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When Smart Tech and Building Science Meet, Resilience Happens

Bridging high and low technology is what today's innovation looks like.

THIS YEAR, WE HAD MORE than twice the number of submissions to our annual "Hot 50" editors' choice products issue. That's very encouraging. The building industry has a reputation for being slow to innovate. There's good reason for that, of course: Builders have been burned many times by adopting new products too quickly, only to find out that they have major flaws.

I often make the distinction between an innovation and an upgrade. Most "new" products, including the ones in this issue, fall into the latter category. They take a proven concept and make it work more efficiently, last longer or look different. This is a normal and prudent approach.

One area where innovation is happening, however, is where smart devices are "learning" to communicate with sticks and bricks and mechanicals and faucets and sprinkler systems.

An obvious example is the *Phyn* system from Uponor. It's a leak detection device that can tell you whether any faucet, toilet or garden hose bib in the home is leaking, all by applying an algorithm.

That's an instant water saver. And similarly, smart thermostats are redefining HVAC efficiency. Motion detectors and smart lighting dimmers, combined with better LED

lamps, dramatically reduce wasted energy from lighting.

Don't get me wrong. I'm skeptical and somewhat suspicious about many of the more-frivolous smart technologies being introduced: "stress relieving" wearables, devices that constantly listen inside your home, and so on. But if you look at tech as tools that can partner with existing equipment, some tantalizing possibilities emerge.

For example, I read about a home saved from wildfire by turning on the exterior sprinklers. Why not install heat-detecting

"Smart devices are learning to communicate with sticks and bricks and mechanicals and faucets and sprinkler systems."

sensors on the property perimeter that trigger sprinklers automatically to save homes? How about creating a system to save homes suddenly flooded and cut off from the grid? You could do this by putting together a solar battery backup such as the one Tabuchi Electric offers, with some Jinko panels and a Bosch mini-split, and hook it all up to a Honeywell smart thermostat and a cellular



hotspot. As other houses nearby rot away with no power access, this home could be slowly dehumidifying and recovering.

Expect to hear a lot more ideas like this as Old School and new discover each other. Meanwhile, enjoy our selection of some of the best sustainably oriented products on the market. **GB**

Intelligent water.
The *Phyn* leak detector uses an algorithm to determine where and if any faucet in the home is leaking.



CREDIT: UPONOR



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Climate change is real, Chevron says

But the oil giant says it and others are not the cause—people are.

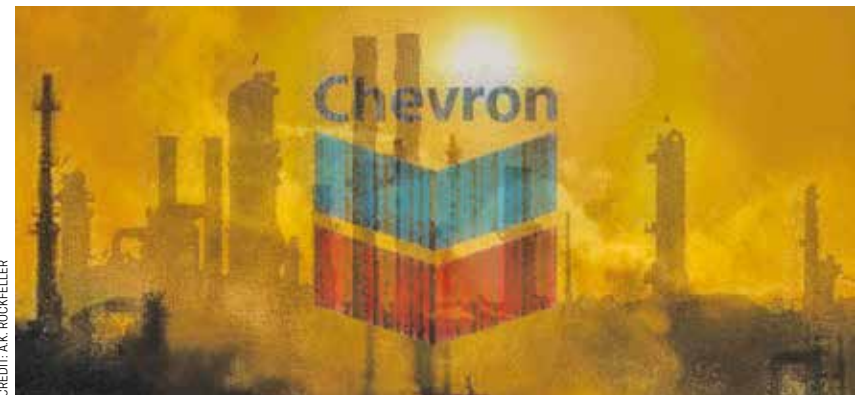
OIL GIANT CHEVRON has acknowledged that studies showing human-caused carbon emissions as a central component to global warming have scientific merit, but rejects the idea that oil companies are to blame. Instead, fault stems from the level of consumer demand for oil and other CO₂ emission-producing products.

The statements came during a hearing at the U.S. District Court for the Northern District of California in March. Legal analysts are calling the proceeding a first-of-its-type “climate science tutorial.”

U.S. District Court Judge William Alsup convened the hearing in response to a lawsuit filed against Chevron, ExxonMobil, ConocoPhillips, BP, and Shell by the cities of Oakland and San Francisco. The cities allege that oil company-induced global warming is causing environmental damage such as sea-level rise, which is impacting public safety and will cost millions to safeguard against.

Before the hearing, Alsup had asked the two sides to answer a series of questions about the history of climate change, and how carbon dioxide and other greenhouse gases interact in the atmosphere. During the hearing, the two sides had 60 minutes each to respond to each topic.

For its part, Chevron “accepts the consensus in the scientific communities on climate change,” says attorney Theodore Boutsous of the firm Gibson, Dunn & Crutcher. “There’s no debate about climate science...[but] it’s not the extraction and production of oil



CREDIT: A.K. ROCKFELLER

Cloudy future. Chevron is one of five oil companies being sued by various municipalities for their role in global warming and air pollution.

that is driving these emissions. It’s economic activity that creates the demand for energy, and that leads to emissions.”

San Francisco City Attorney Dennis Herrera believes the hearing painted a clear picture on the validity of climate science. But it also made Chevron out as the only interested defendant. “What we saw was one oil company begrudgingly accepting the scientific consensus,” he says. “The other four major oil companies refused to participate or even acknowledge the court has jurisdiction over them.”

Alsup says he will use the feedback from the hearing to determine whether the lawsuit can proceed. His decision—expected to be made this spring—could ultimately impact a number of other green lawsuits against oil companies.

With new battery plant, Tesla aims for world record

A huge photovoltaic system will be large enough to power 50,000 homes.

CONSTRUCTION IS UNDERWAY on Tesla’s massive lithium-ion battery production facility in Sparks, Nev., which when complete, will have the world’s largest rooftop solar panel system.

According to the company, the 70-megawatt array—expected to go fully online this year—will be more than six times the size of the current world record holder in Punjab, India. The new plant will be able to produce enough lithium-ion battery cells annually to store 35 gigawatts of power, nearly as much capacity as the rest of the world’s manufacturers combined. It could also generate enough clean energy to power more than 50,000 homes.

A portion of the planned 4.9 million square foot facility, known as Gigafactory 1, opened in January 2017. The plant is being built in phases, to allow Tesla to be able to manufacture product during construction, according to a company release.



CREDIT: TESLA

Super solar. When complete later this year, Tesla’s lithium-ion battery production facility will feature the world’s largest rooftop photovoltaic array.

The array will allow Gigafactory 1 to run entirely on green power—a goal Tesla officials had from the day groundbreaking began in 2014. Power not consumed during the day will be stored via Tesla *Powerpacks* for use when needed.

The Gigafactory will also have its own water recycling and treatment facility. And, construction is underway for an on-site recycling facility that will safely reprocess all types of Tesla battery cells, modules and packs for reuse in new cells or non-toxic solid waste by-product, the company notes.

Massachusetts is nation’s LEEDer again

The Bay State is tops in U.S. for number of certifications in 2017.

FOR A SECOND YEAR, Massachusetts was the state where more buildings became Leadership in Energy and Environmental Design (LEED) certified. In 2017, 130 projects totaling 4.5 square feet per resident and 29 million square feet overall earned a thumbs-up for environmentally sound construction from the U.S. Green Building Council (USGBC), according to the council’s latest annual ranking of Top 10 States for LEED. The Bay State also ranked No. 1 in UCGBC’s survey for 2016.

New York finished second, with 3.39 square feet of certified space per capita from 192 projects, totaling 65.75 million square feet. Illinois was third, with 3.38 square feet of certified space per capita from 135 projects, totaling 43.36 million square feet.

LEED’s top 10 is predominantly East Coast, with Hawaii (fourth, 3.32 square feet of certified space per capita, 16 projects, 4.52 million square feet), California (eighth, 2.4 square feet of certified space per capita, 475 projects, 89.26 million square feet) and Colorado (10th, 2.27 square feet of certified space per capita, 76 projects, 11.4 million square feet) as the only states west of the Mississippi.

Maryland (fifth), Minnesota (sixth), Georgia (seventh) and Virginia (ninth) rounded out the list.

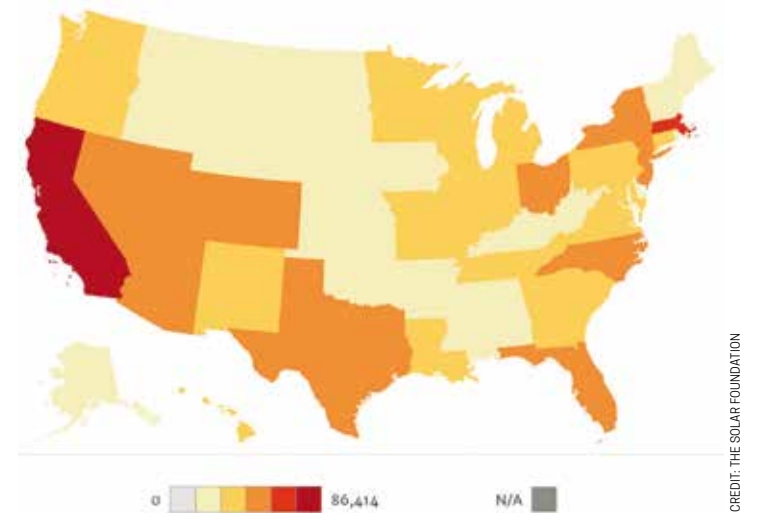
Overall, the top 10 states totaled 1,399 projects and 314.73 million square feet, or about twice the number of projects throughout the U.S. (2,647), and almost two-thirds of the nation’s total square footage (484.56 million).

“These states showcase exceptional leadership,” USGBC President and CEO Mahesh Ramanujam says. “By using LEED, businesses, property owners and policy makers in these states are strategically addressing some of the most critical social and environmental concerns of our time—meeting carbon reduction targets, reducing waste, energy and water consumption, and more.”



CREDIT: NEIL SNYDER/US ARMY ENVIRONMENTAL COMMAND

Certified green. Led by Massachusetts, the top 10 states for projects built to LEED’s strict standards totaled 1,399 certifications and nearly 315 million square feet in 2017.



CREDIT: THE SOLAR FOUNDATION

A new Sun Belt. According to new data from The Solar Foundation, solar jobs are most robust in New England—particularly Massachusetts—plus the Southwest and California.

Solar industry’s job growth triples since 2010

New interactive data shows changes in workforce and types of employment available nationwide.

AN INTERACTIVE MAP AVAILABLE ON The Solar Foundation’s website (www.solarstates.org) offers insight on the number of solar jobs by state, metropolitan area, county and congressional district, and who makes up the solar industry.

According to the data, 250,271 people had a solar-related job in 2017, down 4 percent from 2016 but up almost 200 percent from 2010. Jobs included manufacturing, project development, sales and installation. California was easily the biggest player, with more than 86,000 people working in the solar industry—roughly 1 in every 458 employees statewide. Vermont, Nevada, Utah, Hawaii and Washington, D.C., were other leaders.

In terms of job growth by percentage, Delaware and Minnesota led the way, with each posting nearly 50 percent gains in solar jobs from 2016 to 2017.

“Our solar jobs map shows that many states and cities bucked the national trend and enjoyed significant jobs growth in 2017,” says Andrea Luecke, president and executive director of The Solar Foundation. “In the future, states and localities should look to solar as a key strategy for building local economies and supporting high-quality careers.”

The data also reveals the similarity between the workforce makeup of the solar industry and the U.S. as a whole. In both cases, veterans, Latinos and Asian-Americans/Pacific Islanders are solid parts of the workforce, but women and African-Americans are underrepresented.

The map provides complete data on solar jobs in all 50 states. Users can toggle between 2015, 2016 and 2017 data to see the number of jobs year over year.



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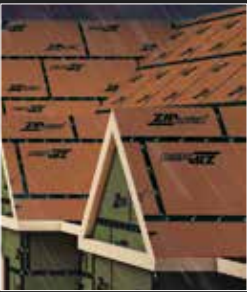
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2018 Editors' Choice

GREEN BUILDER[®] **HOT50** **PRODUCTS**

This year's list of sustainable and useful products merges good building science and smart technology.

BY GREEN BUILDER STAFF

GREEN BUILDER'S **ANNUAL HOT 50 PRODUCTS LIST**

usually draws interest from dozens of companies that want to showcase their latest environmentally friendly wares. This year's list attracted almost 200. Exactly why the field nearly tripled from 2017 is subject to debate. Greater interest in going green? A developmental boom from a growing economy? A veiled response to a less-than-eco-minded Administration? Whatever the reason, one thing is clear: It's no easy feat trimming such a massive roster down to the real all-stars. Selections were based on how green the product actually is, degree of innovation, how new the item is to the marketplace, and how many products were submitted in each of the 12 categories. Those that just missed the cut are in an Honorable Mention section at the end. But anyone who took the time to dream up, develop or actually bring something sustainable to market deserves a shout. So pat yourselves on the back, then check out what ended up as the latest and greatest.



Bosch Home Connect 800 Series Laundry Pair washer-dryer combo

The Bosch *Home Connect 800 Series Laundry Pair* uses a series of connected features to simplify and perfect doing laundry, while living up to its Energy Star status.

When starting a load of laundry, users simply open the unit's EasyStart feature and select the type of clothes to wash. The connected washing machine recommends the perfect program for the load. Meanwhile, the *Home Connect* app lets users compare water and energy usage rates and select cycles based on efficiency.

The ability to remotely control and monitor laundry from almost anywhere means users can start or adjust their laundry on the go by using a smartphone or tablet. The laundry pair's 30-minute dirty-to-dry feature, combined with the *Home Connect* remote control feature, is ideal for active lifestyles.

The washer has earned Energy Star's "Most Efficient" label. The dryer is the only condensation compact dryer recognized by Energy Star.

LG TWINWash with SideKick washer



LG's *TWINWash* washing machine and its *SideKick* pedestal washer is all about saving water. The flagship front-load washer, *Model WM9000*, has earned Energy Star's "Most Efficient 2018" designation, awarded to products that deliver cutting-edge energy efficiency and the latest in technological innovation. With a total capacity of 6.2 cubic feet, this washer allows consumers to do more laundry in fewer loads, and its *TurboWash* technology saves up to 30 minutes on every wash cycle, thereby saving water and energy.

The unit's *COLDWash* feature uses six motions from the direct-drive motor to deliver warm-water cleaning performance with cold water. *TWINWash*

has also been certified "asthma and allergy friendly" by the Asthma & Allergy Foundation of America, which recognizes a product's ability to help control common household allergens, such as dust mites and pet dander.

The *WM9000* is Wi-Fi enabled and compatible with LG's *SmartThinQ* app. This allows users to start and stop wash cycles remotely, receive notifications when laundry is done and be sent reminders about scheduled maintenance.

SideKick serves as an additional washing machine in the footprint of a laundry pedestal. This allows users to run two separate loads of laundry at the same time—an industry-first innovation pioneered by LG. Its compact size is ideal for special care items such as intimates and delicates. *SideKick* is also perfect for washing small loads when a full load seems wasteful.

And, *SideKick* and the main washer can operate simultaneously and independently, so the consumer can wash one load in hot and one load in cold water at the same time. Users can also start or stop one cycle without interrupting the other.



Whirlpool Smart Certified Dishwasher with Third Level Rack

The *Whirlpool Smart Energy Star Certified Dishwasher with Third Level Rack* and its mobile phone-based *Download & Go* option provides users with customized cycles to wash the way they want. Whether in the car or the living room, a user can select a cycle based on the type of cleaning needed.

The unit's Sensor cycle detect soils in a load to select the right wash and dry settings, and use only the amount of water and energy needed. The *Third Level Rack* enables users to load more dishes and hard-to-fit items, and use its *TotalCoverage Spray Arm* to target dishes using more than 20 jets. Other cycles, such as Plastic Items and Canning & Brewing Items, clean even the dirtiest of dishes or the most niche of items.

As another energy and water saver, a 1-Hour Wash cycle cleans dishes in half the time, enabling plates, pans and glasses to be thoroughly cleaned in just an hour.

Whirlpool's mobile app works with Nest, allowing users to delay the dishwasher from starting until they are away. Or, they can use the app and *Amazon Dash Replenishment* to automatically reorder dishwashing supplies when they're running low.



