

# **Raising the Rent Premium: Moving Green Building Research Beyond Certifications and Rent**

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## **ABSTRACT**

Advocates for high-performing, energy efficient buildings understand the hurdles to proving the business case to spur development and investment decisions among commercial real estate owners and investors. Although there is significant evidence that green buildings exhibit increased financial performance via decreased operating expenses and non-energy benefits such as workplace comfort and employee productivity, green building practitioners still face an uphill battle when asked to prove the profits, most frequently pointing to rent premium as an indicator to attract investment.

This paper documents a recently conducted literature review commissioned by the US Department of Energy (DOE) of 39 peer-reviewed and published academic papers pertaining to green or energy-related building attributes and financial performance. The review (first published here) indicated that 27 papers found a positive correlation between green building certifications and rents. If this is the case, then why are green building development and energy efficiency retrofits not the norm for the industry? This paper first synthesizes the recent literature review to illustrate that the existing body of empirical evidence supports green building investment. Next, it describes a workshop of leading academics in real estate sustainability and finance who met in late 2017 to discuss gaps in green building research and assess data challenges in their fields. Insights synthesized the workshop were used to drive new DOE led research that can provide value and understanding to investors and builders of high performing buildings. Finally, the paper offers insights into why the market is not properly pricing building efficiency, with factors ranging from improper mitigation of risks associated with energy and lack of transparency and responsibility felt by building end users, and what further steps are needed to transform green building investment practices in the commercial real estate industry.

## **Introduction**

### **State of the Green Building Industry**

The commercial sector is responsible for 19% of all energy consumption in the U.S., and between 2012 and 2040, commercial real estate energy consumption is expected to increase by 27% (EIA 2017). In the absence of government regulations targeting commercial buildings, ENERGY STAR® and LEED have gained traction as ways to signal exemplary performance in energy efficiency and sustainability in the commercial real estate market. In 2016, over 38% of total commercial office space in the top 30 U.S. markets was certified as “green” or “efficient” (via ENERGY STAR, LEED, or another endorsement scheme), up from 37% in 2015, and

showing significant, sustained growth from 5% in 2005 (CBRE 2017). Additionally, CBRE reported that LEED covered more floor space in 2016 than 2015 despite USGBC updating their reporting methodology to remove buildings that failed to renew their LEED certification after five years (CBRE 2017). The long-term, consistent increase in certified buildings is one sign of continued and growing interest from tenants and investors in energy efficiency and sustainability in the built environment.

In spite of continued growth, green buildings still do not represent the norm for commercial real estate as a whole. During the Great Recession, with less capital on hand and much tighter focus on operating budgets, many real estate owners and operators turned to energy efficiency and sustainability as means for reducing costs and preserving profitability. A decade later, the U.S. economy is thriving, and real estate investors have eagerly returned to the market, competing aggressively assets and trading them at unprecedented prices across the country. It is conceivable that the intense, cost-saving focus on energy efficiency has been obscured in part by the abundance of activity on the market, reducing the incentive to pursue green building strategies with the vigor that macroeconomic conditions once dictated.

### **Are Energy or Green Metrics Connected to Financial Performance?**

Increased market share for green buildings in and of itself is not indicative of improved financial performance, and for several years researchers have been attempting to quantify the financial implications of green buildings on commercial real estate. We now know that high-performance buildings use less energy and resources than average buildings (Pivo and Fisher 2010), improve occupant health and productivity (Miller et al. 2009), and reduce operational and ownership risks (Pivo and An 2015). Investors and owners of commercial real estate increasingly place importance on these benefits, due to general understanding that investments in energy efficiency reduce operating costs, enhance net operating income (NOI), and yield higher rent, occupancy rates, and sales prices for green-certified office buildings (Eichholtz, Kok and Quigley 2013, Devine and Kok 2015).

Stakeholders engaged for a scoping study investigating the role of energy efficiency in commercial mortgage underwriting noted that these benefits are difficult to observe within individual portfolios (Mathew, et al. 2016). The question remains – how do we analyze other factors that maximize asset profitability, such as driving tenant renewals, increasing occupancy, shortening vacancy periods, or yielding higher rental rates and lower rental concessions? These metrics have been, and are being, explored by the commercial real estate industry, but additional data and large-scale analysis are required to generate the empirical evidence needed to truly demonstrate the value of energy efficiency in commercial real estate and justify further investment in energy efficiency and building technologies.

Further, researchers often lack sufficient historical data necessary to analyze connections between energy efficiency and financial performance, due to the proprietary nature of this information. Academics have difficulty replicating results and methodologies without availability and access to asset-level data, and are forced to expend significant time and expense matching records and scrubbing data each time analysis is performed, limiting the capabilities of extended research and collaboration.

