PRINCIPAL REAL ESTATE

Cutting edge ESG technologies and materials for Real Estate

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AT-A-GLANCE: New technologies making a difference in real estate today

- BIPV = Building Integrated Photovoltaics
- Machine learning for BMS = Analytic technologies to identify energy saving opportunities across Building Management Systems
- Smart windows = Windows made with metal oxide ions to automatically tint in direct sunlight
- Heat pumps = Electric HVAC systems that efficiently provide both heating and cooling by moving heat rather than generating it
- IoT = Internet of Things
- PoE = Power over Ethernet
- CLT = Cross-laminated timber

With the tremendous increase in regulations, voluntary commitments, and investor expectations regarding the environmental, social, and governance (ESG) performance of real estate investments in recent years, new technologies and materials are rapidly being developed to support ESG initiatives. Many of these will never reach the scale and pricing to become commercially available, while others have taken the real estate industry by storm.

Solar and wind energy installations used to depend upon subsidies to grow market share, but by the end of 2020, they had become less expensive than fossil fuels. "Today, renewables are the cheapest source of power," said Francesco La Camera, Director-General of the International Renewable Energy Agency (IRENA).[1] And now there are new, cutting edge methods and technologies for incorporating renewable energy into buildings, reducing energy and water use, lowering carbon emissions, and providing additional value to tenants and investors.

Integrated renewable energy

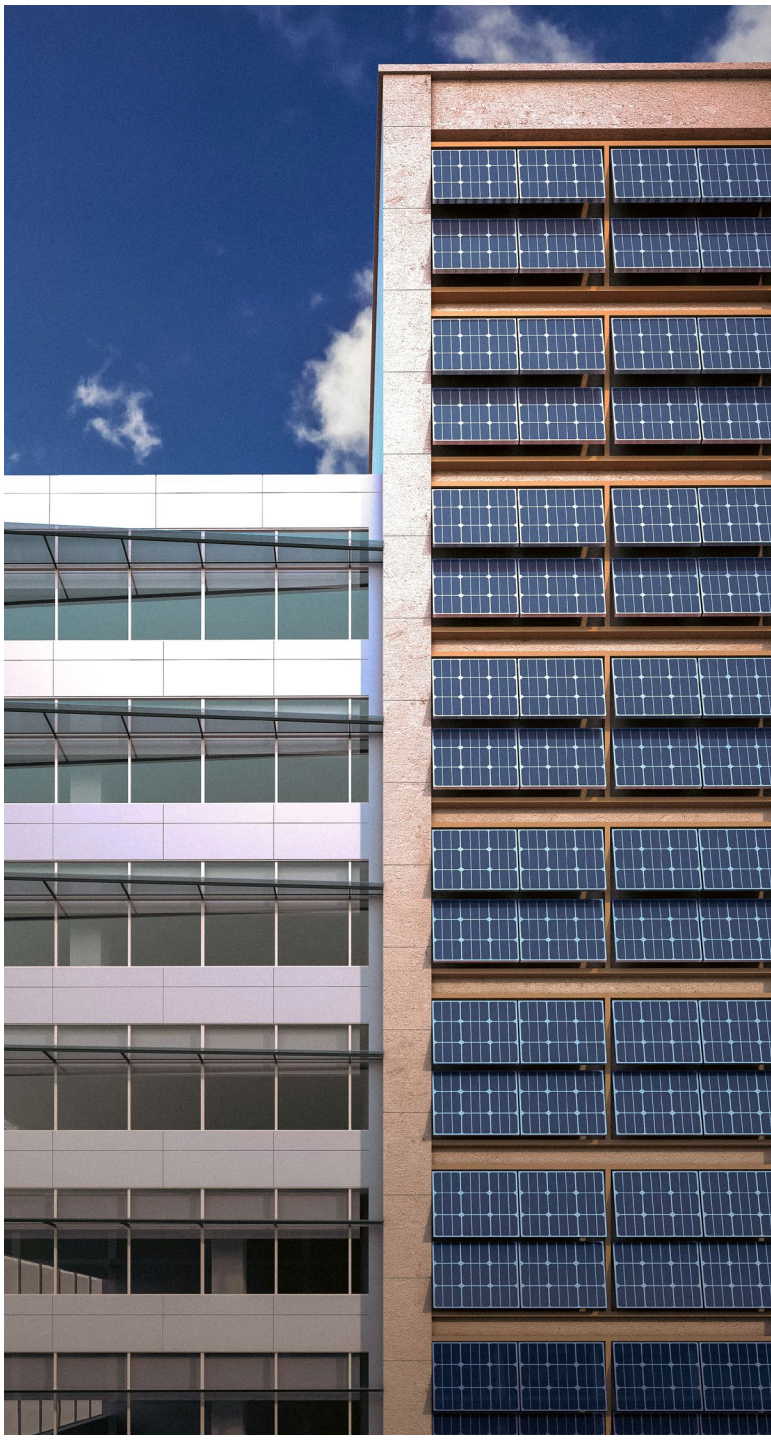
One technology now becoming more commercially available is called Building Integrated Photovoltaics (BIPV). These incorporate solar power generation into materials like windows, siding, roof shingles, and awnings that are built into the building's envelope or structure. While BIPV materials are generally more expensive than conventional construction materials, they have the cost benefit of replacing their conventional counterparts: rather than installing conventional roof shingles and adding solar panels on top, an investor could have solar shingles installed instead—one installation, not two.