Kohler Corbelle toilet

The first Kohler toilet to feature its new *Revolution 360* flush platform, *Corbelle* offers the most complete and powerful flush available. The brand's patented *AquaPiston* canister sends 360 degrees of water through the bowl, keeping it cleaner longer than a convention flush. The invention provides reliable power without wasting water.

This WaterSense-labeled high-efficiency toilet uses at least 20 percent less water than 1.6-gallon toilets and is eligible for consumer rebates in some municipalities. This product meets water savings requirements for California Energy Commission (CEC), CALGreen, and Colorado SB 14-103.

Corbelle also boasts *CleanCoat* surface technology on the interior of the bowl. *CleanCoat* bonds to the surface to form an ultra-thin protective layer that causes water droplets to bead up in the interior of the bowl. This process makes the bowl surface significantly easier to clean by preventing bacteria, mildew and hard water mineral deposits from forming, increasing the toilet's durability.

The toilet's sleek design and skirted tramway also promotes cleanliness, as it eliminates areas where dust and dirt often collect. This design encourages an easy wipe down to ensure a more hygienic environment.

The product is simple to install. Utilizing the patented *ReadyLock* installation system, the two-piece *Corbelle* offers does not require drilling, caulking or special tools.



American Standard Spectra+ eTouch showerhead and remote

Water-efficient showering comes to the fore with American Standard's *Spectra+ eTouch* showerhead, which gives full-body coverage while allowing the user to change spray patterns with a simple fingertip touch on the outside ring of the showerhead.

The *Spectra+ eTouch*, managed by hand or remote, is offered as a standard 2.5 gallon per minute (gpm) model or a watersaving 1.8 gpm option that is WaterSense certified and CalGreen compliant. The oversized, 7-inch showerhead offers four spray patterns: Drench for full body coverage; Sensitive for gentle, soothing coverage; Jet for targeted coverage; and Massage for pulsating coverage. All provide a heavier water spray when they're actually using less.

For added ease of use, the included first-of-its-kind *Spectra+ eTouch* remote can be mounted on nearly any shower wall to offer convenient, one-touch control over the spray patterns. This stylish remote simplifies and enhances shower accessibility for almost any user, regardless of restrictions due to mobility, height or age.

Both the showerhead and remote control are powered by easily accessible batteries, removable without use of special tools.

It's even easy to install. The *Spectra+ eTouch* remote attaches to a base plate that is secured to the wall with adhesive tape or with optional screws included in the package.

BATHROOM FIXTURES



Moen Align Spring pull-down kitchen faucet with *MotionSense Wave*

Moen's *Align Spring* pull-down kitchen faucet provides a look fit for an industrial kitchen, but with the reach and flexibility required for residential use. The fixture is now available with Moen's new *MotionSense Wave* technology, which offers a hands-free experience and provides water when users need it most with just a wave of the hand.

Faucets with this touchless technology are ideal when users' hands are too full or too messy to turn on the faucet. This innovation also minimizes the spread of dirt and germs, as there is no need to touch the fixture to start the flow of water.

The unit's *Wave Sensor* turns water on or off with the wave of a hand, for easy, instant motion-activated control. The sensor also automatically turns off water after two minutes, which allows for a reduction of water usage. The handle on the opposite side of the faucet offers manual operation, letting users adjust flow and temperature.

The *Align Spring* pull-down faucet with *MotionSense Wave* is available with Moen's exclusive *Spot Resist Stainless* finish, which resists fingerprints and water spots to maintain the fixture's brilliance.

Niagara Nano toilet

Sometimes plain is perfect. Niagara Conservation describes its products as "not sexy, but extremely effective," and that's what it delivers with the *Nano*—reportedly the most water-efficient toilet on the planet. Featuring patented vacuum-assist flush technology (which leaves behind a clean bowl every time) and highly innovative Stealth Technology, the *Nano* only utilizes an average of 0.6 gallons per flush and has a noise-cancelling tank. The toilet's compact design maintains the comfort of an elongated bowl, making it perfect for smaller spaces.

The *Nano* is WaterSense certified, MaP premium rated, and certified by the American Society of Mechanical Engineers.

The *Nano* is the latest in the Niagara Conservation's portfolio of products that seeks to save the world's water through everyday ingenuity. While there's a push across the industry for products that support technologies, such as smartphones or Amazon's *Alexa*, Niagara prefers to invest in developing technologies and products that conserve natural resources.



ENERGY PRODUCTION, STORAGE AND CONTROL



Enphase Energy *IQ Combiner+* with *IQ Envoy*

When it comes to energy use, what is a house really up to? Enphase Energy's *IQ Combiner+* and the *IQ Envoy* keep tabs on a home's power usage and production.

The *Envoy* provides in-depth monitoring, energy usage insights, remote update capabilities and load management. It has flexible networking that supports Wi-Fi, Ethernet or cellular connectivity. The *Envoy* also provides production metering and optional consumption monitoring and supports installation of the Enphase *Q Aggregator*.

The Enphase *IQ Combiner+* with *IQ Envoy* consolidates interconnection equipment into a single enclosure and streamlines photovoltaic (PV) and storage installations by providing a consistent, pre-wired solution for residential applications. It comes with an *Eaton BR* series panelboard interior including up to four 2-pole branch circuits for 240 VAC plug-in breakers, for a combined 80-amp total PV or storage branch circuits. The *IQ Combiner+* comes with a NRTL-certified NEMA type 3R enclosure, has a five-year warranty and is UL listed.

IQ Envoy connects each component to create a seamless home energy solution. This includes microinverters, Enphase *Enlighten* software—which makes it easy to track energy production and consumption—and accessories like *Field Wireable Connectors* that make Enphase installations simple, reliable and cost-effective. The Enphase *AC Battery* completes the home energy solution.

Ideal Power 30 kW *Stabiliti 30C3* multiport power conversion system

Connecting multiple energy resources can involve devices that are large in size and difficult to install, with limited system controls that complicate ongoing management. The 30 kW *Stabiliti 30C3* multiport power conversion system addresses these issues by integrating several power inputs through a single power processing platform, removing redundancies and complications associated with conventional single-function power converters. The compact product saves space, weight and dramatically increases overall system efficiency. Like LED lighting, rainwater harvesting and energy-efficient appliances, the *Stabiliti* can make a big difference in new green building construction by earning LEED points for renewable energy integration and smart energy use.

Ideal Power's power conversion products, including *Stabiliti*, allow building owners, system integrators and project developers to manage energy use more cost-effectively and efficiently than traditional solutions on the market by integrating multiple sources of energy. Buildings can decrease their environmental footprint using a smart combination of energy sources, such as solar and energy storage, that minimize the facility's reliance on grid power during average and peak times. Additionally, this equipment package can deliver backup power to the building's critical loads when the grid goes down, minimizing or even eliminating the need for dirty and unreliable diesel backup generators.

The *Stabiliti* has a wide range of implementation opportunities and has especially benefitted customers on island nations that experience higher-than-average energy costs. For example, the cost of electricity on the Caribbean Islands averages about 50 cents per kilowatt-hour (kWh)—about three to five times that of the mainland U.S.



ENERGY PRODUCTION, STORAGE AND CONTROL

Smappee Plus home energy monitor

Smappee Plus measures real-time energy use from household appliances, offering valuable insights into a homeowner’s energy use and production. *Smappee Plus* is the only energy monitor that combines load disaggregation with submetering technology to provide real-time data also for appliances with variable output—such as air conditioning, electric vehicles or heat pumps.

Consumers can see how much energy a device uses and its daily, monthly or annual energy costs. Consequentially, owners can make informed decisions on their energy consumption (e.g., when to buy a more energy-efficient fridge) and act to save on energy costs and efficiency.

Smappee Plus is also the only energy monitor that can be programmed as an “energy traffic controller” in the home. The product can automatically steer excess energy production, such as solar power, to appliances in order of preference, further increasing a homeowner’s energy efficiency and cost savings. They can choose from numerous “recipes” that automate certain actions. For example, if the owner is simultaneously charging an electric vehicle and starting to cook on an electric stove, *Smappee Plus* will control and diminish the power that goes to the car until the owner is finished cooking to avoid fuses from blowing. Afterwards, the car will receive more power again.



Because of this energy traffic controller function, *Smappee Plus* also enables the turning of homes into decentralized energy hubs that can produce, sell and buy renewable energy. *Smappee Plus* is compatible with smart *Comfort Plugs* and various IoT platforms such as Amazon Alexa, *IFTTT*, *Stringify* and more, allowing the homeowner to automate activities or control appliances from a distance.

SolarEdge HD-Wave inverter with integrated EV charger



Homeowners have a new way to become more energy independent, decrease their electricity costs and reduce their carbon footprint. It can save builders a few bucks, too.

SolarEdge’s *HD-Wave* inverter-integrated electric vehicle (EV) powers electric vehicles by supplementing grid power with photovoltaic (PV) power via a single inverter. The *HD-Wave* inverter with an integrated EV charger also provides existing management and monitoring of solar production, and enables EV charging from a single inverter and dashboard. The combined solution offers considerable cost savings on both hardware and labor by eliminating the need for an additional conduit, wiring and breaker installation. The solution also eliminates the need for an additional dedicated circuit breaker, which saves space and, potentially, a main distribution panel upgrade.

Based on patent-pending technology, the EV charger is embedded into SolarEdge’s *HD-Wave* inverter and leverages its solar boost mode. This mode utilizes the grid and PV to charge at 9.6 kW (40 amp) Level 2 charging, which is up to six times faster than standard Level 1 charging. If PV is not available, the inverter-integrated EV charger will use grid power to charge at 7.6 kW (32 amp) Level 2 charging, which is up to five times faster than standard Level 1 charging.

With a 12-year warranty, the inverter-integrated EV charger also offers potential future operating modes, such as demand-response and charging at off-peak hours to optimize Time-of-Use (TOU) rates.

FLOORS, WALLS AND SURFACES

Cali Bamboo GeoWood flooring

Finding a way to emphasize the beauty of hardwood flooring while using fewer trees, Cali Bamboo has developed *GeoWood*, revolutionary, engineered hardwood that pairs real timber with *GeoCore*—Cali’s stabilizing limestone composite foundation. This technological breakthrough yields rock-solid hardwood flooring with *AquaDefy* water resistance technology at a lower price point than solid wood planks.

The beauty layer atop each plank is up to 1.2-mm thick and features sustainably farmed woods and lumber from Lacey Act-compliant managed forests. All flooring is ultra-low VOC with no added urea formaldehyde and employs adhesives that fall well below EO emissions standards.

Cali Bamboo’s proprietary limestone composite fortifies each *GeoWood* plank and helps it resist indentation from high heels, pet claws and furniture. Its composition translates to 50 percent better dimensional stability, meaning less expansion and contraction, and as little as 24 hours of acclimation is required before laying down planks.

AquaDefy technology ensures diehard moisture protection, making *GeoWood* perfect for bathrooms, kitchens and below-grade spaces like basements. Superior water resistance also makes planks more resilient and easier to clean. The flooring is backed by a 50-year residential warranty, double the industry standard.



FLOR carpet tile

Now there’s an indoor floor tile that can be reused as often as the homeowner wants. FLOR’s carpet tile product has a modular design that allows constant redesign to suit situational or personal needs, without the need to buy more expensive, often environmentally unfriendly replacements—as well as keeping waste material out of the landfill.

All FLOR tiles are made from reclaimed and recycled materials and manufactured in progressive, energy-efficient facilities that use less water and energy and produce less waste. They have also been deemed hypoallergenic, meet or exceed standards for low VOCs, and been awarded Carpet & Rug Institute Green Label Plus status. Carpet tiles are designed to stand up to pets, kids, house guests and more. Dirty tiles can simply be removed, washed and replaced.

The company also offers a return-and-recycle program, where used FLOR product can be turned into product for a new generation.

FLOORS, WALLS AND SURFACES



Merge Design *extremeconcrete*

Engineered to contain as much waste stream ingredients as possible, *extremeconcrete* materials allow creation of LEED-contributing architectural products and surfaces while achieving the natural aesthetics and material properties of High Performance Concrete (HPC). Vibrant, fluid and textural, *extremeconcrete* can be infused with a variety of pigments and recycled aggregates to provide unlimited color and material combinations to create unrivaled surfaces and distinctive products.

The proprietary product mix contains up to 85 percent recycled content. Designs can incorporate a variety of recycled or reclaimed elements diverted from the waste stream, such as finely ground by-products from the production of silicon or coal-fired power plants, crushed pre- or post-consumer glass, shredded circuit boards or plastics, stranded fabric or carpet fibers, and even certain construction site and demolition waste diverted directly from LEED projects.

To help reduce the carbon footprint, all *extremeconcrete* products use local sourcing, seeking materials from a 500-mile radius wherever possible. All materials are available in standard-sized slabs for fabrication, such as natural stone. The product is NSF/ANSI 51 certified, made in the U.S.A., and contributes to multiple LEED credits.



Formica Corp. *SurfaceSet Smart Organic* laminates

With a continuing eye toward recycling, Formica Corp.'s *Smart Organics* palette from its new *SurfaceSet 2018* line takes a

scientific approach to environmental consciousness. Smart Organics' *Paper Terrazzo* patterns use small fragments of post-production solid color paper from formica laminate that would otherwise have gone to waste. Remnants are chopped into tiny fragments and directly placed on top of a solid to create a terrazzo-look laminate.

The *Smart Organics* palette also includes three *Bubble* design patterns, in which printing inks were mixed with soap and bubbles, then blown on industrial grade paper. The laminates are offered in natural and man-made greens, grays and warm tones in colors such as green slate, weathered fiberwood and enamel.

The laminates look real, too. *Paper Terrazzo* is created in small-batch craft production, so that each sheet is unique and natural. Paired with a unique *Paper* finish, the *Paper Terrazzo* patterns offer a low sheen-in register finish. The *Paper* texture enhances the real paper effect with synchronized texture. The production pressing process results in a low sheen finish with slightly raised areas that result from the individual embedded paper fragments.

Smart Organics stems from Formica's Reclaimed Denim Fiber effort in 2015, in which scrap indigo-dyed cotton—a vital component of paper making—was incorporated into the production process. About 60 percent of the overlay included recycled content.



Mohawk *RevWood Plus* flooring

Mohawk's *RevWood Plus* flooring combines the look of wood with the toughness of laminate without damaging the environmental footprint. *RevWood Plus* features a combination of proprietary technologies—the *Uniclic* locking system,

GenuEdge pressed beveled edge and water-repellent *HydroSeal* coating—which work together to trap liquid on the surface, making the flooring totally waterproof.

In addition, *Uniclic*, unlike other traditional glue-down installations, has a unique tongue-and-groove locking system that reduces installation time, increases durability, minimizes mess and simplifies cleanup. It also eliminates potential for unstable and uneven flooring, because no glue or drying time is needed.

Each of the made-in-U.S.A. collections delivers aesthetic needs and trends, yet provides the durability, performance and value that consumers require. Each collection has earned NALFA and FloorScore certifications for low VOCs, and features the latest embossed-in-register technology and beveled edges for ultra-realistic detail. The products also feature warranties covering all pets, all accidents, and providing "all-the-time" scratch protection.

RevWood Plus was one of five Mohawk products to receive Dealers' Choice awards at the 2018 International Surfaces Event in Las Vegas in March.

HEATING, COOLING AND WATER HEATING

GeoComfort *Guide Series Variable-Speed Water-to-Water* geothermal unit



GeoComfort Geothermal Systems has unveiled a variable-speed water-to-water geothermal unit—the *WV060*—that can help homes more easily reach net-zero status.

The *WV060* is reportedly six times more efficient than a standard electric water heater and 40 percent more efficient than already-effective standard geothermal heating and cooling systems. The all-in-one unit is capable of powering a home's radiant in-floor heating and cooling, forced air heating and cooling, pool heating and snowmelt

efforts, as well as meet all domestic hot water needs on demand, making it perfect for smaller homes and owners that want only a single system to maintain.

An outdoor sensor relays constant temperature data to the unit, allowing it to use the lowest possible water temperatures for increased efficiencies, and eliminating temperature swings to perfectly match desired comfort settings. Additionally, this system allows for zoning in a home, so different areas in the house can be kept at different temperatures.

