The Future of Green Building

And the technology we'll need to build it.

By **Dawn Killough**

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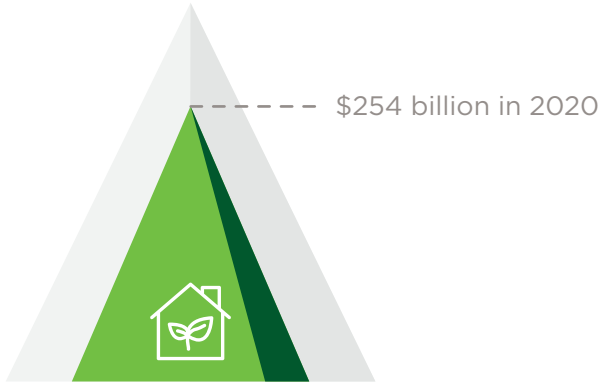
We know where green building has been, but where will it take us?

The future of green building technology is full of opportunities for us to undo some of the damage we have done to the planet and the environment. The green building materials market is expected to be more than $254 billion in 2020, according to **Navigant Research**. **Timothy C. Mack of AAI Foresight** predicts the future of green building materials will hold air cleaning materials, micro-grids, net zero buildings, and smart glass.



I. Air-Cleaning Materials Ease Cleaning Woes Post-Construction

Air cleaning materials, such as paint and concrete, use technology and natural elements to help them take pollutants from the air and break them down into harmless substances. There are two technologies that can achieve this goal: nanoscale titanium dioxide and TX Active.

Products with nanoscale titanium dioxide included in their ingredients use UV light and water molecules to help break down impurities as they fall on surfaces. Titanium dioxide has been successfully added to interior and exterior paints, concrete, pavers, roof panels, and other materials. These products essentially “eat” the pollution in the air and break it down into non harmful byproducts that are washed away by rain or other moisture sources.

Exterior products, such as concrete or pavers, can add TX Active to the mix to ease cleaning and remove pollutants from the air. TX Active, like titanium dioxide, is activated by UV light, and works to breakdown dirt, algae, mold, mildew, and other pollutants and remove them easily when sprayed with water. The product manufacturer recommends that TX Active cement be used as a final finish layer, with the rest of the structure being composed of normal concrete. This will keep costs down, as TX Active cement is more expensive than regular concrete. It also comes in a stucco product, which can be good for shedding dirt and grime over time.

II. Microgrids Could Mean Big Business for the Next Three Years

Microgrids are small electrical grid systems, usually established between several connected buildings that produce, store, and distribute energy amongst themselves, exchanging power as needed. They are found in universities, military bases, and other government compounds. They can be self-sufficient, disconnecting completely from the public electrical grid.

The two major pieces that a microgrid needs to operate autonomously are the ability to generate power and store power. As solar and wind power technology becomes more efficient and less expensive, communities or campuses will be able to develop their own power generation centers using these resources. Power storage technology is always improving and becoming more efficient. The **US Department of Energy** is actively working to improve the technology in this area. Options for energy storage include batteries (both conventional and advanced), electrochemical capacitors, flywheels, power electronics, control systems, and software tools for storage optimization and sizing.

The **Office of Electricity Delivery and Energy Reliability (OE)** has established goals for the use of microgrids in the coming years. The goals are "to develop commercial-scale microgrid systems (capacity of less than 10 MW) capable of reducing outage time of required loads by more than 98% at a cost comparable to non integrated baseline solutions while reducing emissions by more than 20% and improving system energy efficiencies by more than 20% by 2020."

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Improve energy efficiencies by more than 20%

III. Net-Zero Buildings at a Net-Zero (Additional) Cost

Along with microgrids, the future holds more net zero buildings. Net zero buildings generate as much energy as they use over the course of a year. The technology to build these buildings and their systems exists now, but the problem is the cost. Many projects find that net zero is not attainable within their budget.

The key to net zero energy use is using passive systems to heat and cool spaces. Passive design includes using building mass, operable windows, and the chimney-effect to naturally heat and cool building spaces. Large areas of stone, concrete, or water absorb and store heat during the day, then release it during the cooler evening hours.

Opening windows at a lower level and skylights or clerestory windows at the top of a building allow for natural ventilation through drafts, without the need for fans. These drafts and the use of thermal mass allows buildings in some climates to be naturally ventilated, without the need for additional HVAC equipment, thus saving energy and money.

IV. Smart Glass Means Users can Stop Squinting

Smart glass is glass that can tint itself to keep the interior of a building cool. The tinting shades the interior and prevents heat from transferring. There are two types of smart glass: electrochromic and thermochromic.

Electrochromic glass responds to electricity by changing its color. A film is printed onto the glass that responds to electricity by changing from opaque to colored, usually blue. With this glass, an operator must create the electrical charge that starts the change in color. The transition flows from the outside to the inside of the pane of glass. Once the glass reaches the required tinting, no further electrical stimulation is required to keep it there.

Thermochromic glass is similar, but it responds to changes in temperature to regulate the amount of tinting needed. This type of smart glass can automatically provide more tinting when direct sunlight is hitting a window, cutting down on heat gain and reducing energy costs for cooling the building. It also automatically becomes more transparent once the glass has cooled down and is out of direct sunlight.

V. Electricity-Generating Glass That Pays for Itself

The newest glass technology combines smart glass tinting properties with electrical generation, providing windows that generate electricity for use in the building. If a building has a large façade that gets a lot of sunlight, these windows can easily pay for themselves in a short amount of time.

A photovoltaic organic film is sprayed or printed on regular glass. The film generates electricity, which is collected in the window frame. Many brands are touting one year paybacks or less, depending on the amount of area covered. The film can be placed on plastics or other materials, as well as glass. Its expected life span is at least 30 years.

Though many current brands are reliant on direct UV light for power generation, some can generate electricity even in shaded areas and with artificial light due to their advanced technologies. Many buildings don't have enough unobstructed roof space to mount a standard PV panel array capable of meeting their electrical needs. However, if all four sides of a building can be used to generate power, they may be able to completely meet their energy needs, even in climates or seasons not suited for regular solar power.

VI. The Future of Green Building is as Bright as its Past

The green technology advances that occur in the next 5-10 years will steer the future course of green building. The focus must be on making real changes in how we design and construct buildings for the future. Advances such as air cleaning materials will make our indoor and outdoor environments healthier.

Microgrids, net zero buildings, and electricity-generating windows will help reduce our dependence on coal and other greenhouse-gas-emitting energy sources. Smart glass will help make our indoor environments more comfortable and less expensive to heat and cool, saving energy and money.

Author Bio

Dawn Killough is a freelance writer on green building, green technology, and construction. She is the author of Green Building Design 101, an eBook providing an overview of green building and design suggestions. Dawn has been writing professionally since 2008, and currently is author and site editor at Green Building Elements, a blog on green building and construction, and a writer for The Jobsite by Procore, a construction news blog.

Dawn is both a LEED Accredited Professional and a Certified Sustainable Building Advisor. She has worked on several projects seeking LEED certification.

She lives with her husband, Steve, and their six cats in their home in Salem, Oregon. She works as a Contract Administrator at Rich Duncan Construction. In her spare time she enjoys reading and country line dancing.

For more information, find Dawn on LinkedIn at www.linkedin.com/in/dawnkillough

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