## **DOE Efforts to Understand Links Between Financial and Energy Performance**

The U.S. Department of Energy (DOE) is interested in facilitating deeper investigation of the correlation between energy efficiency and financial performance, reducing data acquisition and matching challenges, and developing a stronger understanding of how sustainable design and energy efficiency impact value. In 2016 DOE worked with industry partners to develop resources and infrastructure related to building performance and financial data, and to catalyze further research on the relationship between sustainability, building performance, and financial benefits. Stakeholders helped to define a non-commercialized “data lab” designed to allow for large-scale investigation of asset-level trends by improving access to key data sources via aggregating information from a variety of commercial real estate organizations. DOE also commissioned a pilot research study designed to replicate similar methodologies used in prior research, and confirmed that actionable conclusions could be drawn from the data requested as part of this data lab initiative (White et al. 2017).

After executing the pilot research project, DOE in collaboration with Lawrence Berkeley National Lab (LBNL) coordinated a literature review and workshop with leading academics to analyze gaps in the existing research and develop an outline for future research projects. This paper will discuss the results of the literature review and workshop, and leverage these insights to provide recommendations for future research projects and protocols designed to determine whether high-performance buildings exhibit more desirable financial performance than their non-green peers.

## **Literature Review**

For the past several years, DOE has been working with industry partners in commercial real estate to catalyze further research on the potential links between energy-efficient/high-performance buildings and their financial performance. Having received input from these key stakeholders, DOE commissioned a literature review of the research that has already targeted the industry’s questions with the goal of using these insights to guide future research projects. To initiate this process, DOE requested feedback from leading academics to identify peer-reviewed papers that should be included in the literature review.

The 39 peer-reviewed papers identified by these academics yielded considerable evidence that green building certifications correlate with increased economic value, primarily via higher rents and sales prices. Estimated rental premia were generally around 5% for LEED and Energy Star certifications, but in some cases ranged up to 20%; sale price premia were generally a bit higher than the rental price premia. None of the 27 studies that addressed these variables revealed convincing evidence contradicting this phenomenon. Less clear is whether the underlying features contributing to those certifications (i.e., green features such as energy and water efficiency) were responsible for the effects or whether the designations and labels themselves drove the added value. Both seemed to play a role (Bond and Devine 2016; Eichholz, Kok and Quigley 2010; Reichardt 2014). Relatedly, one study found higher rents only in labeled buildings with net leases (Reichardt 2014), while another found these increased rents in both gross- and net-leased buildings (Szumilo and Fuerst 2015). Szumilo and Fuerst also observed that rent premiums correlated with higher ENERGY STAR scores within the subset of those buildings certified with the label (i.e., within buildings scoring between 75 and 100). However,

when energy performance itself was investigated in the absence of certification, two studies found no measurable increase in market value (Fuerst and McAllister 2011a; Gabe and Rehm 2014) and one found it only in low- and mid-value properties but not in high-value ones (Robinson and McAllister 2015).

Also observed were subtler effects, such as a potentially declining premium over time, at a broad scale across markets (Eichholz, Kok and Quigley 2013; Szumilo and Fuerst 2015), possibly due to increased supply (Chegut, Eichholz and Kok, 2013), and even within given buildings over time (Fuerst, Wyatt and van de Wetering 2013). Some found that premiums appeared to vary across geographies (Eichholz, Kok and Quigley 2010), building values (Robinson and McAllister 2015), or even prevailing political ideology (Harrison and Seiler 2011). Interestingly, a few studies found that certification might offer a hedge in declining markets (Das, Tidwell and Ziobrowski 2011; Eichholz, Kok and Quigley 2013; Das and Wiley 2014; Fuerst and van de Wetering 2015). The results were mixed as to the market advantages of increasingly higher levels (e.g., Gold vs. Silver) of LEED certification (Fuerst and McAllister 2011c;) and the relative value of LEED versus ENERGY STAR (Fuerst and McAllister 2009; Fuerst and McAllister 2011c; Reichardt 2014).

Some studies looked at indicators of value other than rents and sales prices. Many revealed increased occupancy rates in certified buildings (Miller, Spivey, and Florance 2008; Fuerst and McAllister 2009; Kok, Miller and Morris 2012; Reichardt et al. 2012), though a few showed mixed results in this regard (Fuerst and McAllister 2011b; Robinson, Singh, and Das 2016). Several papers found that green buildings had lower capitalization rates (Eichholtz, Kok, and Quigley 2013; McGrath 2013;), i.e., that they were fetching higher prices than buildings with identical net operating incomes. Two others observed somewhat better financial performance of real estate firms investing in green buildings (Pivo and Fisher 2010) and, perhaps relatedly, lower default risk of these buildings (Pivo 2013). One found better self-reported worker productivity (Miller et al. 2009) in labeled buildings.