Homes with the goal of achieving net zero, or close to it, will benefit from this system. As a renewable energy, geothermal is an asset towards going net-zero since it does not burn any fossil fuels. The *WV060* has built-in soft start technology, which makes it more efficient than a standard geothermal heat pump. Higher efficiencies require less electricity, which reduces the number of solar panels needed to power the home.

The unit's exclusive design includes triple compressor isolation, featuring elastomeric vibration absorption pads, a heavy-gauge compressor isolation plate and high-density rubber grommets—all of which makes the *WV060* extremely quiet. This system is AHRI certified to ISO Standards and ETL certified to UL and CSA standards.

Ice Energy *Ice Bear 20* HVAC system

Recognizing the need for a cleaner, greener and more energy-efficient solution to home cooling and heating, Ice Energy has developed the *Ice Bear 20*, a home-optimized HVAC system that utilizes an ultra-high efficiency compressor along with an ice tank with heat exchanger.

The compressor can cool the home with traditional methods or store energy for cooling by freezing water in the ice tank. Once the freezing process is complete, the compressor can be turned off, and—without using any electricity to create cooling—the *Ice Bear 20* will provide up to four hours of cooling to the entire home. The ice battery can be programmed to charge at night, when electricity is cheapest, and discharge for up to four hours the next day before defaulting back to the compressor.

Additionally, the *Ice Bear 20* can integrate with a home solar PV system, utilizing the mid-day solar over-generation period to fully charge without using electricity from the grid.

Both processes serve as alternative solutions to running an air conditioner during the peak times of day when electricity is in greatest demand and, therefore, most expensive. Thirty-five percent of peak electric draw on summer days is due to the instantaneous creation of cooling.

Furthermore, when heating is required, the *Ice Bear 20* can reverse its circuit, switching the compressor to operate as a heat pump to provide all the heating needed for the home.

The *Ice Bear 20* allows homeowners to better utilize solar PV and reduce CO₂ emissions by up to 1,000 pounds per year.



Noritz *EZ Series* tankless water heater

Engineered expressly for the North American residential market, Noritz's *EZ Series* of high-efficiency, condensing tankless water heaters are designed to cut installation time and cost when replacing larger, storage tank-type units. The product line has expanded with the release of the Energy Star-certified *EZ98-DV* and *EZ111-DV* models.

The *EZ98-DV* has a maximum input of 180,000 BTUs per hour (BTU/hour) and a maximum flow rate of 9.8 gallons per minute (gpm), making it suitable for homes with up to three baths. The *EZ111-DV*, with inputs up to 199,900 BTU/hour and flow rates to 11.1 gpm, is intended for homes with up to four baths.

Like the *EZTR40*, unveiled in 2014, the two larger models offer exclusive features intended to ease the installer's job and lessen the homeowner's up-front investment. These include top-mount, hot- and cold-water connections that sharply reduce the amount of new plumbing work required by a tankless-for-tank replacement; maximum venting flexibility with four different options, including outdoor (OD), direct vent (DV), single vent (SV)

and 2-inch flex vent, which utilizes the existing B-Vent formerly used by the tank water heater being replaced; and the possibility of reusing the tank unit's half-inch gas line, thus avoiding the substantial expense of running a new gas line.

Both new *EZ* models have hot- and cold- water connections located on top of the unit—not the bottom, like most tankless heaters. This positioning allows the flexible water lines used by the previous tank heater to be quickly and easily reconnected to the new unit. This saves time and money traditionally spent purchasing and running new plumbing around the tankless unit, and gives the final application a cleaner look.



HEATING, COOLING AND WATER HEATING

Rheem Prestige Series R98V Modulating Upflow Gas Furnace

The Rheem Prestige Series R98V Modulating Upflow Gas Furnace offers the highest efficiency available today at 98.7 percent AFUE, saving maximum energy and money for homeowners. The unit's industry-first patented features make it one of the smartest furnaces on the market.

A newly redesigned heat exchanger improves airflow, which reduces operating sound. The variable-speed ECM motor also contributes to a quieter, more efficient operation, using less energy than a single-stage motor and running at a wide range of speeds to provide precise airflow and provide better humidity control.

The R98V comes standard with a direct spark ignition (DSI), one of the most reliable ignition systems used by the heating



and cooling industry. The unit is also equipped with built-in safety features such as the industry's first blocked drain sensor, which forces the furnace to shut down if a drain gets blocked, preventing spillage and potential water damage.

When connected to Rheem's exclusive EcoNet Control Center, the R98V furnace will display important service and maintenance information. This data can also be accessed on the homeowner's smart phone or tablet, and can be sent direct to a contractor to speed up repairs. Homeowners can also adjust settings for efficiency and comfort from anywhere with the free EcoNet app.

Prestige was named Energy Star Most Efficient by the Environmental Protection Agency for 2016 and 2017.

SunEarth SunWater PV water heater

SunEarth's SunWaterPV water heater offers a simple solution for homes with low- and moderate occupancy.

The unit utilizes thermal battery technology with no photovoltaic (PV) interconnection restrictions. A 50-gallon unit with a dedicated PV system of about 1,000 watts feeds two PV-driven elements that are completely separate from the grid. SunWater also has a 4.5-kw backup.

A full touchscreen system offers visual indicators such as Solar Supply, Grid Supply, Energy Balance, Tank Temperature and Energy Savings. The system also allows users to program in different modes, with the ability to run at the desired times, for designated amounts of time. With the 50-gallon unit—80-gallon and 120-gallon models are coming to market soon—there is a three-hour recovery period, which means SunWater can meet all of a homeowner's daily hot water needs without utilizing any grid energy. This makes the unit

ideal for homes with a two- three-person occupancy, or vacation homes, when compared to a traditional solar hot water collectors.



Trane XV19 Low Profile Variable Speed Heat Pump 4TWL9

Life in the "Big City" just got less expensive, quieter and greener—at least where heat pumps are concerned. The Trane XV19 Variable Speed Low Profile Heat Pump is designed for markets in larger metropolitan areas with strict noise ordinances, such as in the northwest, where many large cities have maximum sound levels of 55 dB(A) during the daytime and 45 dB(A) at night. XV19's operating sound levels are 43 to 57 dB(A), which makes them perfect for keeping things quiet when the unit is located in close proximity to living spaces.

This heat pump complies with zero lot line applications, structures that come to the property edge, has lower sound levels and the lowest annual operating costs to date for Trane ducted split systems on the market. With efficiencies up to 19.5 SEER (Seasonal Energy Efficiency Ratio) and 11.5 HSPF (Heating Seasonal Performance Factor) these are one of the quietest residential split systems and the most-efficient heat pumps available. The new heat pumps exceed Energy Star most efficient criteria of 18 SEER, 12.5 EER (Energy Efficiency Ratio) and 9.6 HSPF.

XV19 can reduce annual electric energy usage and save up to hundreds of dollars annually compared to minimum efficiency single-stage heat pumps. Available in 2- to 5-ton sizes with the ability to operate at 500 speeds, these systems give residents efficient, affordable and reliable comfort. Integrated diagnostics and connected controls also provide homeowners with 24-hour access to monitor or control the comfort system while at home or away.



INDOOR AIR QUALITY AND WATER QUALITY

Airboxlab Foobot air quality monitor



Airboxlab's Foobot is the first air quality monitor which gives users a clear and visual understanding of how good the air quality is in their home—and knowledge that enables homeowners to take small steps to improve it.

Foobot is the only system to measure PM2.5s—particulate matter smaller than 2.5 micrometres—a major source of air pollution resulting from outdoor

elements such as exhaust fumes, factories and ash, and indoor enemies such as dust, pollen and pet dander. Daily data is recorded in five-minute intervals and stored in the cloud, so users can get a documented history of what causes spikes in bad air quality in their home. Adding an air purifier enables Foobot to monitor everything which affects indoor air quality, including VOCs, PM2.5s, CO₂, temperature, humidity and even less-known items such as carpets and furniture.

Viewed data can then be used to determine what can be done to eliminate pollutants. For example, this could be as simple as opening a window, but with Foobot the user knows exactly when it's required and for how long. It can also encourage changes in behaviour that can lead to better indoor air quality.

Foobot can also work closely with other smart home devices with a connected thermostat, such as Google Nest to control your home's temperature, or Amazon Echo. When pollutants exceed healthy levels, Foobot will relay this information allowing Alexa to talk about the problem to the user via voice and suggest possible solutions. With the help of IFTTT, Foobot can also connect to 120-plus home appliances and the ventilation, filtration and purification systems for further air quality management.



Franke StillPure water filtration system

Franke's StillPure, a water filtration system with Bluetooth connectivity and a corresponding mobile app, is designed to help improve consumers' health by removing pollutants. It also reduces further pollution by empowering homeowners to track and cut back on water and water bottle usage.

Providing app users with usage data, StillPure makes consumers more conscious of the volume of water they're using daily. To further incentivize sustainability, the app also lets users know how many plastic water bottles they would have used and the amount of money they would have spent on water bottles had they not used StillPure.

StillPure also generates Bluetooth-driven notifications for upcoming filter changes, and offers one-click ordering, with the ability to have new filters arrive directly to the user's door. This helps make water as pure as possible, because the filter is working and up to date.

Havelock Wool Smart Wall enclosure system

As efficiency becomes more of a focal point in the building equation, greater emphasis is being placed on airtight structures. But airtight building envelopes create inherent challenges, including moisture, which can become trapped in vapor-retarded walls, cultivating mold and other contaminants, and causing long-term health issues.

Havelock Wool's new Smart Wall smart enclosure system tackles that problem with a bevy of highly efficient, durable and sustainable products, including the company's own sheep's wool insulation, pro clima membranes and Gutex insulation board.

Walls incorporating sheep wool form a low-energy, biophilic approach to wall system design and construction, leveraging the efficiency of airtightness without disrupting inherent vapor drive. Made of 100 percent natural, nontoxic materials, they are structured to create a long-lasting building enclosure.

The monolithic membranes allow for air tightness while offering an escape route for inevitable vapor. Mento 1000, a Tyvek replacement, is airtight open to the outside up to 36 perms. Intello Plus is reinforced to serve as insulation netting while being airtight and vapor variable from 0.17 to 13.2 perms. Natural wool in the continuous insulation cavity—and in the service cavity where applicable—enables moisture to be managed, as wool will absorb and desorb against 65 percent relative humidity. Moreover, wool is a keratin and will not support the growth of mold, thereby alleviating numerous challenges posed by some other forms of insulation. And, wool is a natural air cleaner, trapping volatile organic compounds (VOCs) that can lead to reduced indoor air quality.



INSULATION, AIR SEALING AND LEAK PREVENTION



AeroBarrier envelope sealing system

Sealing and insulating a home's building envelope can be expensive and time-consuming, and is subject to human error. Currently, contractors manually attempt to locate small and large gaps

in a building's structure to create an airtight seal, but some areas, such as electrical outlets, escape detection. AeroBarrier's self-titled product is a cutting-edge envelope sealing system that simultaneously measures and seals the building envelope, making net-zero and Passive House levels of envelope tightness possible for any project. AeroBarrier seals holes as small as a human hair, improving acoustics and preventing outside particulates and pollution from entering a building area.

The product measures envelope leakage in real-time, leading to a cost-effective solution to sealing the building envelope that helps reduce mechanical loads, improves energy efficiency and increases renewable energy feasibility for all projects.

Unlike traditional sealing methods, which require an assortment of products used during various stages of the building process—such as insulation, spray foams, wraps, caulking, barrier sheeting and mastics—AeroBarrier can accomplish most of these sealing strategies with a single application. In addition, traditional manual sealing requires numerous workers during various stages of the building process

AeroBarrier often requires only two to three workers to apply the sealant during a single phase of construction, saving on labor costs.

AeroBarrier is instrumental for single- and multi-family projects targeting the performance requirements of LEED, ZERH, Passive House, and the 2015 IECC or better. The sealant is Greenguard Gold certified.

CarpetCycle Quiet-Tech acoustic carpet insulation

CarpetCycle, known for safely removing, collecting and recycling carpet and post-consumer building materials, is now putting that product to Earth-friendly use. Quiet-Tech is an acoustic carpet insulation made from 85 to 90



percent post-consumer recycled materials. More than 4 billion pounds of carpet waste enters the environment annually, and Quiet-Tech helps divert some of that waste from landfills by taking used material from the floor and putting it right back into building walls.

Quiet-Tech is environmentally friendly, safe for construction workers and provides noise reduction qualities. It meets all requirements for UL Greenguard Gold certification for ultra-low chemical emissions, contributes to LEED and WELL credits, and holds a Class A fire rating. It can improve Sound Transmission Class (STC) by nine points and has a Noise Reduction Coefficient (NRC) rating of 0.95.

The product does not contain volatile organic compounds (VOCs) or inhalable airborne material, making it safer for a working environment. It is also mold and mildew resistant.

Designed for use in metal or wood frame construction, Quiet-Tech's friction fit insulation batts provide ease of installation without the need for fasteners and adhesives.



Freedom Pet Pass Energy-Efficient Pet Door

Air leaks can be anywhere—even where pets exit and enter. Freedom Pet Pass almost literally seals the deal with a pet door that is 15 times more airtight than human doors that meet Energy Star standards.

Sustainability-minded owners can give their pets freedom to come

and go as they please without wasting energy.

Freedom Pet Pass's DoubleMag seal technology creates a magnet-to-magnet airtight seal around the entire perimeter of the door, but remains easy for cats and dogs to use. The doors also have an insulated flap to reduce conductive energy loss. Freedom Pet Pass pet doors have a documented air leakage rate of 0.03 cubic feet of air per minute per

square foot, an order of magnitude better than standards for windows and human doors. The pet doors have been tested using industry-accepted tests like ASTM E-283 for air leakage and NFRC 100 for U-factor to verify performance.

The impact of an energy-efficient pet door replacing an inefficient one can be huge. Laboratory testing has shown that the best-selling pet door leaks 16 cubic feet of air per minute per square foot at 50 Pa pressure. In contrast, Energy Star standards are 0.5 cfm/sq. ft. for a human door and 0.3 cfm/sq. ft. for a window.

In addition to being energy efficient, Freedom Pet Pass doors are designed to last for years. Pet doors are subject to extremely rough use, as big dogs can bang through the door dozens of times every day. Freedom Pet Pass makes wall-mounted and door mounted pet doors in sizes that can accommodate the smallest cats and the biggest dogs.



Sto Corp. StoGuard AirSeal membrane

Air leakage resistance and moisture control are important elements of wall design. Preventing leakage and enhancing the drying potential of wall assemblies can minimize the risk of water damage from condensation.

Enter Sto Corp.'s StoGuard AirSeal, a high-build, vapor-permeable fluid-applied membrane designed for application over CMU and sheathing. It can also be used under various claddings, including StoTherm ci, stucco, metal panels, cement board, vinyl, wood, brick and stone. StoGuard AirSeal is part of the StoGuard air barrier and moisture barrier family of products.

StoGuard AirSeal is applied quickly and easily with an airless sprayer or roller—no need for specialized equipment. It can be applied to a continuous 40 mil DFT (Dry Film Thickness). The product does not contain harmful solvents; it is water-based with low VOCs. It is safe to apply and environmentally friendly. As part of the StoGuard System, AirSeal includes rough open protection that is optimized for various conditions and trades. It also will not tear or lose effectiveness when in use, and resists UV degradation for up to six months.



Covestro PReWall insulated wall panel

PReWall from Covestro LLC is a high-performance, insulated structural wall panel that is a more cost-effective and energy-efficient alternative to a traditional panel wall assembly.

These panels replace traditional exterior sheathing and house wrap with a combination of polyisocyanurate (polyiso) continuous insulation on the exterior and structural spray polyurethane foam (SPF) in the wall cavity. This creates a robust, high-performance wall using only a 2-by-4 stud with 24-inch on center placement.

PReWall panels are structurally comparable to a traditional wall assembly in racking strength. With appropriate structural connectors, the panels can be engineered for use in all regions of the United States.

