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RUNBERG ARCHITECTURE GROUP

THE SUSTAINABLE MULTIFAMILY HOUSING OPPORTUNITY

How Proven Technology Makes Better Buildings for Developers and Tenants

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EXECUTIVE SUMMARY

A focus on sustainability and energy efficiency in the multifamily housing market can deliver benefits for a wide range of stakeholders. A holistic, integrated approach to green design can:

- Drive operating and maintenance costs down for owners, investors, operators, and tenants.
- Future-proof buildings against future energy efficiency and carbon reduction legislation or fees.
- Increase property income by appealing to today's sustainability-focused consumer, as evidenced by a Cushman & Wakefield analysis that showed multifamily properties with LEED certifications achieved 3.1 percent higher rents than non-certified properties between 2000 and 2021.[1]
- Contribute to the long-term health of occupants, communities, and the planet.

Using green features and sustainable design achieves optimal results when all priorities, perspectives, and goals of stakeholders are in balance. The needs of the capital partner, the developer, the leasing manager, the architects, the engineers, and the tenants can be met using low-risk and proven technology and methods that have measurable value-add to the properties. To achieve this, energy modeling and sustainable design should be part of the earliest planning stages, ensuring every decision delivers a measurable benefit.

This paper presents multifamily housing projects by teams of developers, architects, and engineers in Seattle who have collaborated over the past two decades to complete more than a dozen award-winning projects, delivering some of the nation's most high-performing, economically efficient, and highly marketable apartments.

The following report details the necessary evolution of integrated design and energy strategies creatively implemented in three successive completed multifamily projects in Seattle using standard, "off-the-shelf/kit-of-parts" technology, making them financially justifiable for most conventional market-rate budgets. From the outset, the intention was to share with the multifamily industry what has worked well in hopes of influencing others to make responsible decisions in sustainable building design which will help slow down the sizeable negative effects of climate change on the planet.

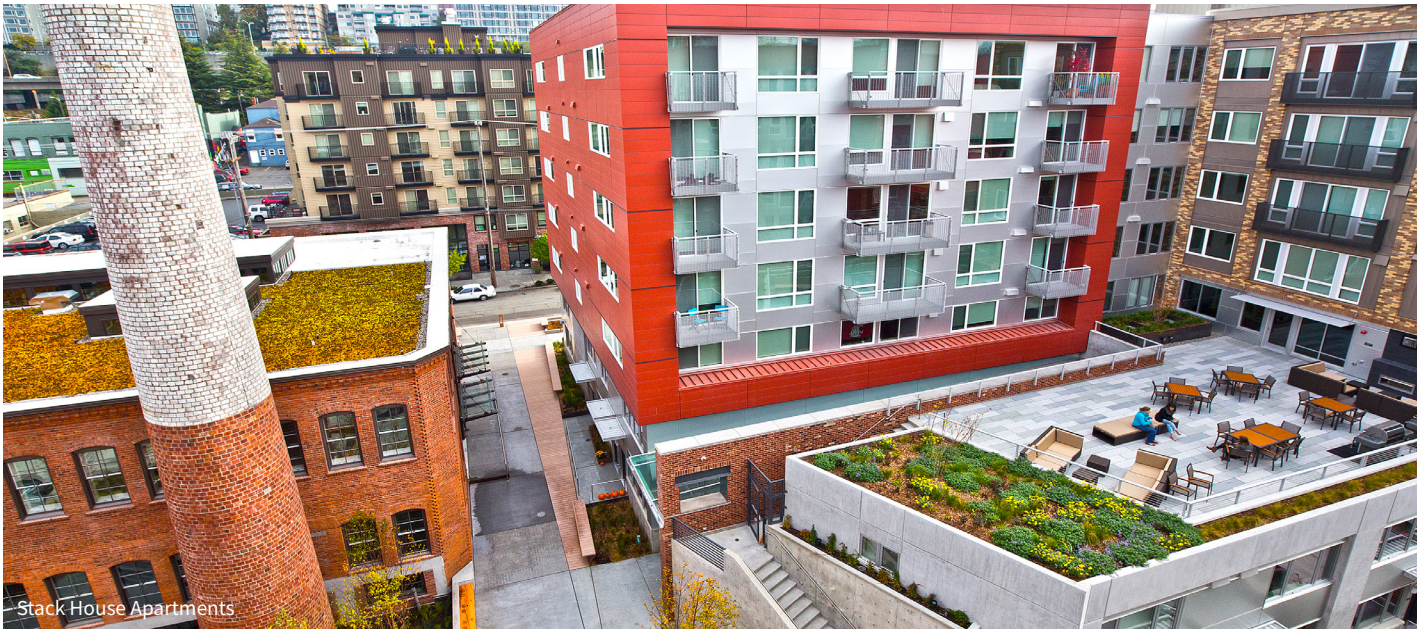
WHY IS MULTIFAMILY HOUSING SO CRITICAL TO THE SUSTAINABILITY MOVEMENT?

