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Accelerating the Urban Transition to 100% Renewable Energy

Urban environments offer immense opportunity for renewable energy installation. This report explores emerging technologies in solar windows, long-duration energy storage, and solar-powered cooling.

As of 2018, 55% of the world's population lived in urban environments, with that figure projected to grow to 68% by 2050. Already, cities account for nearly two-thirds of the global energy consumption and 70% of the world's energy-related CO_2 emissions. If we are to wean ourselves off fossil fuels, we must start in cities. Standard photovoltaic paneling has been reviewed by numerous analysts, so instead this report focuses on other, newer technologies.

Solar Windows	Long-Duration Energy Storage	Solar-Powered Cooling
Energy-generating solar windows first appeared in the 1980s. Since then, most commercial solar windows have been made from glass coated in amorphous silicon - similar to the black silicon solar panels found on rooftops. The technologies reviewed in this report allow for up to 90% visible light transmission.	Long-term energy storage enables a continuous flow of renewable energy (even when the sun is not shining) over timescales of days, weeks, or months. Technologies researched include: an iron flow battery, phase change composite thermal energy storage, & an electrothermal energy storage system.	Adsorption chillers depend on a refrigerant, whereby energy to drive the cooling process is pulled from waste heat, such as exhaust or steam from industrial processes, or heat directly generated from solar panels. Technologies researched include: adsorption cooling technologies using solar thermal systems.
Advantages • Lower net effective price relative to traditional windows • Often 1 year payback period • Up to 10% energy efficiency	Advantages • Lower fire risk • Lower human health risk • Low levelized cost of storage • Can be paired with wind/solar or stand-alone	Advantages • Relative to absorption cooling, lower costs & reduced maintenance • Non-toxic, non-corrosive materials • Increased flexibility in the face of variable temperatures
NEXT Next Energy Technologies Inc. · SOLAR WINDOW TECHNOLOGIES, INC. · ubiquitous energy	ESS INC CATALYZING A CLEANER FUTURE · NETenergy · ECHOGEN power systems	FAHRENHEIT Cooling Innovation.

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