The panels offer design flexibility to meet current energy codes, including requirements for continuous insulation. PReWall panels can be designed to perform well beyond existing building codes, making them a good fit for net-zero and passive home designs. The panels also provide increased R-value and decreased air infiltration in the wall assembly, contributing to a higher Home Energy Rating System (HERS) index score. They also have minimal potential for condensation in the wall assembly in hot/humid and cold climates versus conventional wall assemblies.

PReWall panels are manufactured at a panelization facility, in a controlled environment, and installed at the construction site. This alleviates jobsite workforce bottlenecks, produces less waste, requires less wood use and results in a faster framing time for builders.

Honeywell Solstice Liquid Blowing Agent

As demand for resilient, energy-efficient buildings continues to grow, so does the need for greener, high-performance insulation. Honeywell's Solstice Liquid Blowing Agent (LBA) is a breakthrough in polyurethane (PU) foam formulations that helps improve energy efficiency, is better for the environment, reduces costs and is safer.

Solstice LBA is being adopted globally in high-performance PU insulation such as closed-cell spray polyurethane foam (ccSPF) for residential wall and roof systems, insulated building panels and a wide variety of PU insulation applications. Solstice LBA is non-ozone depleting, non-flammable, VOC-exempt (U.S. EPA), and has an ultra-low GWP of 1 (99.9 percent lower than HFC alternatives and equal to CO₂). It is a near drop-in replacement for other liquid foam blowing agents, making it a cost-effective choice.

The product has received EPA approval under the Significant New Alternatives Policy (SNAP) Program.

Honeywell also offers Solstice Gas Blowing Agent (GBA), which replaces HFC blowing agents such as HFC-134a, in low-pressure and one-component spray foam applications and other applications.

LIGHTING FIXTURES, CONTROLS AND SENSORS

Brilliant Control

Remember the remote-controlled TV? They were huge when they first appeared, and were quickly followed by other remote-controlled products, such as CD players, stereo systems and VCRs. But there were also a bunch of remotes to keep track of. Fast-forward to today, and “technoclutter” exists in the form of smart devices, many of which could one day end up in the landfill.

The *Brilliant Control* takes the place of an existing light switch to provide touch and voice access for lights, climate, music and other smart home products. Turn on the lights by swiping the screen; play Spotify on the Sonos simply by asking. Since Amazon *Alexa*, Google *Assistant*, video intercom, weather reports, baby monitoring, smart lighting, digital displays and other capabilities are included, the home does not need lots of specific appliances such as *Echos*, *Homes*, and *Dots* to do these things in each room. This helps with the home's power footprint and aesthetics.

The product is also packed with sensors that can be used to save energy, such as motion control (auto-shut off can reduce lighting costs by 15 to 64 percent), temperature (can be integrated with *Nest* and *ecobee* for room-by-room heating), microphone and speaker, ambient lighting, a camera and more. Power management and measurement are included, and can be used to understand which circuits are using the most energy.

Industries have taken notice. The *Brilliant Control* has been recognized



by the Consumer Technology Association (Smart Home Product of the Year), the National Association of Home Builders (Outstanding Smart Home Product), IoT Innovator (Best Consumer Hardware Product), *CE Pro* magazine (Best Whole Home Automation), IHS Markit (Best Smart Home Solution), and more.

Häfele's Loox LED Lighting System

Just when it looks like household lighting couldn't get any smarter, Häfele raises the bar with its *Loox LED Lighting System*. Sure, indoor lights can be controlled with a Bluetooth-enabled smartphone or tablet. But opening a drawer or cabinet and having it immediately light up and then turn off when closed adds “Wow,” as well as convenience and functionality.

The fun continues with *Loox's* strip lighting, which can be cut to fit into any furniture, closet or cabinet application, or spliced for longer runs of uninterrupted LED. And there is color “temperature” control, which provides the ability to set warm tones within a room or closet with a swipe of a finger. Users can also spotlight a specific region or item within a room with a quick-to-enter command.

Puck lights, typically a mainstay in kitchen, bath and closet applications, are available in surface-mounted or recess-mounted styles. These stylish, IP44-rated fixtures are ideal for any area prone to condensation, small splashes or moisture. *Loox* also offers an infrared, heat-sensitive toe-kick LED light which stays on in four-minute increments—perfect for safe treks down a dark hallway or stairwell.

Loox can be easily expanded with future Häfele apps and installations. Apps for the system are now available in the Android and iOS stores.



Lamps Plus Interceptor LED ceiling fan

It's all about airflow with the *Interceptor* LED ceiling fan from Lamps Plus. With a wet rating for indoor or outdoor use, the oil-rubbed bronze LED fan circulates more than 7,000 cubic feet of hot and cold air every minute for maximum comfort, and illuminates with low-wattage LED.

Electricity use is a mere 35 watts, excluding the lights. Airflow efficiency is 214 cubic feet per minute per watt. The 58-inch blade span provides style and functionality while using nearly half the total energy of a 60-W incandescent bulb.

The three-blade Casa Vieja brand of ceiling fan includes the option to include or not include the LED light. The fan enables the ability to save energy during summer and winter: Cool air flows with the fan's counter-clockwise spin in summer. The fan's clockwise rotation enables warm air to rise in winter.

The fan can also be installed on a sloped or vaulted ceiling to about a 15 degree angle, allowing for use in almost any type of interior, and in some cases boosting the light output without requiring brighter bulbs and additional electricity.

NSi Industries TORK Smart in-Wall Switch

With NSi Industries' *TORK Smart in-Wall Switch*, it's a case of the more, the merrier. In addition to all of the classic smart control features, *TORK* and its mobile app allow homeowners to create lighting scenes by interconnecting multiple devices together—perfect for holiday displays—but not breaking the bank when it comes to the utility bill.

Using the app, homeowners can also remotely turn on or off lighting, ceiling fans and small appliances—anything connected to the wall switch—from anywhere in the world via tablet or smartphone. The app is compatible with iOS and Android devices.

Wi-Fi technology allows homeowners to set schedules for turning lighting on and off at a particular time. This helps improve security and save energy, especially with easily forgotten small appliances. Users may also schedule different times each day of the week if desired.

The product installs in a standard junction box and allows manual control of light switches and appliances as well as the mobile app. No special wiring required, as the stand-alone control works with all pre-wire definitions and is updated for Wi-Fi controls through the mobile app.

TORK Smart in-Wall Switch is compatible with any floor/table lamps or recessed downlights using LED, compact fluorescent or incandescent lamp sources. The product also works with the voice-controlled Google *Assistant* app and Amazon *Alexa* devices to further enhance control.



ROOFING, SIDING AND DECKING

Accys Group *Tricoya* MDF panel

For all their usefulness, versatility and appeal, medium density fiberboard (MDF) panels were forbidden fare when it came to exterior and constant wet-use environments. But the *Tricoya* MDF panel from Accys Group breaks that barrier with a virtually waterproof product.

Tricoya uses proprietary acetylated wood technology and a modified MDF manufacturing process to create a super durable, stable wood panel product. Acetylation is a revolutionary sustainable process that increases the number of naturally occurring hydrophobic acetyl groups in the wood cells using acetic anhydride. The process exchanges the hydroxyl groups with acetyl groups, preventing water absorption at these sites, and thus enhancing the dimensional stability and durability of the wood.

Tricoya can be used on a variety of exterior applications that would not normally be considered ideal for any MDF products including façade, cladding, fascia and soffit panels, window components, outdoor furniture, and play frames or tree houses. It can also be used in wet interior applications such as wall linings in swimming pools, bathrooms, wet rooms and changing rooms.

The panels, unrecognizable as a food source for insects and fungal decay, are backed by a 50-year above-ground and 25-year below-ground warranty.



bioLime *bioStucco*

With bioLime's *bioStucco*, what's old is new again. Made from natural hydraulic and dolomitic lime, select marble powders, pozzolanic aggregates and plant-based resins, *bioStucco* is a simple yet highly advanced stucco product that takes an idea originating thousands of years ago and moves it into the 21st century.

Ancient homeowners knew that their dwellings required safe, non-toxic, natural protection that could maintain internal temperatures and that could last centuries. Today's conventional materials like cement stucco store heat energy during hot summer months and do the same with cold temperatures during cold winter months—thereby transferring outside extreme temperatures into the wall cavity, causing interior environments to be temperature unstable. In the process, interior climate control systems switch on regularly to stabilize the feeling of comfort indoors.

bioStucco changes all that by becoming a naturally breathable skin on the outside of the building that keeps extreme temperatures from transferring into the wall cavity, reflecting it outward and keeping walls seasonally cooler or warmer. As a result, climate control systems switch on less regularly and allow homes to feel more comfortable, naturally.

The product's excellent vapor transmission maximizes the integrity in sustaining an overall wall assembly and will not promote the entrapment of heat or moisture in a wall system. And, the colorants of the *bioStucco* finish coating system are chemically inseparable from any color loss due to continual UV exposure, and will not fade, crack or peel.

LP Building Products *SmartSide Trim & Siding*

Call it wood without worries. LP Building Products' *SmartSide Trim & Siding* combines the warmth and beauty of traditional wood with the durability of treated, engineered wood.

Ideal for homes that are partially finished in stone, stucco or brick, *SmartSide* also meets the company's green products mandate via its construction from sustainably harvested wood.

Resins and binding agents used in the Sustainable Forestry Institute (SFI)-certified product result in an extremely low emittance level of Volatile Organic Compounds (VOCs). The product does not contain urea-formaldehyde. Manufacturing waste is kept to a minimum, with 99 percent of every log used for the product or as fuel to make it. And, the product can help builders and remodelers achieve certification points in a number of leading green building programs.

SmartSide is also no friend to termites or fungus—the company's *SmartGuard* process makes it strong enough to resist hail.



CertainTeed *Matterhorn Metal Roofing*

Among the most energy-efficient roofing options available today, CertainTeed's *Matterhorn Metal Roofing* replicates the architecture and charm of traditional wood shake, slate and barrel tile roofing while providing superior wind, fire and impact resistance.

Green elements abound: *Matterhorn* roofs, coated with a PVDF Tri-Pigment Reflective Paint System, reflect more of the sun's rays than traditional roofing. This lowers roof surface temperatures by 50 °F to 70 °F.

The roof's ability to re-emit up to 89 percent of absorbed heat also prevents excess warmth from escaping into the home. This reduces air conditioning needs, lowers energy bills and improves indoor comfort. It also cuts down on the generation of electricity—responsible for 29 percent of all greenhouse gases—and more than doubles the average roof lifespan.

Roofs built with *Matterhorn Metal Roofing* have a useful life expectancy of more than 50 years, eliminating the construction waste that comes with replacing the average 20-year roof. *Matterhorn* is also 100 percent recyclable. The product is available in shake, slate and tile varieties.

James Hardie *Aspyre Collection*

James Hardie's *Aspyre Collection* pairs two well-known home exterior product lines and creates a unit that is stylish, durable and Earth-friendly. Custom builders and architects can now use the thick, distinctive profiles of *Artisan* siding with the smooth, geometric *Reveal Panel System* to develop traditional to ultra-modern housing styles.

With *Artisan* siding, homeowners, builders and architects can expect the performance and durability of fiber cement with the traditional look of cedar. Unlike wood-based siding products which may rot, curl, warp or split from exposure to moisture, *Artisan* siding resists the harshest weather conditions. The product's 5/8-inch thickness and unique features provide a precise fit and finish, as well as the freedom to miter corners for attractive, streamlined styling.

The *Reveal Panel System* is a customizable system of durable, 7/16-inch-thick high-grade panels, trims and fasteners that can result in clean, simple lines that give homes a modern aesthetic. The panels are engineered for climate and are specifically formulated to stand up to the extreme weather conditions wherever they are installed.

The *Aspyre Collection*'s manufacturing process relies on natural, sustainable raw materials that are low in toxicity. At least 75 percent of the raw materials used are locally sourced, and James Hardie's manufacturing facilities work to reduce the environmental impact caused by transportation of finished materials. Fiber cement is engineered for long life and resistance to damage from long-term exposure to water, heat and UV radiation. The company's products are also performance tested in two separate climate zones—an industry one-of-a-kind effort.



SMART AND CONNECTED TECHNOLOGY

ecobee4 Pro smart thermostat

ecobee has always been on the smart side with its thermostats. Now people get to talk about it. The company's latest incarnation, the *ecobee4 Pro*, is the first thermostat with built-in Amazon Alexa Voice Service (AVS).

Users can verbally ask *Alexa* to warm or cool the home, order groceries, read the news and more. If *Alexa* isn't the vocal servant of choice, homeowners can use *Siri* through Apple *HomeKit* or Google Assistant instead.

Like its predecessor, the *ecobee4 Pro* comes with a *Room Sensor* to help with hot or cold spots throughout the home. The sensor measures temperature to deliver comfort to the rooms that matter most. It also keeps energy use low when no one is home, cutting heating and cooling costs by up to 23 percent each year. Homeowners can feel good about maximizing their comfort at home while minimizing their ecological footprint.

The *ecobee4* is compatible with most HVAC systems, including radiant heat units, multi-stage and dual fuel heat pumps. It also comes with a *Power Extender Kit*, meaning it's not dependent on another device for recharging.



Emerson Sensi Multiple Thermostat Manager

Managing multiple thermostats across multiple locations can be a demanding and time-consuming job for apartment managers who need to balance the comfort of their occupants with energy conservation and available manpower. With Emerson's *Sensi Multiple Thermostat Manager*, heating and cooling needs can be quickly met across multiple locations.

The product is a software application that helps control multiple heating and cooling systems through one convenient online portal. The software works with *Sensi* Wi-Fi thermostats to provide an affordable HVAC management solution for locations with multiple HVAC systems.

Since the thermostats don't have to be adjusted manually, the business can save time, energy and money. By making simple adjustments in a seamless interface that impacts multiple thermostats at once, facilities no longer have to rely on janitorial or evening staff to adjust every thermostat to keep the system from running overtime on evenings or weekends. Users can also enable optional notifications that let them know when and where extreme temperature or humidity changes are detected in their buildings.

Thermostats can be locked and unlocked to prevent tampering, and to control heating and cooling costs. Thermostats can be changed in batches and can be monitored in real time.

Unlike traditional costly large-scale building management

systems, the *Sensi Multiple Thermostat Manager* does not require additional costly hardware. It only requires *Sensi* Wi-Fi thermostats, which are easy to install. *Sensi* thermostats are designed to work with most heating and cooling systems.



FirstAlert Onelink Safe & Sound smoke and CO alarm

First Alert's *Onelink Safe & Sound* combines first-rate protection from smoke, fire and carbon monoxide (CO), with exceptional audio capabilities and compatibility with the top connected home platforms. The alarm combines premium home speakers and hands-free voice commands.

The *Onelink Safe & Sound* is the first smoke and CO alarm with fully enabled Amazon *Alexa*, as well as a model that works with the Google Assistant. Additionally, both models are compatible with Apple *HomeKit*.

Unlike other smoke and CO alarms in the connected home space, the *Onelink Safe & Sound* is compatible with many existing interconnected hardwired alarms. Consumers don't have to re-install or purchase all new alarms if they desire smart home technology. Each alarm, installed easily thanks to an integrated adaptor plug, automatically activates other hardwired alarms in the home when an emergency is detected.

Compare to other smart alarm products, the *Onelink Safe & Sound* offers superior audio capabilities through premium home speakers. With proper ceiling installation, the alarm provides consumers with an exceptional sound experience in their homes thanks to a natural acoustic backdrop.

The enhanced audio and virtual assistant platforms offered by the *Onelink Safe & Sound* ensure that people will never think of their smoke and CO alarm in the same way again. What was once an often overlooked safety product is now a safety and entertainment device.



Phyn Plus Smart Water Assistant + Shutoff monitor

In the U.S., more than 1 trillion gallons of clean water get wasted through leaks every single year. Homeowners are often alerted to leaks and water damage days or weeks after it has started, which is too late and can be costly and traumatic. The *Phyn Plus Smart Water Assistant + Shutoff* tool help keeps water loss to a minimum until repairs can be made.

From the moment it is installed, *Phyn Plus* monitors and measures tiny fluctuations in water pressure to detect and alert homeowners the moment a leak is identified, mitigate costly damage through automatic shut off, and diagnose potential problems in plumbing systems before they become an issue.