It is critical for the building industry to dramatically reduce energy use and carbon emissions if the US is to meet the targets of the Paris Agreement which is an attempt to limit global warming to 1.5°C. President Biden's Federal Sustainability Plan[2] calls for net-zero emissions buildings by 2045, including a 50 percent reduction by 2032.Washington State has committed to a fossil-fuel free electrical grid by 2035 and is implementing energy code improvements and progressive legislation such as Clean Building Standards targeting carbon-neutral buildings by 2045. Locally, Seattle is implementing a range of policies to accelerate this transition by banning new fossil fuel equipment in most new commercial and multifamily buildings.

The building sector is responsible for nearly 47 percent of global carbon emissions[3] and multifamily homes account for roughly half of the commercial real estate market.[4] This form of housing includes apartment buildings, condos, lofts, and other types of dense group living – ranging from low-income family dwellings to student housing to active adult communities to luxury condominiums.

Multifamily housing, if designed and built responsibly, is an important part of the solution to the climate predicament:

- It provides much needed housing for a fraction of the cost of single-family construction.
- By design, dense urban housing creates a smaller carbon footprint, dramatically reducing per person energy use and carbon emissions.



Stack House Apartments

Sitka Apartments

- It can be designed to use about half the energy of current typical construction and rely exclusively on a clean green electrical grid.

Multifamily buildings are large and complex and as a result, owners, property managers, and investors may believe that prioritizing sustainability would require substantial financial outlays without a commensurate return. However, this is simply not true.

Number of people living in multifamily housing in U.S.:
44M+[6]

New multifamily units under construction in U.S.:
300K+[7]

Median unit size in U.S.:
1,087 feet[8]

Percent of new multifamily construction with green features in U.S.:
47%[9]

Size of the global sustainable multifamily housing market by 2026:
$241B[10]

OFF-THE-SHELF APPROACH FOR SUSTAINABILITY

Sustainability-minded decisions from the start of a project actually drive down costs over time, resulting in better living environments and increased long-term return on investment (ROI).

Using this proven approach:

- Operating costs go down.
- Developers can obtain better financing options because the pro forma demonstrates lower ongoing costs and a higher financial return.
- Long-term risk is mitigated because there is no fossil fuel usage in the building.

These types of designs go against the grain of generations of conventional wisdom in the built environment industry, but this paradigm is shifting as demonstrated by the recent New York Times piece titled “Investors Seek Greener Buildings,”[5] in which Stephen Tross, chief investment officer from Dutch firm Bouwinvest, succinctly put it, “Today, you don’t sacrifice returns for sustainability, you create returns with sustainability.”

The shift is happening and this evolution is vital for the health of the planet given the known and increasing impacts of buildings on the environment. Additionally, high performance can

be achieved in the multifamily sector without compromising good design or construction budgets and timing.