[1] https://www.irena.org/newsroom/pressreleases/2021/Jun/Majority-of-New-Renewables-Undercut-Cheapest-Fossil-Fuel-on-Cost

Buildings as energy providers

Advances in battery technology have recently allowed buildings with on-site renewable energy production to become net energy providers rather than consumers, functioning as nodes in a battery network connected to the electrical grid. Not only can battery storage shift the peak and provide energy to the building when it would otherwise be most expensive, building owners can sell their excess energy production as an additional revenue stream.

Thanks to advances in smart grid technology and software intelligence, building owners can also shift peak energy loads through demand response[2] programs available from local utilities. Demand response solutions can allow property managers to adjust the timing of flexible energy usage to correspond with lower energy prices to save on cost, or they can choose cleaner energy sources to reduce the building's carbon emissions.[3]



Machine learning for BMS

While Building Management Systems (BMS) have been available for decades, new machine learning technologies use artificial intelligence (AI) to optimize these systems for energy efficiency and occupant comfort. Especially for existing buildings that may not have been recommissioned recently, machine learning programs can scan all building operations and identify anomalies or inefficiencies across the system. They can consider large amounts of data, show how systems such as heating and ventilation interact, and forecast equipment demands.[4] Addressing the inefficiencies identified in the first year commonly generates 10%-15% in energy savings.

[2] https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid/demand-response

[3] https://markets.businessinsider.com/news/stocks/cpower-partners-with-watttime-to-supercharge-emissions-reduction-benefits-of-demand-response-1030333344

[4] https://www.primexvents.com/why-machine-learning-is-the-future-of-hvac-and-building-management/

They may not offer significant additional savings in years two through four at the same building, once all identified issues have been fixed in year one. But savvy real estate portfolio owners can cycle machine learning programs through 20% of their properties each year, ensuring that each building's BMS and equipment is checked for efficiency opportunities every five years.

Smart windows and shades

Another technology becoming increasingly available for commercial real estate is that of smart windows. These windows use metal oxide ions to automatically tint themselves when hit with direct sunlight and adjust to the amount of sunlight as needed to reduce heat gain and glare indoors. While they cost more than conventional windows, smart windows have been shown to decrease building energy usage up to 18% while increasing tenant comfort and satisfaction.[5]

There are also motorized smart shades that can be programmed to automatically rise and lower as needed throughout the day, using just an app. Some of these come with their own solar chargers to operate with zero emissions. They can be added to existing windows and replace manual shades for a similar shading and comfort effect without the expense of new windows.

3D printing

In the last few years, three-dimensional (3D) printing technology has advanced to the point of being able to 3D print entire buildings or to create bespoke components with minimal waste. Cutting-edge 3D printers used in construction today are extremely fast: they can build an 800 square foot home in only 24 hours.[6] For ESG purposes, they can build with locally sourced materials, be powered by renewable energy, and generate almost no material waste by printing exactly what is needed.

[5] https://betterbricks.com/uploads/resources/Lake-Union-Building-Case-Study_0.pdf
[6] https://www.sculpteo.com/en/3d-learning-hub/applications-of-3d-printing/construction-and-architecture/

Bi-directional electric vehicle charging

Real estate investors are seeing increased demand for electric vehicle (EV) charging stations as a service to their tenants and residents. According to recent research from BloombergNEF, zero-emission vehicles will represent 70% of global car sales by 2040.[7] As the average U.S. EV owner is paying $30 for a full charge at a public charger[8], these charging stations provide both a service to tenants and a revenue opportunity for building owners.

In addition, new vehicle-to-grid (V2G) technologies allow EV vehicles to also become a source of electricity, transferring energy from the EV batteries back into the building as an emergency power source or to support the building's electric load during periods of peak demand. Not every EV has the capability for bi-directional charging today, but more are being developed with this ability.[9]

Electric heating

As the world moves toward a zero carbon-emission future, gas-burning equipment such as furnaces and boilers will need to be replaced with electric heating systems. The most efficient of these is the heat pump. Heat pumps work like reversible air conditioners, transferring heat out of indoor air to cool it in the summer and pulling heat in to provide warmth in the winter. Recent advances in heat pump technology have made them a feasible option even in colder climates.[10] If powered by renewable energy, heat pumps can provide comfortable heating and cooling with zero operational carbon emissions. As an added bonus, heat pumps often qualify for local rebates and incentives —such as in California[11] and New York[12]—that make them more cost effective.