Phyn measures micro changes in pressure—240 times a second—to fingerprint the unique signatures of each fixture and catch plumbing issues ranging from the smallest pinhole leaks to faucet drips and frozen pipes. Advanced algorithms that analyze multi-dimensional sensor data from pressure, flow and temperature sensors provide a high-definition view of a home's plumbing system that accurately determines whether something is a leak or normal water usage.

The product also connects to a nationwide network of plumbing specialists educated on the *Phyn Plus* and its installation process, to enable any necessary repairs.



TP-Link Smart Light Switch 3-Way Kit

Replacing three-way switches for a smarter, greener lifestyle throughout the house is as simple as snapping fingers—or picking up a smart phone. TP-Link's *Smart Light Switch 3-Way Kit* makes knowledge of wiring or auxiliary switch configurations optional for the average homeowner.

The *Smart Light Switch 3-Way Kit* provides smart lighting control from two locations, making it ideal for living rooms, halls and stairways. Doing so is easy: Simply replicate the wiring from old switches and the *3-Way Kit* takes care of the rest. The accompanying *Kasa* app on an iOS or Android system guides the user through installation and connection to a home Wi-Fi network.

Once connected, the *Smart Light Switch* kit can be conveniently controlled from anywhere using *Kasa*. The system also easily connects to Amazon *Echo* or Google Assistant voice tools for convenient hands-free control. Smart plugs and smart bulbs can also be control with a tap on a touchscreen.

Users may also check on lights remotely on their phones, create schedules, set timers and countdowns, and activate an *Away Mode* to switch lights on at different times.



STRUCTURAL SYSTEMS, MATERIALS AND LANDSCAPING

Nisus Corp. *Bora-Care with Mold-Care* treatment



While many things green relate to nature, one natural item—mold—is not on the welcome list. It can grow unseen in a home inside wall voids and create a dangerous indoor air quality health hazard for homeowners, and severely degrade the integrity of

the structure. Nisus Corp.'s *Bora-Care with Mold-Care* fungi treatment is an environmentally friendly way to prevent the "dark matter."

Applied by a pest company during the dried-in phase of construction, *Bora-Care* does its protective work in only a few hours, meaning no slowdown to the building schedule. It's a crucial fix, as wood is generally the largest single investment in a home, and there is only one opportunity to treat all of it. Just a 10 percent weight loss from wood decay can mean up to a 50 percent loss of strength in one piece of wood.

Because *Bora-Care*'s active ingredient is a disodium octoborate tetrahydrate (DOT)—a non-synthetic, borate mineral salt—it doesn't break down over time and remains in the wood for a lifetime, providing long-term residual protection. There's also no harmful infiltration into the soil.

Bora-Care also takes care of another pest, termites, in a similarly Earth-happy fashion. Only a few gallons are required to completing treat the home's structure, and it's applied directly to the wood. In contrast, typical termite killers require hundreds of gallons that must be pumped into the soil around the house.

Using the anti-fungal agent can also gain a builder points in green building programs such as LEED for Homes, NGBS Green Product Certification Program, EarthCraft and others.



Quikrete *Lightweight FRS* (Fiberglass Reinforced Stucco)

Use of pre-blended concrete products just got a bit easier and less expensive. Quikrete has unveiled *Lightweight Fiberglass Reinforced Stucco (FRS)*, which is reportedly the lightest and most sustainable stucco on the market.

FRS is 35 percent lighter than traditional pre-blended stuccos, making it easier and faster to transport, stage, mix, pump, place and finish. It's also safer: Working with lighter bags decreases fatigue, increases speed and prevents mistakes, improving overall productivity on jobs—and profitability.

The Quikrete product is a Portland cement-based plaster blended with recycled, coated Expanded Polystyrene (EPS) beads, uniformly graded sand, and alkali-resistant glass fibers. *FRS* is one-hour fire rated and contributes to U.S. Green Building Council LEED credits.

FRS is available in 50-pound bags and 1,950-pound bulk bags that can be troweled or spray applied on traditional three-coat scratch, brown and finish systems, from 3/8 inch to 7/8 inch, as well as one-coat systems. One 50-pound bag yields the equivalent coverage area of a traditional 80-pound bag of pre-blended stucco.



Rachio 3 Smart Water System

The *Rachio 3 Smart Watering Controller* takes the guesswork out of watering with a unique platform that combines smart sprinkler control, wireless leak detection, enhanced weather data and powerful smart technology in one easy-to-use system.

The product's *Rachio Wireless Flow Meter*, the industry's first such meter for residential use, utilizes patented *Vortex* technology to obtain highly accurate readings of water flow. The Rachio app alerts homeowners when leaks are detected, and the *Flow Meter* automatically shuts down water supply, protecting against landscape damage and flooding.

A related app, the *Rachio 3 Smart Sprinkler Controller*, enables users to give precise watering commands, ranging from basic start, stop, pause and skip zone instructions, to a custom-run schedule for specific regions. It will also recommend days and times for watering based on location, vegetation and soil type. Such an exact process dramatically cuts down on residential water waste, 60 percent of which occurs outdoors.

The sprinkler controller also functions with popular smart home systems and voice services, including Amazon *Alexa*. Users can control their intelligent sprinklers simply by using their voice, helping to further improve water efficiency in the home.

WINDOWS AND DOORS

SageGlass *LightZone* smart glass

Call it good news, bad news: Windows, providers of the biggest source of natural light and warmth in a home, are also the biggest source of unwanted heat in the summer and lost heat during the winter. SageGlass's updated "smart" glass handles both situations with ease. The company's electrochromic product, *LightZone*, allows homeowners to control which sections of a window tint during exposure to sunlight, and the degree to which it darkens. This can help

reduce the home's overall energy load by up to 26 percent during peak hours.

Available in sheets of up to 5 feet-by-10 feet, *LightZone* has three tint zones that can be handled automatically, with pre-programmed settings to manage light, glare, energy use and color rendering, or controlled manually via a wall panel or the SageGlass mobile app. Controls can also be integrated into an existing building automation system.

LightZone runs low-voltage electricity through a five-layer electrochromic coating

about 1/50th the thickness of a human hair to control the degree of tint. Applying a low voltage darkens the coating as lithium ions and electrons transfer from one electrochromic layer to another. Removing voltage, and reversing its polarity, returns the ions and electrons to their original layers, lightening the glass to its clear state.

The homeowner's utility bill will only go down when using SageGlass. Electricity use for the windows is practically nil: It takes less electricity to operate 2,000 square feet of SageGlass than to power a single 60-watt light bulb.

NanaWall SL73 glass wall

Hurricane-force winds are no friends to windows. But the NanaWall Systems *SL73* glass wall has proved a worthwhile ally. *SL73* has received high ratings on static and dynamic pressure water resistance tests, and is tested to demanding standards for preventing water, wind and debris from entering the building—not only at the ground level, but up to 15 stories. Homeowners and business owners in hurricane-prone areas can enjoy their views while remaining safe and dry.

With reinforced vertical posts or astragals down each panel side for added performance, the glass walls pivot on and are hinged to either side of the vertical post, providing strength against high winds and water. The product is also floor supported, which provides extra stability during storms. High-performance raised sills prevent static and dynamic water penetration, and yield higher pressure ratings against heavy wind loads. And, specialized seals and panel design provide superior wind and rain resistance, while the engineered sills prevent wind-driven water from entering the home or business.

In addition, NanaWall's multi-point locking system includes top and bottom locking rods that securely insert into the upper and lower frame to prevent vandalism and burglary once post-storm cleanup efforts are underway.



Overhead Door *Thermacore 490 Series*

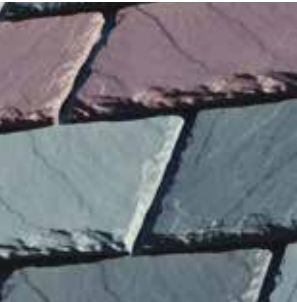
Insulated garage doors are a great way to save energy, as they help keep inside temperature constant in one of the home's least-efficient locales. But they don't always look better than average from the outside. That's why Overhead Door, a leading maker of residential garage doors, has expanded its *Thermacore Collection* with bi-directional wood grain finish options on its most-premium insulated garage doors.

The *Thermacore 490 Series*, which features an R-value of 17.5—making them the most thermally efficient doors in the collection—now offers wood grain finishes in the colors of golden oak, walnut and mission oak. The *490* series consists of the company's standard panel (494), long panel (496) and V5 panel (497) product.

The embossed wood-grain texture adds beauty and sophistication to a door that is built to last with two layers of corrosion-resistant steel. Models 494, 496, and 497 meet IECC requirements for U-Factor and air infiltration, ensuring a thermally efficient solution for a broad range of residential applications.

The new styles give homeowners with a desire for stained wood doors an attractive and low maintenance option. Wood grain finishes can also be paired with optional vertical or horizontal windows and decorative hardware, including handles and hinges, for a more-customized look.

HONORABLE MENTION



EcoStar Majestic Niagara Slate roofing tile

Bigger is better when it comes to EcoStar's latest innovation. *Majestic*

Niagara Slate is a natural-looking, 5/8-inch thick, synthetic slate roofing tile manufactured from 80 percent post-industrial recycled materials. The design consumes less raw material, reduces roof load by up to 20 percent and lowers installation labor by 30 percent.



Greenworks Pro 60V blower

Every year, more than 17 million gallons of gasoline are spilled into the ground by U.S. consumers while pouring gas into their lawn equipment. The *Greenworks Pro 60V* handheld leaf blower, powered by a 4-Ah lithium ion battery, helps combat that problem. The unit produces zero carbon emissions and minimal noise, and can run about 45 minutes per charge.

Honeywell Lyric T6 Pro thermostat

Honeywell's *Lyric T6 Pro* thermostat uses geofencing technology to automatically adjust a home's temperature based on an owner's smartphone location. Whether arriving home late from work or leaving the house for a few hours, the *T6* will know and switch into savings mode, automatically maximizing energy efficiency. This helps save the Earth, and keeps money in homeowners' pockets.



Legrand-Wattstopper Dual Technology Dimming Wall Switch Occupancy Sensor

The Wattstopper DW-311 *Dual Technology Dimming Wall Switch Occupancy Sensor* provides building- and energy code-compliant occupancy and 0-10 V dimming control for LED lighting applications.

Incorporating lighting controls can result in extra energy savings of 30 to 40 percent in office and home environments, and 50 to 70 percent in restrooms.

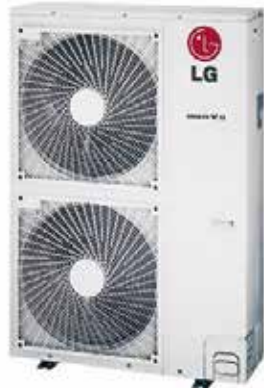
Lennox SL280NV Ultra Low NOx gas furnace

Lennox's *SL280NV Ultra Low NOx* gas furnace produces 65 percent lower NOx emissions than standard low NOx furnaces and has a heating efficiency rating of 80 percent AFUE. The unit operates at two different levels of heat output, helping homeowners stay comfortable, reducing utility costs, and cutting down air pollution.



LG Multi V S 5-Ton Heat Recovery Unit

As the U.S. market's first single-phase Variable Refrigerant Flow (VRF) 5-ton heat recovery system, LG's compact *Multi V S* provides excellent energy efficiency and the versatility of simultaneous heating and cooling. Capable of supporting up to 12 indoor units, *Multi V S* redistributes rejected heat to areas that need it, effectively managing energy demands across the entire system.



Owens Corning Pure Safety Insulation

Pure Safety insulation by Owens Corning is the world's first certified asthma and allergy friendly high-performance insulation that has low dust, and is mold and mildew resistant. The insulation is fire resistant, and helps reduce and control the spread of household noise. *Pure Safety* insulation is also, on average, 65 percent recycled content.

Rheem High Efficiency Tankless Gas Water Heater with Built-In Recirculation Pump

Rheem's *High Efficiency Tankless Gas Water Heater with Built-In Recirculation Pump* delivers a continuous flow of hot water at a maximum of 11 gallons per minute and 0.94 UEF. The unit has timer-based recirculation, internal recirculation, and water leak and gas leak detection features.

The heater maintains consistent unit performance, preventing cold water bursts and protecting the unit from freezing temperatures.



Rinnai Corp. Sensei Tankless Water Heater

The next generation of Rinnai's *Sensei Tankless Water Heater* features a new combustion design that enables components to work together for enhanced output.

The water heater has 14 vent configurations, a 65-foot vent run with 2-inch PVC and quick gas conversion. The unit self compensates in areas with low or fluctuating gas pressures to optimize performance.



Zen Ecosystems Zen Thermostat

The *Zen Thermostat* is a solution for consumers looking to reduce energy costs and carbon footprints. When demand is high—such as during a hot summer day—the thermostat automatically adjusts temperature to reduce energy use and strain on the grid. Consumers receive utility incentives and lower energy bills, all while doing their part to support grid operations.



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READERS' CHOICE 2018

GREEN BUILDER®

What do green professionals perceive as the most sustainable building products and brands? Find out now.

BY GREEN BUILDER STAFF

There's nothing like positive peer pressure. If something works for a colleague in your industry, odds are you're inspired to try it yourself—and vice versa. A product recommendation goes a long way toward the success of your business. Aggressive marketing helps too—as attested by the fact that respondents voted Tesla as the most-recognized sustainable-products company of all.

Unlike consumer-based reports, *Green Builder's* annual Readers' Choice survey taps into what's on the minds of green pros, resulting in the *Consumer Reports* of the green building industry. That's powerful information you can use.

See full results of *Green Builder's* Readers' Choice survey at
www.greenbuildermedia.com/2018-readers-choice-awards

2018 READERS' CHOICE SURVEY RESULTS

Who are the greenest ones of all? Find out in our annual survey of building professionals.

Note: Results as presented include only companies that received approximately 3 percent or more of total vote within a given category.

Which company offers the best SMART HOME TECHNOLOGY platform?

Amazon Alexa		45.3%
Google Home		24.1%
Samsung SmartThings		9.4%
Apple HomeKit		9.0%
Belkin		3.3%
Leviton		3.3%

Force of will. These results may not surprise anyone. Both Amazon and Google have spent vast sums attempting to dominate the emerging white space of smart home tech. They are certainly the best known systems, but our respondents also consider them the “best” products. Does market pre-eminence automatically confer consumer confidence? If so, their marketing dollars have been well spent.

Amazon Alexa
45.3%

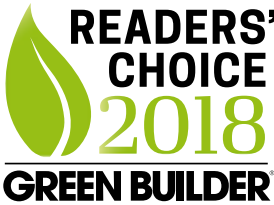
Which company offers the best SMART THERMOSTAT products?

Nest		49.1%
Honeywell		20.3%
Bosch		9.9%
ecobee		9.0%
Sensi		4.7%

Smart moves. As our Cognition Smart Data analysis of the smart thermostat market has shown, Nest entered this niche early, and has tracked consumer behavior closely. By tying its thermostat sales to utility rebates and later, by dropping prices to the “will buy” threshold, it leads the pack. Honeywell, meanwhile, is cleverly reinventing a category it ruled for decades. Behind them, it’s a new frontier, as Bosch, ecobee and Sensi seek a larger claim.

Nest 49.1%

See full results of Green Builder’s Readers’ Choice survey at www.greenbuildermedia.com/2018-readers-choice-awards



Which company offers the best SMART SWITCHES AND PLUGS?

Samsung		27.4%
Lutron		23.6%
Leviton		17.0%
WeMo		10.9%
iDevices		6.1%
TP-Link		4.7%
Other		3.8%

Roaring back. Here’s some good news for Samsung. When it initially launched its *SmartThings* platform, it faced criticism for numerous glitches and security issues. But apparently the bad days are over as far as users are concerned, and the South Korean company has surged to a dominant position in this category. Perhaps it’s the sheer number of products included in the *SmartThings* universe. This has to be frustrating for solid companies such as Lutron and Leviton, which have been in the switches and plug business since the dawn of time. At the same time, WeMo products from Belkin have taken almost the opposite approach from Samsung. They’re growing steadily, with the promise of simplicity and ease of use.

Samsung 27.4%

Which company offers the greenest LIGHTING products?