THE BENEFITS OF HIGH PERFORMANCE, SUSTAINABLE MULTIFAMILY HOUSING

Developing highly-performing, sustainably-designed multifamily housing has many benefits for owners/investors and tenants. Among them are:

- **Energy efficiencies**. Careful selection of glazing, insulation strategies, lighting and lighting controls, and heat pumps for water heating and space conditioning can reduce energy consumption and energy bills by more than 50 percent.
  - **Stack House Apartments**: Completed in 2013, uses 50 percent less energy and 60 percent less water than baseline multifamily buildings and was one of the first multifamily projects to rely on commercial heat pump water heating technology.[11]
- **Healthier and more attractive environments**. 75 percent of today's multifamily renters are interested in green features and LEED certifications.[12] Incorporating sustainable features into a new property has demonstrated results of faster leasing and an even higher rent roll.
  - **Sitka Apartments**: Completed in 2018, elevated green features and amenities to new heights[13] with Northwest Regionalism-inspired design and landscaping elements such as a "tree house" retreat, expansive green roof, and dense tree-filled courtyard drove a nearly 50 percent faster than average lease-up rate and filled all 384 units in nine months.
- **Compliance with current and future federal and local energy and carbon mandates**. Leading the charge, states such as WA, NY, and CA all have processes in place to rapidly develop energy codes and policies to drive energy efficiency and electrification. More than 60 cities nationwide now have rules regulating the use of fossil fuels in new construction and Building Performance Standards are being designed to move existing

Angled sun shades on the Stack House Apartments

Aerial of sister projects Batik Apartments (left) and Cypress Apartments (right)

buildings away from reliance on fossil fuels. Savy developers can economically build these high-performance features today and also avoid being penalized later by pending stricter code changes.

- **Batik Apartments**: Completed in 2018 as part of the 30-acre Yesler Terrace urban re-development, was designed to deliver a high-performance, energy-efficient, and ahead-of-the-codes building with minimal carbon footprint. The current total energy usage of Batik is about 50 percent less[14] than a typical code-compliant building.

As a developer is planning a multifamily development, it would be useful to consider the integrated design techniques in the case studies featured throughout this report. They prove that a strong relationship between developer, architects, and engineering experts experienced in sustainable development can deliver on these tangible and value-add objectives.

Most importantly, the right collaborations will enable the developer to better track and measure the impact of investments and fully realize the cost and energy savings immediately.

The success of the nearly two decades-worth of collaborations between Vulcan Real Estate, Runberg Architecture Group, and Ecotope is due to the shared goals of high-performance sustainability held by the three firms. All stake holders came to the table with the desire

"There is a common misconception that sustainability measures just increase development costs, reducing the financial feasibility of a project. But with proper advance planning in design, they often result not only in the dividends of a healthier environment to live, work, and play in, but also operational savings for owners and occupants, enhancing property values."

-Brandon Morgan, Director of Residential Development, Vulcan Real Estate

to push the envelope of high-performance design in multifamily housing that also made financial sense for both the property owners and tenants.

Stack House Apartments[15]

The Stack House Apartments in Seattle surpassed industry standards – both locally and nationally – through many sustainable innovations and energy efficiency measures. The project was completed in 2013 and earned LEED Platinum Certification and the USGBC's LEED for Homes 2014 Multifamily Project of the Year.

Key features:

- Innovative mechanical systems, including central heat pump water heating system
- Rainwater catchment and reuse via cistern for on-site irrigation
- Rooftop urban agriculture feature
- Low energy lighting design and controls
- Ductless heat pumps for all south- and west-facing units (40 percent of total units)[16]

Results:

- 50 percent reduction in energy use
- Deemed the most energy-efficient apartment in 2014 in the Pacific Northwest by Air Conditioning Contractors of America (ACCA)[17]
- Paved the way for what was possible on future sustainable projects. This project integrated the first Commercial Heat Pump Water Heating system in the Northwest. These systems are now required in Seattle for new multifamily construction
- LEED Platinum certification
- Salmon Safe certification
- EUI (energy use intensity): 19 kBtu/ft2/yr

THE PROCESS OF INTEGRATED DESIGN

Especially in sustainable development, the intersection of aesthetics, functionality and energy benchmarking has become increasingly valuable to both the developers' bottom line and to the tenants' experience. This all starts with the alignment of the architects and engineers.

