Trucks? Stop Buying Things.” I have long advocated for the “R” that is found in “refuse,” but it’s hard to get much traction with that one in an economic system driven by continuous and unlimited growth. I suppose we’re once again ahead of our time with that idea.

But there is another collection of stranded assets that has been on my mind a lot lately. The ones that seem to have lost

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the most value in recent times are not natural resources, nor consumer or commercial products, and they’re not available in stores or online. They are embedded in guiding principles, the kind that our society was originally based on—or, at least, that is what we have been led to believe and still hope to be the case in spite of increasing evidence to the contrary.

Somewhere along the way we have agreed to devalue things like honesty, integrity, generosity and empathy. The truth was the first casualty. We are constantly bombarded with misinformation, disinformation and outright lies to the point that it has become almost impossible to believe anything we’re told no matter who’s speaking.

Common courtesy, decency, unity, responsibility, duty. These were common assets that we traditionally held dear and treasured. All of those were once prominent in our lexicon, but our shared vocabulary has veered in other directions. At a time when our society is reeling with uncertainty resulting from partisanship, greed and the aims of special interests, it is struggling to regain its footing as we are instead confronted by a bankruptcy of leadership, at many levels.

Together we possess a tremendous stockpile of valuable assets. They were earned at too high a price and they cannot be taken from us unless we give them away. It is up to us to muster the courage that will refuse to leave them stranded. **GB**

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