Philips		35.9%
Sylvania		19.8%
GE Lighting		13.7%
CREE		10.4%
Eaton Lighting (formerly Cooper Lighting)		5.2%
Kichler		4.3%
Halo		4.3%

Credit where due. The two leading companies in this category have earned their spots with emphasis on innovation and greener products. Philips *Hue* lighting broke new ground in making LED lights more attractive for home use, and Sylvania has undertaken freight reduction and changed many production processes to reduce its eco-footprint, while at the same time constantly innovating toward energy efficiency.

Philips
35.9%

Which company offers the greenest **FLOORING** products?

Armstrong		24.5%
Mohawk		18.9%
Cali Bamboo		14.2%
Shaw		10.9%
Milliken		9.4%
Interface		5.7%
Mullican		4.7%
Forbo		3.8%
Tiles of Italy		3.3%

Tough stuff. Armstrong's offering of bio-based alternative PVC flooring probably has something to do with its good placement in this brand category—although that product is primarily commercial. Eco-friendly flooring has always been a challenge. Companies such as the top contenders here that make an effort, however, can quickly catch the attention of buyers, because so much flooring is not especially sustainable.

Armstrong
24.5%

Which company offers the greenest **HOT WATER SYSTEM**?

Rheem		29.7%
Bosch		25.5%
Rinnai		9.4%
A.O. Smith		8.0%
Bradford White		7.6%
Takagi		7.1%
Noritz		5.7%
Stiebel Eltron		4.3%
Navien		2.8%

Ancient loyalties. Rheem switched positions with Bosch this year to take the top brand position. Like Bosch, it's a company with deep experience—88 years to be precise. But age doesn't always guarantee brand loyalty. Rheem, however, has been proactive. For example, it introduced an integrated control system called *EcoNet*, which raised the bar on how its products perform as a suite, and how it simplifies controls. Other manufacturers below rank five or so remained at about the same percentage of brand loyalty as last year.

Rheem
29.7%

Which company offers the greenest **APPLIANCE** products?

Bosch		22.2%
Whirlpool		17.5%
Samsung		14.2%
LG		13.2%
GE		10.9%
SubZero/Wolf		5.7%
Electrolux		5.2%
Miele		4.7%
Viking		4.3%

Ups and downs. The dominance of Bosch and Whirlpool in this category is no surprise. They work hard to keep their eco-imaging at the forefront of buyer perceptions. But how did Samsung leap ahead of both LG and GE this year, in selling its green credentials to professionals? Our best guess: Samsung has emphasized its "smart" appliances, and buyers apparently see a cognitive link between this innovation and product performance.

Bosch 22.2%

Which company offers the greenest **COUNTERTOP** products?

Corian		25.0%
Eco by Cosentino		14.2%
Caesarstone		10.4%
Cambria		10.4%
Samsung		7.6%
PaperStone		7.1%
Formica		7.1%
IceStone		5.2%
LG Hausys		3.8%

Spain stumbles. Until this year, Eco by Cosentino had held the number one spot, and rightly so. But DuPont Corian's move up to the top spot points to complex consumer psychology. The product's main green feature is its durability and track record. But many of the other products below it on the perception scale share these features, and some have a well-developed sustainability story. In this category, buyers appear to lean on brand recognition, with more emphasis on reliable performance than recycled materials.

Corian 25.0%

Which company offers the greenest **CABINET** and **SHELVING** products?

IKEA		24.1%
KraftMaid		18.4%
Merillat		9.4%
Wood-Mode		8.5%
Timberlake		8.5%
Echelon Cabinetry		6.6%
MasterBrand		6.1%
Advanta Cabinets		5.7%
Executive Cabinets		3.8%

Knowledge gap. Perceptions about cabinet product sustainability is often lacking, and this year is no exception. Ikea has jumped into first place over last year's leader KraftMaid, because it, unlike most U.S. companies, has begun to tell its green story. For example, it has a new line of black cabinets made with recycled plastic bottles. But companies ranking low in brand status, such as Neil Kelly, make very sustainable products. Sadly, perceptions here don't necessarily reflect actual sustainability efforts.

Ikea 24.1%

Which company offers the greenest **PLUMBING FIXTURE** products?

Kohler		38.2%
Moen		17.0%
TOTO		8.5%
Delta		8.5%
American Standard		8.0%
Niagara		4.3%
Hansgrohe		4.3%
Pfister		3.8%
Grohe		3.3%

Locked down. The top six brands in this category ranked in exactly the same order in last year's survey. If nothing else, this shows that our annual survey has a high degree of accuracy. The plumbing industry's major players have hit a plateau in terms of their "green" credentials, and buyers don't seem to be shifting loyalties much.

Kohler 38.2%



Which company offers the greenest **HEATING, VENTILATION** and **AIR CONDITIONING** products?

Trane		14.4%
Lennox		14.0%
Bosch		12.3%
Mitsubishi Electric		11.3%
Carrier		10.9%
Rheem		9.9%
ClimateMaster		7.1%
Panasonic		4.3%
Daikin		3.3%
LG		3.3%

Ductless dueling. Forging ahead with new products and new partnerships, Trane (part of Ingersoll-Rand) held on to its first place position in this category. Perhaps their powerful partnership with Mitsubishi—in the arena of ductless mini splits and heat pumps—gave them just enough of a brand boost to step ahead of Lennox.

Trane 14.4%

Which company offers the greenest **VENTILATION FANS**?

Panasonic		32.1%
Delta Breez		21.2%
Broan NuTone		17.5%
Air King		13.2%
Fantech (SystemAir)		11.8%

Clear winner. It's clear that Panasonic leads the mindspace in this area. The company has done a good job telling its sustainability story, tying innovation such as humidity detection to quieter, more efficient DC fans. But other brands are not far behind. It's good to see the whole sector moving toward greener messaging.

Panasonic 32.1%

Which company offers the greenest **INSULATION** products?

Owens Corning		31.1%
GreenFiber		12.7%
Nu-Wool		9.9%
Dow		9.0%
CertainTeed		8.0%
BASF		6.1%
Icynene		5.2%
Johns Manville		3.8%
Knauf		3.3%

Material hierarchy. There was a time a few years ago when it looked like Owens Corning might lose its market dominance. But by innovating and adjusting its products and message, such as its “Why pink is green” campaign, it has reaffirmed its leadership spot. Meanwhile, the rest of the insulation mental space is more fractured. But if you combine GreenFiber and Nu-Wool cellulose products, you approach the mental share of Owens Corning. Combine BASF and Icynene, and the spray foam category has a healthy slice of market perception.

Owens Corning
31.1%

Which company offers the greenest **ROOFING** products?

EnviroShake		17.9%
EcoStar		17.5%
Owens Corning		16.0%
CertainTeed		11.3%
GAF		7.1%
DaVinci		6.6%
Atlas Roofing		5.7%
Boral Roofing		4.7%

Top honors. We’re encouraged to see products such as EnviroShake and EcoStar leading the green roofing category. Historically, recycled composite roofing products have not marketed their products aggressively, and tend to get overlooked. But the green roofing niche is largely wide open for new and innovative contenders. By the time we get to third place, respondents appear to be thinking of “green” roofing in narrower terms—for example, special features such as heat-reflective granules. It’s surprising that neither metal roofing nor clay tile makers rank in the top five. Both products have extremely good durability. What’s missing from their messaging?

EnviroShake
17.9%



Which company offers the greenest **SOLAR SYSTEM COMPONENTS?**

Tesla		31.3%
SolarEdge		21.8%
Delta Electronics		8.1%
Schneider Electric		7.6%
Enphase		6.6%
Sonnen		5.2%
Tabuchi Electric		5.2%
OutBack Power		4.3%

Old and new. While the top players in this sector remain consistent with last year, SolarEdge is growing stronger. We’re also pleased to see new entries to the U.S. market such as Tabuchi Electric gaining some brand awareness. Enphase is also a smart and responsible company that puts a lot of thought into its smart devices, powering them with solar and kinetic resources rather than batteries.

Tesla 31.3%

Which company offers the greenest **SOLAR THERMAL** products?

Rheem		25.9%
Solar US		18.9%
SunEarth		17.9%
SunMaxx Solar		12.7%
Steibel Eltron		10.4%
AET Solar		5.7%
Apricus		5.7%

Changeup. Last year’s leader in this category, SunMaxx Solar, slipped several positions to fourth this year, leaving brand powerhouse Rheem at the helm, followed by other well-established firms. Rheem appears to making major strides this year in its eco-friendly image across several categories.

Rheem
25.9%





Which company offers the greenest **WINDOW** and/or **DOOR** products?

Andersen		23.6%
Pella		17.9%
Therma-Tru		9.4%
Marvin		8.5%
Jeld-Wen		5.7%
Milgard		4.3%
Masonite		4.3%
Sierra Pacific		4.3%

Shatter proof. Andersen continues to hold the high ground in this category, followed by strong contenders Pella and Marvin. But notice that Therma-Tru has slipped in above Marvin this year. This is a major improvement for that brand, which last year ranked 10th. Perhaps Therma-Tru's messaging about it's Energy Star-rated doors, etc., is getting some traction with buyers.

Andersen 23.6%

Which company offers the greenest **BUILDING WRAP** products?

DuPont Tyvek <i>HomeWrap</i>		32.6%
Huber <i>Zip System</i>		10.4%
Fortifiber <i>WeatherSmart</i>		7.1%
Owens Corning <i>PinkWrap</i>		7.1%
Tremco <i>Enviro-Dri</i>		7.1%
Kimberly Clark <i>Block It</i>		6.1%
Typar <i>HouseWrap</i>		5.7%
Dow <i>Weathermate</i>		4.7%
CertainTeed		4.7%

Above the fray. While DuPont Tyvek has once again nailed it—securing its market dominance in this category, Huber Zip systems continue to push the envelope at number two. It's interesting to note, however, that Zip actually lost a few percentage points in brand share compared with last year's survey. Is this just a bump in the data, or does Zip need to tweak its messaging? The housewrap sector's green brand space is very much in play once you get to the number three position and beyond.

DuPont Tyvek 32.6%

Which company offers the greenest **DECKING** products?

Trex		35.9%
EcoLife <i>Viance</i>		10.9%
TimberTech		10.4%
CertainTeed <i>EverNew</i>		9.0%
TruGrain		5.7%
Cali Bamboo		5.7%
GeoDeck		4.3%
ChoiceDek		3.8%
Fiberon		3.8%
MoistureShield		3.8%

Which company offers the greenest **PAINT** and **COATING** products?

Sherwin-Williams		23.1%
Benjamin Moore		19.8%
Valspar		14.2%
Behr		11.8%
Glidden		8.0%
PPG		7.1%
YoloColor house		4.3%
Dunn Edwards		3.3%
Olympic		3.3%

Static field. This year's top three brand rankings were identical to last year. This suggests that short of a new player or innovation, this sector is relatively stable for now. MoistureShield, however, did see a notable drop in brand perception from last year, from sixth place to 10th position, behind Fiberon and ChoiceDek. What changed?

Trex 35.9%

Victory lap. Once again, Sherwin-Williams leads this category, followed by Benjamin Moore. Other brands align pretty well with last year's results, too. Glidden saw a slight bump up over PPG this year, which seems fitting, since Glidden was one of the very first to offer no-VOC paints back in 1992, long before they were a household word.

Sherwin-Williams 23.1%

Which company offers the greenest **STRUCTURAL SYSTEM** products?

Boise Cascade (EWP)		21.2%
Weyerhaeuser – Trus Joist		17.9%
Fox Blocks		10.9%
Premiere Building Systems (SIPs)		9.4%
BuildBlock		7.1%
Logix (ICF)		6.6%
Ainsworth (EWP)		5.7%
Norbord (EWP)		4.3%
Katerra		4.3%

Scattered loyalties. This data is a pretty good mental map of how builders operate. They tend to identify a structural system and stick with it. Engineered Wood Products such as first-place Boise Cascade are now familiar to trades and a comfortable choice. But read between the lines and you see both an ICF product (Fox Blocks) and an SIP maker ranking high in brand perception. Builders and trades are loyal to their structural favorites, yes, but that loyalty is not heavily concentrated in one type of system.

Boise Cascade (EWP) 21.2%

Which company offers the greenest **SIDING** products?

BASF (EIFS)		14.6%
CertainTeed Cedarboards		12.3%
James Hardie (fiber cement)		11.8%
Omega Stucco		8.5%
Boral (brick and manufactured stone)		6.1%
Eldorado Stone (manufactured stone)		5.7%
KlipTech EcoClad		5.7%
Nichiha (fiber cement)		5.2%
LP Smartside		5.2%
Dryvit		4.7%
Creative Mines (manufactured stone)		4.3%

EIFS returns. Gone are the panicked days when early versions of EIFS stumbled into building science problems. EIFS and stucco systems in general have rebuilt their brand trust and loyalty with pros, leapfrogging above last year's brand winner, James Hardie fiber cement. And CertainTeed's insulated vinyl/polymer siding product also made gains (up from fourth position last year). This is worth noting, because although Cedarboards contain 60 percent recycled (post-industrial) content, they are largely a vinyl product. The company asserts [www.certainteed.com/resources/137.pdf] that these products are now accepted as an environmentally friendly product. Are they right?

BASF (EIFS) 14.6%

Which company offers the greenest **WORK VEHICLES?**

Toyota		24.5%
Ford		22.2%
Chevy		13.2%
Nissan		9.9%
Mercedes-Benz		9.0%
Dodge RAM		7.6%
Sprinter		7.6%
GMC		3.8%

Nearly tied. Toyota claimed the lead brand position from Ford this year, but just by 2.5 percentage points. These top vehicle makers have increasingly embraced new technology, EV chargers and hybrids, and brought it into the contractor workplace. Buyers expect to see ever more efficient vehicles that do not sacrifice power, and they have been getting just that from the industry.

Toyota 24.5%



Which company offers the greenest **PHOTOVOLTAIC SYSTEM** products?

Tesla/SolarCity		34.9%
SunPower		16.0%
LG		15.1%
Panasonic		9.0%
CertainTeed		6.1%
Vivint		5.7%
Jinko		4.7%
Sharp		4.3%

No change. In this category also, the top three brand hierarchy mimics last year exactly, with about the same percentage spread. The Tesla PR machine whirs on, and SunPower has a strong commercial sector presence that apparently crosses over into residential loyalty. But overall the PV market remains surprisingly predictable. Will a new product line or innovation ultimately shake things up?

SolarCity 34.9%

The Right Roof

Roofing products have improved, but a shingle still can't avoid the limitations of its material nature.

BY GREEN BUILDER STAFF



Limits of luxury. Higher-priced composition shingles generally perform better in extreme weather and high heat, but the age of an asphalt-based shingle still matters.

CREDIT: ECOSTAR

WHEN PROSPECTIVE BUYERS CONSIDER whether they will buy a home, the type of roof it has is not the first thing on their minds. But it should be high on the list—after all, the shingles over their heads prevent leaks into the home, aid in energy-saving efforts, and improve the value of the house.

So yes, a roof is more than just a collection of panels made of wood, stone or asphalt. The style chosen will impact the house—and homeowner's pocket book—for years to come. That's why builders and everyone else involved in that roof need to keep an eye on developments within the marketplace.

Here's a look at the types of roofing on the market, what makes them unique and what's new or improved.



CREDIT: OWENS CORNING

Hot topic. Solar-reflective tile can lower roof temperatures by up to 50 degrees, saving on environmental control costs.

Asphalt: Getting Greener

IT'S NOT THE OLDEST ROOFING PRODUCT and it's certainly not the most exciting item out there. But asphalt shingles—a.k.a. composition shingles—are definitely the most popular. They are the least expensive, the easiest and fastest to install.

The newer fiberglass asphalt shingles also have a top flame spread rating (Class A) and good durability (up to 30 years in proper weather conditions). They come in a wide variety of colors, layers and styles in an effort to make them as close as possible in appearance to their slate and wood counterparts. Some lines even include limited lifetime warranties. GAF's roofing tiles are good examples of all these points.

More than 79 million tons of asphalt materials, including shingles, were recycled in 2017, up from 76 million in 2016, according to the National Asphalt Pavement Association. But, markets for recycled product are still limited.

They're also somewhat limited in their performance in hurricane-prone regions. Studies have found that after as little as 8 years, composition-shingled roofs begin to fail in extreme winds.