Runberg Architecture Group's Process: Balancing the Environmental, Social, and Economic Interests

Runberg's performance goals are integrated into the environmental, social, and importantly the economic aspects of a project. By using these high-performance design principles, Runberg creates structures that not only lessen environmental impact, but also improve the performance of the building and its occupants, while providing significant value-add on the owner's investment.

- **Environmental**: Consider the best practices for healthy built environment, specifically leveraging each unique project's potential.
- **Social**: Integrate the context of surrounding community and the needs for social spaces within a project to unlock its quality and authenticity.
- **Economic**: Utilizes the latest BIM software to deliver highly accurate feasibility models and pro forma data metrics in real time as a valuable communication tool for the developer and their analysts.

It goes beyond just numbers. To unlock the true value of these properties and achieve each building's target performance, Runberg Architecture Group builds the design from the inside-out. The programming starts with the basic chassis of the dwelling unit and layering

View from Cypress Apartments roof deck, adjacent sister project to Batik

Kit-of-Parts

Unique innovations that emerged from the Runberg, Vulcan, and Ecotope partnership:

- **Central Commercial Heat Pump Water Heater**: Domestic hot water represents the single largest source of energy use and carbon emissions for most multifamily buildings. These buildings switch from fossil fuel fired water heating equipment to electric heat pumps. Below grade parking garages are often an ideal location for this equipment in Seattle as the buffering effects of the ground and building keep the air temperature relatively warm throughout the winter leading to highly efficient heat pump operations.

- **Corridor ventilation system optimization**: Because corridors are typically served continuously with conditioned air throughout the year they often require as much heating and cooling energy as all the apartments put together. This energy bill is paid directly by the building owner. Using natural ventilation, heat recovery ventilation, and/or zonal heating and cooling with small heat pumps can reduce corridor energy use by a factor of 4 or 5.

- **Ductless heat pumps**: Careful selection of glazing for shading properties and use of zonal ductless heating and cooling delivery can affordably provide extremely energy efficient comfort for apartments. This is especially important for South and West-facing apartments.

- **Green rooftops and Bioretention planters**: These rooftops reduce the urban heat island effect, slow down and absorb run-off, and provide greenery for City dwellers.

- **Rainwater catchment and reuse**: Rainwater cisterns can be used for irrigation or toilet flushing to save hundreds of potable gallons of water per day.

- **Salmon-Safe certification**: In 2015, Vulcan committed to become the first real estate developer in the U.S. to receive Salmon-Safe accreditation by certifying their entire development portfolio would establish and implement best practices for operating properties, managing land, and increasing public awareness of Salmon-Safe certification.[18]

Verde Apartments at Esterra Park, under construction

a sequence of experiences based on functionality and livability, a sense of community, establishing each its unique, authentic sense of place within the urban environment.

Runberg typically draws upon a larger design narrative by taking into account the specific site context, history, or other unique surrounding community relationships. Gaining a greater understanding about what came before and what defines any given "place," designers can better translate a responsible building form that acts as the backbone to the design and creates a sense of authenticity and relevance for the final built project, which has proven to yield better value.

Ecotope's Process: Prioritize the Highest Impact Areas – Efficiency plus Electrification

Ecotope's design approach for buildings centers around three key responses to the climate crisis:

- **Electrify Buildings**: Ecotope seeks to end usage of fossil fuels in buildings and shift to high-efficiency heat pumps using clean grid electricity. Ecotope does the research and development to bring new products and techniques to market and demonstrates those new technologies in its design and engineering practice.
- **Design for Off**: Energy efficiency is the primary way to reduce the climate impacts of buildings. "Design for Off" is a design philosophy and approach that eliminates or minimizes the use of energy and mechanical equipment wherever possible.
- **When Matters**: In a grid dominated by solar and wind, when buildings use energy starts to matter as much as how much energy they use. Ecotope strives to align when buildings use energy with the availability of solar- and wind-generated electricity on the grid. This will become common practice as utilities develop Time-of-Use pricing structures over the next several years.