The literature review also revealed some insight into which variables are receiving focus in the literature and which areas could be explored more deeply. Not surprisingly, at least for U.S.-based journals, ENERGY STAR and LEED certification received most of the attention. Perhaps less predictably though, office buildings -- as opposed to all other types -- were the focus of most of the studies, with a disproportionate emphasis on Class A office space. Regarding value indicators, rent, price, and occupancy rate received almost all of the attention, to the near exclusion of such measures as capitalization rates, appraisals, and other measures. Table 1 offers a frequency matrix of the findings among the 39 papers.

Table 1. Frequency of findings across the 39 studies. Darker shades represent higher frequency.

	LEED	ENERGY STAR label	ENERGY STAR score	Energy use	BREEAM	Energy Performance Certificates (UK)	BOMA BEST	Walkability	Non-energy green features	Other
Rent	20	18	1	2	2	2	1	1	1	
Rent concessions	1	1					1			

Sales price	9	11		1	1			1		1
Assessed value	2	2								
Market value	1	2				1		2		1
Occupancy	10	9					1			
Lease renewals	1	1					1			
Service charge						1				
Operating cost	2	3								
Energy cost	2	3								
Tenant satisfaction	1	1					1			
Sales time	1	1								
Default rate								2		1
Capitalization rate	1	2						2		1
Net operating income		1						1		1
Loan to value ratio								1		1
Debt service coverage ratio								1		1
Worker productivity	1	1								
Other	5	4				1		4	2	2

Omitted variables are a potential issue for some studies reviewed. In particular, certified buildings tend to also offer other desirable features, such as higher-quality finishes and furnishings, and some studies did not or could not address this issue, often due to data limitations. The literature recognizes this potential shortcoming and has moved to address it over time. Some more recent studies employ richer datasets that include control variables for many of these features. Still, there is room for further work ensuring that measured effects reflect certifications or energy features *per se*, and not their correlates. Relatedly, the strategies employed by the literature were generally correlative and not causal. Moreover, perhaps because the literature has roots in the hedonic pricing literature, most of the econometric methods employed were cross-sectional (at times pooling data generated at different times), despite the apparent availability of time series data for some studied markets that could help control for latent time-varying factors. There is room for greater use of both panel data and quasi-experimental methods to further test the findings of the literature thus far.

## Moving Green Building Research Forward

### Gaps and Opportunities for New Research Areas

The Building Technologies Office (BTO) at DOE recently sponsored a workshop that brought together LBNL and a group of 16 real estate sustainability and finance academics to discuss gaps in green building research, assess data challenges in their fields, and prioritize future research areas. The workshop was facilitated by LBNL and hosted at University of North Carolina, Chapel Hill, beginning with an in-depth review of the literature described in the previous section of this paper.

During the workshop, LBNL facilitated a discussion about prioritizing future research designed to both fill gaps in the current literature and overcome limitations in available data.

While many studies address the potential benefits of green buildings, due to data limitations they are not able to analyze capital expenditures, or a firm's cost of capital for green construction or energy efficiency renovations. Given that current literature predominantly addresses new construction and Class A buildings, which are highly traded and prime market office properties, the impact of certifications like LEED has not been fully explored for existing buildings and different building classes such as multifamily or retail.

Researchers agreed this area of study would benefit from a panel data approach, looking at the longitudinal impact of energy and green building features on financial performance. Workshop participants also discussed the issue of data endogeneity in the current stock of green buildings: firms that make the decision to apply for green building certifications may be a self-selecting sample whose behaviors cannot be applied to the entire industry.

## **Market Transformation Mechanisms Beyond Research**

### **Data quality, access, and matching**

From a research perspective, the commercial real estate industry is certainly not lacking in data availability. An abundance of service providers collect or generate data at the property level for various business reasons. These include brokers, appraisal firms, property management companies, accounting and billing platforms, and recently, sustainability benchmark surveys (CREDA 2017). To capitalize on this, numerous commercial real estate (CRE) data providers have emerged who curate a variety of building-level information. However, multiple discussions with building owners and real estate academics have reiterated that the major challenges are data quality and the level of transparency for researchers. These data sets are typically not comprehensive, as each usually lacks some key fields. They may have small sample sizes in limited markets, or do not track far back enough in time. As such, research will often require the use of multiple data sets and a process for cleaning and matching them.