On a positive note, composition shingles are increasingly available with reflective surfacing. In this case, the shingle is coated with granules that provide better solar reflectance and lower heat absorbance. Roof temperature, which can hit 150 degrees during summer, can drop by up to 50 degrees. Malarkey Roofing's *Ecoasis* product takes this path.

The more eye-appealing (and expensive) architectural style, or dimension shingle, has more staying power. This thicker tile is rated for up to 130 mph wind uplift and carries a lifespan of up to 40 years. Unlike the more basic 3-tab variety, architectural shingles are installed in staggered fashion, giving a three-dimensional look that resembles slate or shake shingles. CertainTeed offers several good examples of these.

Roof Tile: Lighter Options

TILE ROOFS ARE BLESSED with a seemingly eternal longevity. Under the right circumstances, the natural stone, clay and concrete varieties can last for 50 to 100 years – possibly longer.

That pretty much means there won't be much technology focused on making the materials last longer. Instead, the emphasis has been on making tiles that are lighter in weight but still durable to occurrences such as seasonal elements, storm-induced damage and even common roof repairs.



CREDIT: BORAL USA

Strong as stone. Lightweight clay tiles look just like the traditional heavy variety, without the three-quarter-ton per square bulk. They're also a great insulator.

Slate, the longest-lasting and most elegant of roofing materials, carries a big price tag—around \$20 per square foot, about twice as expensive as wood shake and four times higher priced than asphalt shingles. It poses an even heavier burden on a home's structural integrity, weighing in at about 1,500 pounds per square. Clay shingles are just about as expensive and heavy, depending on the exact formulation. Concrete carries the same price but is only half as heavy.

The industry has developed alternatives. Boral Roofing's line of lightweight tiles look like their heavier cousins, but weigh about one-third as much, making them suitable for reroofing projects. There are also stone-coated steel tiles, such as Decra Roofing System's lineup, which are similar in strength and durability—but at only a fraction the weight of clay.

Lighter weights have a design benefit as well. Products such as Monier's lightweight slate line enable far lower roof pitch than the real thing – about 5 percent less on average. Appearance is another plus. Lightweight tiles now look as good as their heavier brethren, to where it's hard to tell the difference. The combined roofing construction elements can give a homebuilder or remodeler enhanced architectural freedom.

“Compared to standard-weight tile, the lightweight variety can help contractors cut constructions costs by at least 25 percent, through easier installations, labor savings and shipping costs.”

Wood: From Shake to Envirofriendly Fake

FOR ALL OF THEIR CHARM, wood-shingled and shake roofs have a huge disadvantage to other types: Mother Nature. Sun, moisture, insects, plant life and mold will wreck a roof in a fairly short time (roughly 20 years) compared to environmentally heartier surface structures like tile or asphalt shingles. And, many municipalities are banning wood roofs due to fire danger.

That's where faux wood comes in. Composite shingle lines such as those from Enviroshake Inc., DaVinci Roofscapes and Brava Roof Tile replicate the look of naturally weathered shingles and shake without the fragility. All are made almost entirely of recycled material that will not rot, blister, peel or crack, and is mold, fire and insect resistant. The roofing carries a Level 4 impact certification, is LEED Gold certified, and has been high-wind speed tested. The product's lifespan is about 50 years, after which it may be fully recycled again.

Metal roofing also has its wood lookalikes, such as Decra Roofing Systems' Shake XD, EDCO's ArrowLine and Kassel & Irons' KasselWood. All of these replicate hand-split wood shake and heavyweight architectural shingles in an easier-to-install form that is light enough to be installed over existing roofs, keeping them out of the landfill.

There's a cost-cutting element here, too. Composite, metal and wood are in the same ballpark in terms of material costs – around \$4 per square foot, depending on geographic location and labor pools. Simpler, faster installation also makes for a lower overall price tag on the builder's end.



New old-fashioned look. Enviroshake's composite tile combines the feel-good nature of wood with the long-term durability of clay.



Sheet metal. Metal roofs aren't what they used to be—in addition to looking fashionable on most structures, they are 100 percent recyclable.

Metal: Timeless and Tough

THE METAL ROOF is the middle child of the roofing spectrum. At about \$9 per square foot to install, it's a bit pricier than asphalt or wood roofs, but only about half as much as tile or slate.

In addition to the low cash outlay for product, a metal roof keeps labor costs down compared to its slate and tile cousins thanks to its easy install of a few days. The roof is more than likely to stay on for 40 to 50 maintenance-free years, meaning fewer visits for repairs.

Once available only in metal sheets, builders can now install the product as interlocking shingles to accommodate many architectural

"Metal roofs are suitable for low-pitched roofs, can be installed as stylish tiles, and are 100 percent recyclable."

styles. They're also suitable for low-pitched roofs. The shingles' natural reflective ability reduces heat buildup in attics and upstairs rooms; it's not uncommon for CoolRoof-rated systems to cut electric bills by 20 percent to 30 percent during peak AC usage months.

Not surprisingly, the roofing material is generally made from recycled content that can be completely recycled again when no longer needed. A metal roof also lends itself well to rainwater harvesting. Its smooth, clean surface results in fewer particles being flushed off the roof, which leads to less required filtering.

Roofing material choices from manufacturers such as Interlock and Alucom include low-end G-90 galvanized steel in sheets or interlocking steel shingles; corrosion-resistant galvalume steel; stone-coated steel; and alternate, pricier metals like aluminum, copper and zinc. A metal roof system is generally available in any color finish.



Right in place. Cold-in-place recycling finds a second use for the asphalt used to patch highway roads.

Asphalt Hits the Road Again

WHEN IT COMES TO ASPHALT and recycling, it's not just roofing tiles on the public's minds. Cold-in-place recycling (CIR) is something you may not be familiar with unless you're in the road-building business. But it's a term you should know. According to *Healthy Building Network*, CIR, the rarest form of asphalt pavement recycling, can reduce carbon dioxide emissions by as much as 95 percent per lane mile and can save as much as 40 percent compared to conventional techniques. More-common warm mix asphalt can reduce carbon dioxide emissions by 15 percent compared to conventional paving.

CIR is a method of removing and reusing the existing asphalt surface. It involves grinding off the top 2 to 5 inches of the existing asphalt surface and mixing the crushed asphalt with an asphalt recycling agent, and placing it back down with a paver. Often, specific-sized aggregate is added to correct deficiencies found in the existing asphalt material.

By restoring and reusing existing material, less outside product needs to be hauled to the worksite. This efficiently improves the

road surface and strength while minimizing expenses typically incurred during the paving process. In addition, CIR can correct deep asphalt defects such as rutting, fatigue (alligator) cracking, and utility cuts that cannot be addressed by a surface treatment or an overlay. It also allows minor corrections to the profile of a road surface and reduces reflective cracking, while posing only a minor inconvenience to traffic.

As its name implies, this is a cold process that requires minimal additional heat during rejuvenation of the asphalt material. This decreases the amount of energy required to produce the final product.

It also extends road life. According to a Federal Highway Administration study for New York State, a CIR with a 1.5-inch overlay is expected to last 10-15 years, with little maintenance, compared to the 5- to 8-year lifespan of a traditional 1.5-inch overlay. **GB**

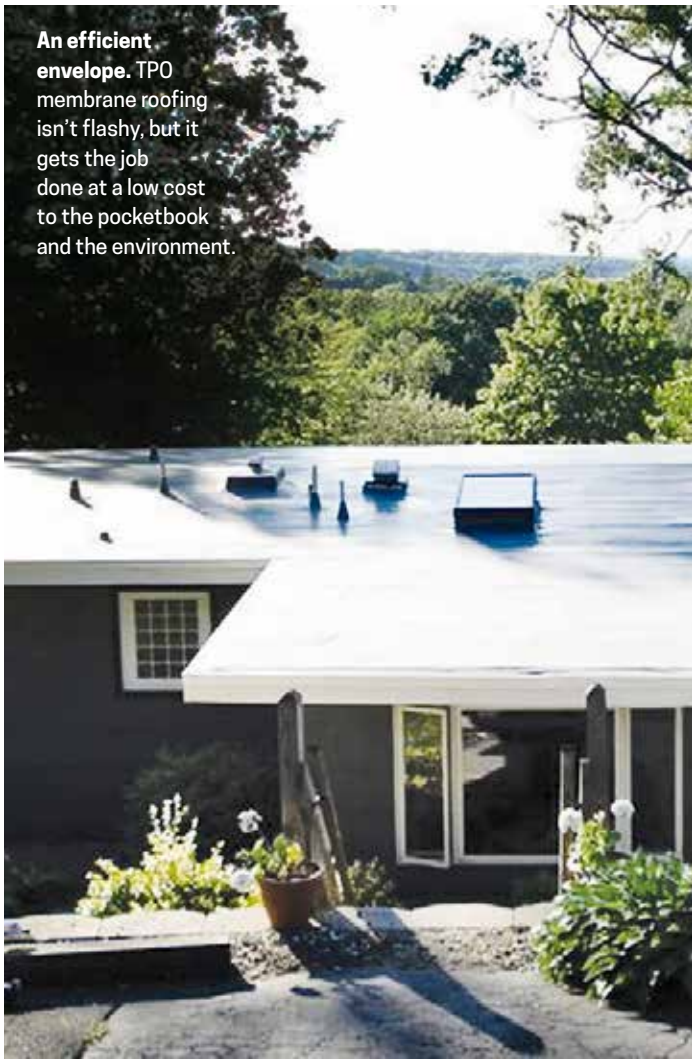
Excerpted from the Cornell University article, What is Cold-in-place recycling and what are its advantages? (www.clrp.cornell.edu/q-a/077-cir.html).

TPO: Single-Ply Perfection

HOMES WITH FLAT OR LOW-SLOPE ROOFS are at a disadvantage when it comes to products like slate or wood roofing. Thermoplastic olefin (TPO) membrane is a cost-effective and energy-efficient option. Considered to be a form of cool roof, TPO is Energy Star rated and 100 percent recyclable.

Products such as GAF's *EverGuard* line are becoming popular among residential owners due to a low price tag—TPO typically costs about \$6 per square foot, or about \$9,000 for a 1,500-square-foot house. There's also a strong solar reflection ability, and resistance to tears, dirt and bacteria.

On the down side, the warranty isn't great—typically, five years for workmanship—and a lot of questions remain about the product's long-term viability because of its mere two-decade presence on the market. Many manufacturers are still improving their formulations to achieve the greatest durability and longevity at the lowest cost. And, ASTM standards for TPO roofs are still being revised every few years.



An efficient envelope. TPO membrane roofing isn't flashy, but it gets the job done at a low cost to the pocketbook and the environment.



CREDIT: TESLA

Flat fiction? If the Tesla CEO has his way, flat, high-efficiency solar panels will soon be available for custom homes nationwide.

Solar: Space-Age Roofing?

IT SOUNDS LIKE SCIENCE FICTION: high-end solar panels that look like roofing shingles. But when the backer is Tesla CEO Elon Musk, the idea doesn't seem so far-fetched. The billionaire is pushing development of four glass-tiled prototypes that he believes will be the next evolution in residential photovoltaic power.

Tesla's product, scheduled to hit the market by the end of 2018, would be indistinguishable from another house without panels and would be capable of powering the entire home—making it instantly net zero, according to the company. Excess energy would be stored in a *Powerwall 2* battery pack for night and cloudy days. The glass tiles would be strong enough to walk on and would be custom made to keep a roof from looking just like a neighbor's.

The drawback is the price. Analysts note that construction materials, housing designs—most likely those for high-end custom homes—and specialists needed to install such systems could mean a total price of \$70,000 to \$100,000 for a 3,000-square-foot roof. A typical homeowner would have to save \$55,000 to break even.

For the record, several other companies have attempted or have flat solar products on the market. Dow Chemical failed with the *Powerhouse Shingles* line it unveiled in 2010. CertainTeed has its *Apollo II* roof-top energy system, which installs into existing roofing—a step up from Tesla's product, which requires an all-new roof during install. Sunflare's new thin-film solar panels, capable of 9kW output, can be attached with a two-sided specialized roofing tape. Atlanta Energy System's *SunSlates Power Roof* and SunTegra's *Solar Tile Roof Systems* are also making their way through an ever-more crowded market. **GB**

Top Dollar for Durability

No two types of roofing tiles look alike—and their price tags vary, too. Here's a rundown of the average range of costs for each version, by square foot:

Type of Shingle	Material Cost	Installation Cost	Total Cost
Asphalt	\$1.00 to \$3.00	\$2.00 to \$4.50	\$3.00 to \$7.00
Wood/Shake	\$2.50 to \$4.00	\$3.00 to \$5.00	\$5.50 to \$9.00
Metal	\$2.00 to \$6.00	\$3.00 to \$7.00	\$5.00 to \$13.00
Tile (Clay/Concrete)	\$5.00 to \$12.00	\$6.00 to \$10.00	\$11.00 to \$22.00
Slate (Stone/Composite)	\$4.00 to \$10.00	\$5.00 to \$12.00	\$9.00 to \$22.00
Tesla Solar [based on percent of tile used]	n/a	n/a	\$22.00 to \$28.00

SOURCE: ROOFINGCALK.COM



Semi-metallic makeover. Changing the roof from one style to another—such as here, where it goes from wood (above) to stone-covered steel (below)—can give a house an all-new look.

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4 The Storage Battery stores energy from the solar panels or from the utility company for use at night when solar panels don't operate or during a power outage.

5 Home lighting, appliances and systems are powered first by the solar panels and the battery, and supplemented as needed by the utility company.

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COGNITION **Smart Data**

Smart, Smarter, Smartest

When it comes to aiming for smart home technology, security and energy efficiency call the shots.

BY SARA GUTTERMAN

Cognition Smart Data, Green Builder® Media's suite of market intelligence and data services, leverages Artificial-Intelligence (AI)-based technology to uncover insights into purchasing patterns and buyer preferences. This issue, we highlight trends in the exploding sector of smart home technologies.

SMART HOME TECHNOLOGY is becoming ubiquitous. The ecosystem of connected devices now spans far beyond speakers and thermostats, and Smart Home 1.0—which consists mainly of command and control features—is rapidly evolving into a sophisticated interplay of intelligent devices that self-optimize to decrease resource use, enhance living spaces and anticipate homeowner preferences.

Given the swift pace of innovation, it's no wonder that homeowners and builders alike are struggling to keep up with the exploding smart home tech sector. Fortunately, Green Builder® Media's cutting-edge AI-based platform, Cognition Smart Data, offers proprietary intelligence and pioneering insight into the smart home sector, tracking macro-market trends as well as user-specific behavior to make sense of key indicators like purchasing patterns, behavioral preferences and brand preferences.

The Cognition data indicates that energy and security rule when it comes to driving purchases of smart home technology. Homeowners identify that energy efficiency is the top reason that they purchase connected devices, followed by enhanced safety and security. They also like the ability to check on their home, kids and pets when they're away.

Correspondingly, thermostats and security devices, such as cameras, sensors and locks, are the hottest smart home gadgets.

When it comes to smart home system features, homeowners insist that security—all kinds—is the ultimate “must have.” They want their smart home systems to ensure the security of their data by protecting against hackers and cyber-threats, and they want their homes to be proactive, sensing fires and other dangers, and respond accordingly—by doing things like turning on sprinklers and irrigation systems—and sending alerts when an intruder is approaching.



Secure thoughts. Wireless home automation, such as ELAN's security-driven indoor control system, are at the top of consumers' “must have” lists.

Living Easier

Indoor air quality is trending as consumer emphasis on health and wellness continues to grow. Cognition data shows a snowballing demand for smart systems that track indoor air quality by measuring toxins, CO₂, dust, temperature and humidity. But measurement alone isn't enough—homeowners are calling for seamless intelligence behind the scenes. They want their homes to intelligently respond if the quality of their air has been compromised by turning on ventilation systems, enabling fresh air exchange, opening windows and the like.

It's also clear that smart home technology remains in a fairly nascent phase with plenty of room for improvement. Trending homeowner frustrations include the inability for all of their devices to connect with one central hub, and unforeseen glitches in the setup process and ongoing usage.