Sitka[19]

This mixed-use development leveraged much of the learning from the Stack House project and brought innovative and sustainable design to a whole new level.

Key features:

- The wastewater heat recovery (WWHR) system was the first in the nation to recycle heat in wastewater in a multifamily building. A large vault adjacent to the parking garage captures daily wastewater. A water-to-water heat pump extracts heat from the warm water in the vault and uses it to heat water for use the next day. Each night the cold vault water is discharged to the sewer to make room for the next day's warm wastewater.
- Also contributing to efficient water use was the first greywater reuse system in a Seattle multifamily project. Greywater from shower and laundry drainage is directed to a holding tank, and the water is used for landscape irrigation.
- LED lighting with advanced controls and energy-efficient appliances
- Thoughtful access to natural light and natural ventilation (including central corridors and stairs).
- The exterior elevator system reduces significant interior air leakage.

Results:

- 40 percent reduction in energy use
- Rapid (100%) lease-up
- LEED for Home Platinum Certification
- Salmon-Safe[20] certification
- USGBC's LEED for Homes 2020 Multifamily Project of the Year
- Multiple energy awards and press
- EUI: 16 kBtu/ft2/yr

How to Integrate Energy Efficiency and Decarbonization Planning into the Fabric of the Design

Energy modeling is implemented from the start on every project. Ecotope leads the design team to create clear and solid energy targets, which they monitor and respect throughout the design phase. Every team member looks for opportunities to modify design elements to improve energy performance and reduce energy consumption. Energy and emissions targets can be set to achieve points for LEED or other sustainability programs, to achieve reductions aligning with federal tax credit targets, or to meet future Building Performance Standards targets.

No two sites are treated the same, nor should they be. Each project has different contextual and environmental constraints. For example, factors such as the amount of direct sun can vary widely from one project to the next. Team members must be intimately familiar with each project's geography, limitations, tenant population, and owner/investor goals. The buildings discussed in this report point the way to standardized solutions for systems and approaches that can be deployed across a wide range of buildings.

COLLABORATION IS ESSENTIAL

Sustainable planning and energy modeling for multifamily homes truly requires alignment among the developer and design team stakeholders. Because of the high level of integration and collaboration, the stakeholders must be especially adept at listening to and incorporating a wide range of perspectives. The team needs to align the priorities of integrated design and the bottom line of the project. The entire team must have a clear and measurable objective that will ultimately drive choices and trade-offs.

Among the many factors the design and modeling team considers are:

- Electric heat pumps for water heating and space conditioning
- Heat recovery ventilation
- Efficient lighting with daylight and motion sensors
- Passive heating, cooling, ventilation, and lighting. Take advantage of operable windows and sunlight wherever possible
- Energy-efficient appliances and electronics
- Low-flow plumbing fixtures
- Energy-efficient windows
- External sunshades that help to reduce heat gain

Batik[21]

This award-winning project achieved LEED for Homes Platinum certification using off-the-shelf technology in creative ways. Batik serves as a replicable example of what is possible in the multifamily sector within a market-rate budget.

Key features:

- Air-source heat pump water heater
- State-of-the-art and energy-efficient lighting design and controls
- Ductless heat pumps in South and West-facing apartments
- Low energy corridor ventilation design

Results:

- A replicable model that developers can implement
- 40 percent energy reduction
- LEED Platinum certification
- Salmon Safe certification
- EUI: 17 kBtu/ft2/yr

All of these sustainable features have proven to be practical and affordable in the design and construction process, and also continue to pay off in lower energy and water costs for both owners and renters.

FUTURE TRENDS IN SUSTAINABLE MULTIFAMILY HOUSING

Climate change is real and carbon emissions must be contained as buildings are constructed and updated. Moving forward, buildings should house society in appropriate, appealing ways that encourage the growth of vibrant, healthy communities that are also economically sensible.

