A receptionist sits behind the information booth during the $530 million retrofit of the Empire State Building, originally constructed in 1931. The retrofit to the Art Deco icon saw the replacement of all 6,500 windows and all heating, cooling, and lighting systems—an energy reduction of 38 percent.

The Empire State Building was never intended to be green. It was intended to be tall. Born out of competition between titans of industry to construct "the world's tallest building," it went up in just over a year and officially opened on May 1, 1931, when President Herbert Hoover ceremonially flicked on its lights from Washington, D.C. The building held its title of tallest until 1972. Once the poster child for bravado and might rendered in steel, limestone, and granite, the Empire State Building is now the poster child for retrofitting to achieve energy efficiency in the built environment—that is, addressing how much heat and cold are escaping or entering the building, what internal systems cool or warm inhabitants, and how the building is illuminated.

Global warming will not be addressed without attending to the buildings that house humankind day and night. Worldwide, buildings account for 32 percent of energy use and 19 percent of energy-related greenhouse emissions. In the United States, buildings' energy consumption is more than 40 percent of the nation's total. They pull from the electric grid or natural gas lines to heat, cool, and light the spaces within them and to power all manner of appliances and machinery.

As much as 80 percent of the energy consumed is wasted—lights and electronics are left on unnecessarily and gaps in the building's envelope allow air to seep in and out, for example.

Much of the attention paid to green buildings is in new design construction. Various standards—Leadership in Energy and Environmental Design (LEED), Net Zero from the International Living Futures Institute, Passivhaus from the German institute of the same name, and R-2000 developed by Natural Resources Canada, to name a few—specify how to build well from the start, so that wasteful energy use is designed out of the building before it goes from the drafting table to real life. While it is important to look forward and shape the structures to come, it is equally critical to modify existing buildings—and not just commercial buildings. There are 140 million buildings in the United States and 5.6 million are commercial. These structures hold the greatest potential for energy reduction. Because old buildings are replaced by new at a rate of 1 to 3 percent per year, most of the existing building stock will still be here fifteen to twenty years from now.

Ramping up retrofitting was a central impetus for the Empire State Building endeavor. New York City has pledged to cut greenhouse gas emissions by 80 percent by 2050. To meet its goal, buildings need to be retrofitted. In the early years of the twenty-first century, the Empire State Building used as much energy in a single day as forty thousand single-family homes. The retrofit project—a collaboration between private, philanthropic, and nonprofit entities—set out to cut that usage by 40 percent.

The Empire State Building will save $4.4 million in energy costs and avert more than 100,000 tons of greenhouse gas emissions. The building's 6,514 windows were key for advancing efficiency. To save waste and money—more than $15 million worth—they were rebuilt on-site, with a layer of insulating film placed between the existing panes. Although the Empire State Building is a splendid example because of its art-deco heritage and cultural cachet, the 38 percent energy reduction it will achieve is just the beginning. The Willis Tower in Chicago, built in 1970, saved 70 percent of its energy use through a retrofit. Net zero retrofits now exist for older buildings. In the United States, there are 8,000 buildings over 500,000 square feet like Empire State and Willis. They should not avert focus from the other 139.5 million buildings that need retrofitting and for which energy savings, payback, and job creation would be extraordinary.

Retrofitting is a well-understood practice, and good building performance data is making it increasingly effective. The payback on retrofits, depending on the building, is five to seven years on average. Lenders such as Fannie Mae will increase commercial mortgages by 5 percent if the loan is used for greening a building. Yet existing commercial buildings are being upgraded at a rate of just 2.2 percent per year. This being real estate, the common obstacle is money. However, money can be found because the payback is there. There are now consultants in every city who will guide clients through any kind of retrofit desired and help arrange financing. Most utilities will consult as well and specify a wide range of appliances, lighting choices, variable speed pumps, and heating and cooling alternatives that can keep energy in the ground and put money in your pocket. Another payback is rarely mentioned: Retrofitted buildings have higher occupancy rates.

Tenants want healthy green spaces and will pay more for them in most cities today. Studies show people to be more creative, productive, and happy in well-designed green workplaces, and employers find it easier to recruit and retain talent. Developers such as Jonathan Rose Companies seek out and buy older office buildings in downtown areas from New York to Portland, Oregon, retrofit them, and rent them out again. The retrofit raises the quality and desirability of the workspace, which increases demand. Retrofitting extends the life of the building and increases its value. Green buildings, new or old, are better places to live and work—and to own.

For those who can see it and crack it, the business opportunity in retrofits is substantial. According to market sizing and analysis done by the Rockefeller Foundation and Deutsche Bank's climate change shop, $279 billion could be invested in the United States in retrofitting residential, commercial, and institutional buildings, yielding more than $1 trillion in energy savings over ten years—equal to 30 percent of the country's annual spending on electricity. In the process, more than 3.3 million cumulative job years of employment would be generated across all parts of the country, and U.S. emissions would be cut by almost 10 percent.

To realize the massive financial and emissions savings that are possible, a building-by-building approach to the world's 1.6 trillion square feet of building stock (99 percent of which is not green) is probably not the way to go. The Rocky Mountain Institute is piloting a more industrialized strategy in Chicago: Limit the scope of retrofitting to a set of highly effective, broadly applicable measures; pursue additional measures on the basis of impeccable analysis; and undertake multiple buildings simultaneously to gain economies of scale. Early results show it can reduce retrofit costs by more than 30 percent and achieve payback within four years. It is this sort of effort that is needed to connect the dots between people and energy, well-being and economics, and the future of the atmosphere.

IMPACT: *As with net zero buildings, there are no results presented from our models here. Building owners who retrofit existing residential and commercial building space install better insulation, improved heating and cooling equipment, upgraded management systems, etc. These solutions are accounted for individually. No retrofit will look exactly the same, making forecasting costs and savings nearly impossible.*