Generally speaking, homeowners feel good about smart home technology. Many express confidence that connected devices are making their lives easier and their homes safer, but an equal amount of others indicate that the verdict is still out, and they're reserving judgement one way or another.

At this time, the majority of homeowners own one to five smart devices. Another, growing group owns six to 10 devices.

CREDIT: PHILLIPS LIGHTING



Brighter outlook. Amazon, with products such as the Echo Plus, which recently paired with Phillips Lighting on a smart lamp system, remains the overall leader in smart home technology.

Smart Home Tech Titans

Not surprisingly, Amazon is king of the smart home tech domain—it is the most recognized brand on all fronts, with Google *Home* following a ways behind, and Samsung *SmartThings* just barely beating Apple *HomeKit* for third.

Samsung is the leading brand in the smart switches and plugs category, and Nest leads the pack in smart thermostats.

Home protection and wellness are the leading keywords with the most positive sentiment in web and social media discussions about smart home technology. Security and health are the most active purchase drivers, and smart video cameras, sensors, security cameras and thermostats receive the most regular call-outs with regard to smart home devices.

When we analyze the Cognition smart home tech data by user groups, we see that production homebuilders resonate positively with the keywords comfort, design and resale value, and we steer clear of the terms security and wellness—whereas progressive green builders resonate much more strongly with energy and sensors, and they have a very negative sentiment towards water leaks.

Consumers identify most positively with smart appliances, and they currently have a negative sentiment towards the categories of security and indoor air quality.

We'll be reporting on other Cognition analyses over the coming months. Let us know if there's a topic or product category you'd like us to investigate with a “deep dive.” If you're a manufacturer looking for some customized real-time data, drop us a line. **GB**

For more information, visit www.greenbuildermedia.com/cognition.

To learn more about how our market intelligence services can help your business, email Sara Gutterman at sara.gutterman@greenbuildermedia.com.



CREDIT: AWAIR

Night right. In response to rising demand by consumers, increasingly innovative smart products such as Awair's self-named, clock-like air quality monitor, are hitting the market.

Taking the Fast Track to Efficient HVAC

Why wait for the future? Heat pumps are ready to employ now.

BY PAUL HAWKEN

Note: This article is taken from *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*, which describes the 100 most substantive solutions to climate change, as well as their financial histories, the carbon impacts they provide, the relative cost and savings and each solution's path to adoption.

BENJAMIN FRANKLIN may be the only diplomat to have studied the science of refrigeration. That was in Cambridge, England, in 1758, when he was trying to reduce tensions between King George and the American colony but found time for the lab as well. He and English chemist John Hadley were intrigued by a Scottish scientist's discovery, made a decade earlier, showing how the evaporation of volatile liquids manifested a secondary effect: cooling. The basic principle is that higher-energy (hotter) molecules evaporate first, leaving the lower-energy (cooler) ones behind.

In Cambridge, the researchers' equipment consisted of a beaker of ether, a mercury bulb thermometer and a bellows. After wetting the thermometer in the ether, they worked the bellows hard to evaporate the liquid as rapidly as possible. The thermometer recorded the temperature, which dropped to seven degrees Fahrenheit in one trial, and the accumulation of ice solidified the experiment.

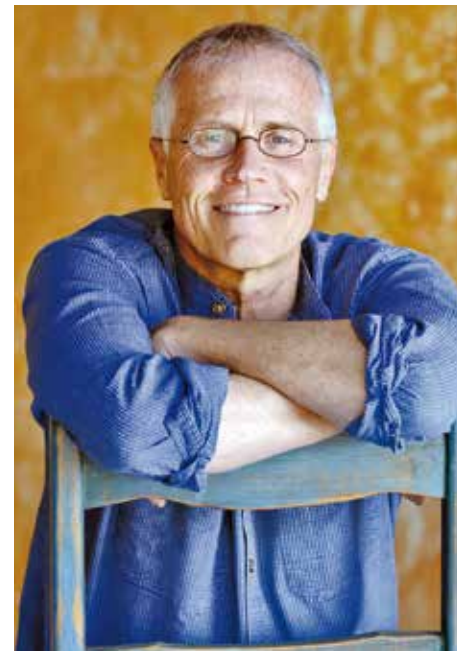
Franklin wrote a friend, "One may see the possibility of freezing a man to death on a warm summer's day." An exaggeration, but the famous polymath was, yet again, on the right track. Could he have foreseen the consequences of his insight?

Gwyn Pris, professor emeritus at the London School of Economics and Political Science, suggests that addiction to air conditioning (AC) is "the most pervasive and least noticed epidemic" in the United States—where the amount of electricity used to keep buildings cool is equal to what the whole of Africa uses—for *everything*.

It is easy to understand how this happened: Fossil fuels were plentiful and cheap, no one worried about greenhouse gas emissions or global warming, and cool air was a welcome relief at home and at work. Critics argue AC is one road civilization should never have taken and must now exit. Perhaps, but an exit is not likely. A top aspiration of people around the world—many of them living in the hotter climates of Asia and Africa—is the comfort of air conditioning.

Demographics alone dictate that the world is set for a massive increase in AC demand in this century. One study predicts as much as 33-fold by 2100. China's experience foreshadows: In the decade-plus between 1995 and 2007, the percentage of air-conditioned homes in Chinese cities increased from 7 percent to 95 percent. China will soon surpass the United States as the leading consumer of AC.

Air conditioning grabs most of the headlines when the subject is conservation and efficiency, but heating is just as susceptible to inefficiency and just as prime for improvement. The building sector worldwide uses approximately 32 percent of all energy generated; more than one-third of that is for heating and cooling. Various bodies have analyzed the potential for increased efficiency and projected the results. All agree on two points: Business



CREDIT: TERRANCE MCCARTHY

"In the United States, the amount of electricity used to keep buildings cool is equal to what the whole of Africa uses—for everything."

as usual generates spiraling emissions from heating and cooling; and maximum efficiency could cut energy use by 30 percent to 40 percent.

Better Energy Efficiency the Easy Way

The means to increase efficiency are at hand and not necessarily high tech. For example, smart thermostats that correlate the temperature setting inside the building with the temperature outside and with actual human occupancy make good sense, but are often missing. Fan speeds are surprisingly important and are often set incorrectly. Heat exchangers to recover heat or cold from air ventilated outside are vital. Retrofitting existing structures with these low-tech interventions is more expensive, but in any new building they should be mandatory. They save money,



CREDIT: GETTY IMAGES

Hot property. Heat pumps like this sewer line-based unit from manufacturer Stadwerke Amstetten offer an emissions-free, green energy-powered way to heat and cool homes.

prevent discomfort and reduce emissions. Combine them with thermostat settings that are a few degrees warmer in summer and a few degrees cooler in winter, and the energy benefits are exponential.

One technology stands out from the rest: heat pumps. These could address the world's heating and cooling needs and eliminate almost all emissions if powered by renewable energy. Most people have a variation of a heat pump in their homes already: a refrigerator. The working principle is the same. All refrigerators and heat pumps have a compressor, condenser, expansion valve and evaporator, and both transfer heat from a cold space to a hot one.

In winter, that means pulling heat from outside and sending it into a building. In summer, heat is pulled from inside and sent out. The source or sink of heat can be the ground, air or water. Air-source pumps work best in temperate climates, as efficiency drops off when outside temperatures drop below 40 degrees Fahrenheit. However, newer technology is effective down to 5 degrees if a building is well insulated. In areas such as Scandinavia and northern Japan, ground-source heat pumps are the technology of choice, taking advantage of the Earth's relatively constant temperature underground.

While cost can be high and efficiency fluctuates depending on local climate, heat

pumps are easy to adopt, well understood and already in use around the world. They can supply indoor heating, cooling and hot water—all from one integrated unit. When it comes to efficiency, heat pumps have a singular advantage: For every unit of electricity consumed, an equivalent of up to five units of heat energy is transferred.

According to the International Energy Agency, a 30 percent penetration of the building sector by appropriate heat pumps could reduce worldwide carbon dioxide emissions by 6 percent. This would be one of the larger contributions of any technology now on the market.

When paired with renewable energy sources and building structures designed for efficiency, heat pumps will do more than move warm air. They will move Earth toward drawdown. **GB**

Paul Hawken is executive director of Project Drawdown, a coalition of researchers, scientists, graduate students, policymakers, business leaders and activists who assemble and present the best available information on climate solutions and their beneficial financial, social and environmental impact over the next 30 years. He is also editor of Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming. He may be contacted at paulharken@drawdown.org.

HVAC's Heavy Impact

HEATING AND COOLING OF residential and commercial building space requires more than 13,000 terawatt-hours of energy and is estimated to increase to more than 18,000 terawatt-hours by 2050.

This energy use comes from on-site fuel combustion and electricity-based systems—from gas furnaces to air-conditioning units. High-efficiency heat pumps reduce fuel consumption to zero and use less electricity to generate heating and cooling.

Current adoption is low at .02 percent of the market, but rapid growth is expected as costs continue to decrease by up to 25 percent by 2050. For a cost of \$119 billion in addition to what would be spent on conventional technologies, operating savings could reach \$1.5 trillion over three decades and \$3.5 trillion over the technology's lifetime. Emissions reductions in this scenario come to 5.2 gigatons of carbon dioxide.

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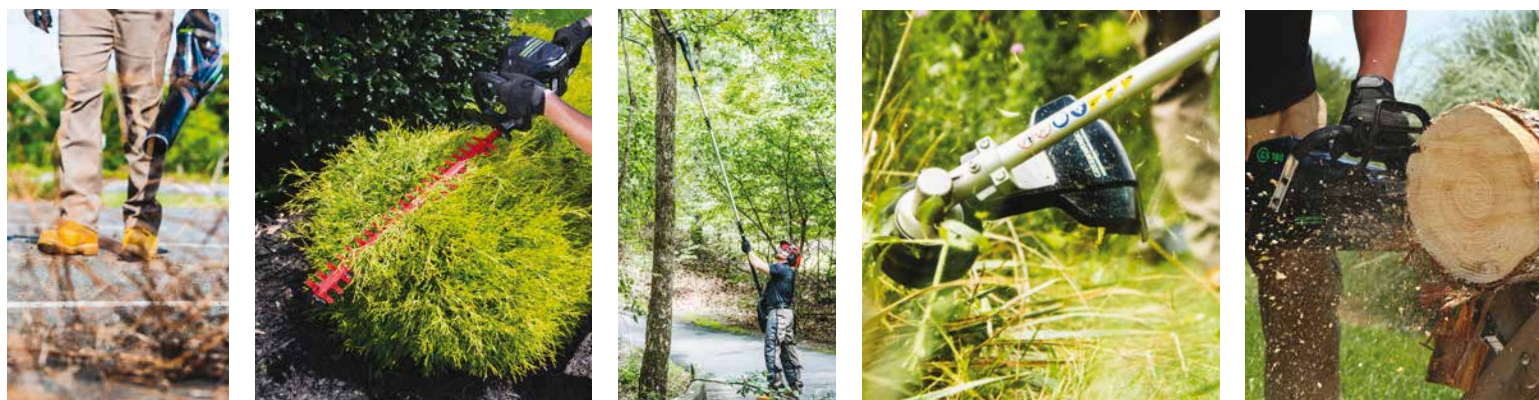
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FROM THE TAILGATE

New Offerings for the Sustainable Minded

By Ron Jones

Greed and Spite: Twin Evils

THE REDWOOD NATIONAL PARK in California was formed in 1968, although by that time about two-thirds of the land it occupied had already been logged. Then in 1977, a U.S. congressman from California introduced legislation that would enlarge the size of the park, and in 1978 President Carter signed it into law.

A provision of the legislation allowed timber companies to remove any redwood trunks that were lying on the ground. It is reported that in the last days before the law took effect, timber bosses ordered crews directly into the redwood forest to drop every redwood they could get to before the deadline.

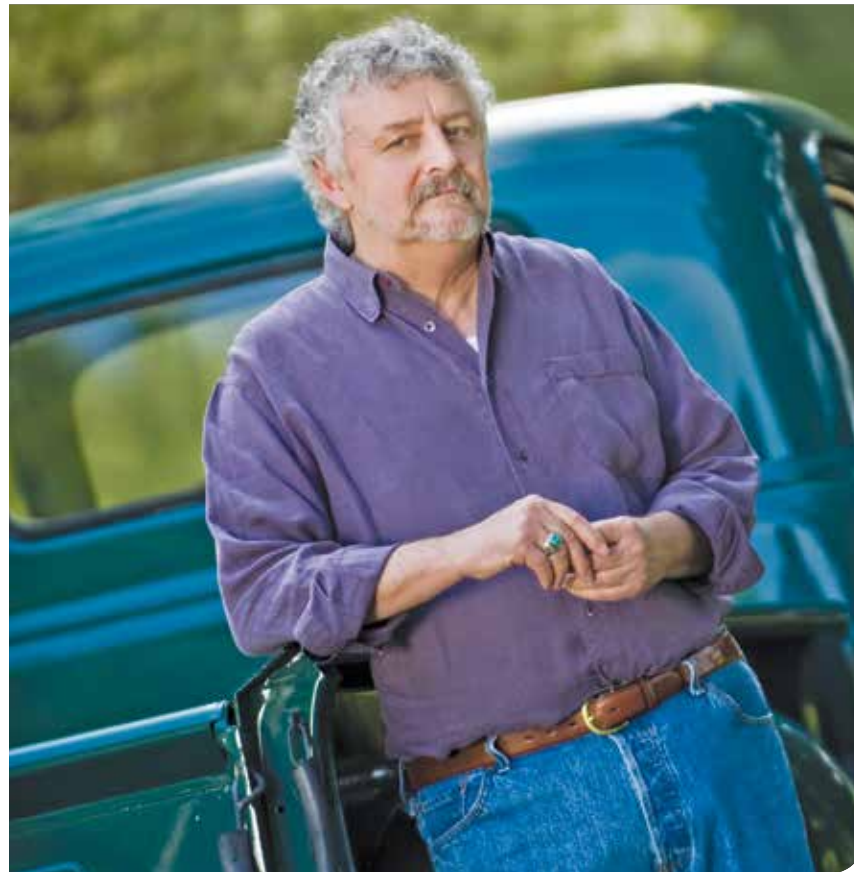
As the story goes, they would fell the biggest and most valuable trees first to maximize their profits, while leaving less valuable trees for follow-up crews. The forests were left with clear-cuts that fanned out from staging zones visible from the air for decades.

Actions such as these blur the lines between greed and spite. Sure, the timber companies involved sought to wring every last drop of profit out of those amazing natural treasures. But they may have been equally motivated by resentment at having been denied unfettered access to the remaining resource. One has to wonder how many redwoods would survive today if not for regulations and legislation enacted to protect them.

In a number of ways, this tale reflects the mindset of many engaged in the homebuilding industry. This is true particularly those involved with trade associations, whose mantra seems to be: "Make all you can for as long as you can, and fight against any form of outside oversight with everything you've got!"

I recently read a release from RESNET reporting that in 2017 more than 2,000 homes across the country received HERS ratings of 40 or less. These homes were constructed by builders large and small, from coast to coast, in virtually every climate zone and in every price and size category.

Yet at the same time, some in the homebuilding industry, most notably homebuilder associations at various levels, directed vast amounts of financial resources, time and energy to attempt to prevent, or at least stall, adoption of updated energy codes. This occurred even though national surveys, many conducted by the trade groups themselves, consistently revealed—and still do—that homebuyers understand the benefits of greater energy efficiency and are willing to pay a premium for that performance.



Something says that this cannot all be about the dollars alone. While some builders and their apologists are willing fall on their swords to resist anything that adds a dime to their upfront costs—no matter how much lobbying expense and human resource is required to wage the battle—there is an even darker motivation driving them.

Put simply, they despise any form of oversight that holds them accountable. I hate to say it, but in my half-century in the industry I have witnessed deep, seething anger at being told what to do or how to do it. The trade associations have learned to harvest this ideological resentment of regulatory oversight and leverage it to their own advantage. They assume the role of defender and champion of the builder to justify and perpetuate their own existence.

Those who find success in this industry going forward will do so because they are willing to learn and adapt as the art and science of home building evolves, leaving the unnecessary baggage of spite where it belongs. **GB**



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