A collaborative and focused process, combined with innovative products, will lead to significant changes that help preserve our planet.

Integrating design, engineering, construction, and energy tracking/reporting functions are all essential for success, energy reduction, and cost savings. Subject matter experts must come together to develop innovative short- and long-term strategies.

Many specific products are also critical to the process. Sustainable builders and designers are investing in:

- Commercial heat pump water heater systems (CHPWH), which Ecotope recommends for multifamily housing
- Commercial-grade smart thermostats that automatically adjust to temperatures in private units and common areas
- Space conditioning with zonal electric heat pump systems
- LED lighting throughout with integrated occupancy and daylight controls in corridors and common spaces
- Energy-efficient appliances
- Sustainable water management systems, like those outlined in our case studies. High-efficiency faucets and showerheads, low-flow toilets, and rainwater or greywater capture and reuse
- Smart features and amenities such as solar electric panels and electric vehicle (EV) charging stations

LEARN MORE ABOUT BATIK AT GREENBUILD. ATTEND THE BATIK CASE STUDY SESSION:

Creating a Carbon Copy: What Batik Can Teach us About Replicating High-Performing, Multifamily Design at a Market Rate

On Tuesday, November 1st

PREPARE FOR THE FUTURE OF MULTIFAMILY HOUSING SUSTAINABILITY

Stack House, Sitka, and Batik all prove it's both possible and profitable to achieve sustainability goals regarding energy/water usage and carbon emissions using "off-the-shelf" materials.

Remember that the building sector is responsible for about 40 percent of carbon emissions, so every change – big or small – can make an impact.

Runberg Architecture Group seeks to balance the goals of its clients with the context of the building's neighborhood while pushing for innovations in high-performing, sustainable design that creates a lasting product with positive impacts on tenants, the surrounding community, and the environment at large.

Ecotope counteracts the climate crisis with research-proven engineering and visionary leadership; we drive the building industry toward transformative and scalable low-carbon solutions, informed by four decades of learning and technical innovation. Our clients seek holistic designs that optimize energy efficiency and are in harmony with the future grid.

Greenbuild is continually looking for sustainability thought leaders in all aspects of green building and development to sponsor reports like this one. Please contact Jeff Stasko at jeffrey.stasko@informa.com to discuss options. Be sure to attend Greenbuild 2022 for more case studies and innovations.

ABOUT THE SUBJECT MATTER EXPERTS/SPONSORS

Brian Runberg, AIA, NCARB, is a principal and founding partner of Runberg Architecture Group in Seattle. Founded in 1998, the company has created vibrant and livable urban residential communities.

Sitka Apartments

Runberg and his team are credited with designing some of the nation's most energy-efficient mixed-use projects.

A champion for performance-based sustainable development, Runberg uses intelligent design to solve complex challenges. His clear, collaborative approach has earned him long-term relationships with many of the region's leading developers and has contributed to the development of more than $4 billion in mixed-use residential buildings.

In 2021, Runberg was named Designer of the Year as part of the Puget Sound Business Journal's Commercial Real Estate Leadership Awards.

Jonathan Heller, **PE**, is President of Ecotope, Inc., an award-winning research and engineering firm and leader in building research, energy strategy, and MEP design. Over the past 35 years, he has designed, researched, and consulted on energy and resource efficiency in the building sector.

As a licensed mechanical design engineer, Heller has worked with developers, architects, housing authorities, utilities, and municipalities. His integrative design approach for commercial, multifamily, and other residential projects is based on a targeted focus on energy-efficient construction and decarbonization.

Heller's recent research engages manufacturers to develop new mechanical system technologies to decarbonize the built environment. He is the technical lead for the national Advanced Water Heating Initiative commercial team and he has led Ecotope to six national ASHRAE Technology Awards for innovation and performance. Heller and Ecotope are also recipients of two LEED Project of the Year awards.

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