[7] https://about.bnef.com/blog/electric-vehicle-sales-set-to-rise-faster-than-ever-but-more-policy-action-needed-to-get-on-track-for-net-zero/

[8] https://thebluedot.co/how-much-does-it-cost-to-charge-your-ev-at-public-charging-stations

[9] https://www.sae.org/news/2022/01/bi-directional-charging-amps-up

[10] https://www.energy.gov/energysaver/heat-pump-systems

[11] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/building-decarb/cpuc-hpwh-and-electrification-fact-sheet_q22020.pdf

[12] https://www.nationalgridus.com/media/pdfs/bus-ways-to-save/nys_clean_heat_1pager_2021.pdf

Smart irrigation

Another important ESG consideration is water conservation, and real estate investors can use new technologies to save water—and costs—on landscape irrigation. New systems link to real-time weather data and can be customized to the specific plants on site to irrigate only when needed. They can also monitor water flow and promptly detect leaks. For example, Lowe's installed smart irrigation at 939 stores that reduced their water use by 650 million gallons and saved the company $5 million.[13]

Internet of things

Many of these technologies—including smart irrigation systems and networked EV charging stations—rely on the Internet of Things (IoT). As more machines and systems transmit data on their performance levels and maintenance needs, property managers should be able to leverage the data to increase efficiency, improve ESG performance, and reap further savings.

Power over ethernet

Power over Ethernet (PoE) is a fairly simple but useful technology that allows network cables to carry electrical power, replacing two separate cables. Network cables can be installed anywhere, use less electricity, and save the cost of an electrician. As a result, PoE-compatible devices like building surveillance cameras can be flexibly located wherever needed and are not tethered to an electrical outlet.[14]

Construction materials

Real estate investors who seek to reduce the embodied carbon[15] emissions in their development projects can consider new methods and construction materials in their buildings to establish an ESG leadership position in the industry. Focusing on reducing or eliminating embodied carbon through smart procurement decisions of high impact materials such as steel and concrete is essential. New materials are quickly being invented and produced, and developers can check the EC3 Calculator[16] from the Carbon Leadership Forum to evaluate different manufacturers and materials to choose the lowest embodied carbon options appropriate for their projects. For example, depending upon local building codes, cross-laminated timber (CLT) can be used as an effective, renewable substitute for steel beams and can be sourced from sustainably-managed forests.[17]

For concrete, normally the largest source of embodied carbon in the built environment, options are now available that incorporate recycled glass or ash waste, or that are made using new technologies that capture and sequester carbon during the manufacturing process.[18] With concrete now accounting for eight percent of all global carbon emissions—three times higher than the entire aviation industry[19]—it is crucial for real estate developers to address the type and quantity of concrete used in construction projects to support global carbon reduction goals.

Tried and true

Of course, many of the tried-and-true methods and technologies are still applicable today. Installing LED lighting, ENERGY STAR® certified appliances, variable frequency drives (VFDs), air sealing products, and additional insulation are quick wins to improve a building's energy efficiency performance. Incorporating submeters to track unit-level energy and water use provides critical data and allows building owners to partner with tenants to reduce whole-building consumption. Building controls have become more affordable so that even small commercial buildings can implement smart building solutions to save energy. And architects can design structures that simply require less concrete, steel, and wood to build using advanced framing and other modern techniques.

[13] https://www.hydropoint.com/case-studies/lowes-reduce-water-use/
[14] https://www.veracityglobal.com/resources/articles-and-white-papers/poe-explained-part-1.aspx
[15] https://www.carboncure.com/concrete-corner/what-is-embodied-carbon/
[16] https://carbonleadershipforum.org/ec3-tool/
[17] https://www.buildwithfsc.org/post/what-are-mass-timber-and-cross-laminated-timber-clt-why-is-use-increasing
[18] https://materialspalette.org/concrete/
[19] https://www.dw.com/en/concrete-cement-climate-carbon-footprint/a-60588204

In short, real estate investors now have access to a plethora of new—and not-so-new—materials, technologies, and methods to improve the ESG performance of their buildings. These can help commercial buildings comply with local ordinances, attract and retain tenants, reduce the embodied carbon of new construction, and meet the increasing demands of investors for more sustainable real estate assets.

Risk Considerations

Investment involves risk including possible loss of principal. Past performance is no guarantee of future results. Potential investors should be aware of the risks inherent to owning and investing in real estate, including value fluctuations, capital market pricing volatility, liquidity risks, leverage, credit risk, occupancy risk and legal risk.

Environmental, social and governance responsible investing (ESG) is qualitative and subjective by nature, and there is no guarantee that the criteria utilized, or judgment exercised, will reflect the beliefs or values of any one particular investor. Information regarding responsible practices is obtained through voluntary or third-party reporting, which may or may not be accurate or complete, and such information is used to evaluate a company's commitment to, or implementation of, responsible practices. Socially responsible norms differ by region.

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