Despite this abundance of data, access to individual data sources for academics is a major challenge. Data providers employ a “pay to play” model of data access, often only permitting individual researchers access on a case-by-case basis and, at times, at high costs. Vendors often harvest their data from participating owners or managers and are concerned about compromising the confidentiality of their data contributors. To overcome this, data providers who agree to work with academic researchers require the signing of a non-disclosure agreement (NDA). Because NDAs are granted individually, every researcher granted access to a specific source must individually invest resources in cleaning raw data – using up valuable research time and limiting opportunities to collaborate with others and scale prior research.

There is a notable effort at the University of North Carolina's Kenan Institute of Private Capital to find solutions toward data parity with other investment asset classes. The Commercial Real Estate Data Alliance (CREDA) is a working group of about twenty academics in the field striving to identify possible approaches to overcoming commercial real estate data challenges. Last year the group attempted to identify and catalogue the data available from several commercial and non-commercial institutions. The goal of this effort is to create a key that can allow these datasets to be matched and used together, adding value for the users of the data and vendors alike (CREDA 2017). The group plans to conduct a pilot with this key on a small population of buildings to match several datasets from various data providers. If the key is

successful, they will expand the matching effort to a set with more buildings, which will then yield a large dataset that can be used for further research efforts.

Separate from this initiative, DOE with support from the Pacific Northwest National Laboratory (PNNL) is looking to solve a critical challenge for disparate dataset matching by creating a Unique Building Identification (UBID) protocol (PNNL 2018). As previously mentioned, the current methods for address-matching different datasets involves lengthy data scrubbing processes and often yields low match rates, rendering large portions of data unusable for research purposes. The new UBID protocol will provide a standardized framework under which a unifying field is used to match building data from various sources to a single object, creating an identifier similar to a vehicle identification number (VIN). This system will reduce the risk of mismatched or unmatched data, easing the burden for data exchange for buildings research and other needs for referencing properties. DOE is currently working with several municipalities to pilot the system on public sector buildings.

## **Transparency**

In recent years, numerous jurisdictions in the U.S. have enacted building benchmarking and transparency policies. Benchmarking by measuring a building's energy use and then comparing it to the average for similar buildings allows owners, governments, and the public to understand their buildings' relative energy performance. Consistent benchmarking and subsequent disclosure where the information is shared publicly can result in operational and behavioral changes in building management, and increased investment in energy efficiency (Hart 2015). As of March 2018, benchmarking policies are covering more than 10 billion square feet of floor space in major real estate markets in the U.S (Hart 2015). As data from these policies are gathered and analyzed, their analysis can inform policy and program development for jurisdictions to target the most inefficient buildings in their area.

While benchmarking disclosure policies may increase transparency for policy makers and building owners/managers, they typically have lower impact on the building occupant, thus the common consumer does not have insight into the benefits of building efficiency. Select markets such as New York City and Chicago are attempting to address this by requiring large buildings to display an A-F letter grade or star rating similar to restaurant health grades to represent their energy performance to renters and buyers, a strategy that is employed in the European Union (Unger 2017). For most building occupants awareness of energy efficiency remains low. The incremental impacts of reduced energy costs and improved building operations on their daily lives is often low, and the benefits are difficult to see and appreciate.

## **Risk and Valuation**

A critical reason that energy efficiency is not properly priced in today's real estate market is the fact that real estate transactions, including key components such as mortgage underwriting and valuation, do not fully account for energy factors. This is somewhat striking given the impact of energy costs and volatility on building owners' net operating income (NOI). Nonetheless, energy efficiency is not properly valued and energy risks are not properly assessed and mitigated (Jaffee et al. 2013, Mathew et al. 2016a).

LBNL, in collaboration with UC Berkeley Haas School of Business, has shown through a unique data set merging building-level energy use data from benchmarking ordinances with

financial data from commercial mortgages that source energy use intensity (EUI) and electricity prices are statistically and economically associated with commercial mortgage defaults. They have also shown through simulation studies of five actual buildings that variations in source EUI could raise or lower the default rates between 5 and 40%, depending on property type and geography (Mathew et al. 2018). They propose a simple energy risk score that lenders could use to assess their energy exposure during the underwriting process. These scores could also provide a market signal for incentivizing energy efficiency investments through commercial lending.

Finally, DOE has explored the role that energy performance and green features have in commercial building appraisals and valuation. The majority of current appraisal practice does not consider energy performance, though there are several potential interventions that could ensure that energy is properly incorporated (Alschuler et al. 2016). Appraisals are used to determine the building value for mortgage lending purposes, ownership groups' internal valuation purposes, and in the due diligence process for asset acquisitions. Energy-related equipment and performance are relevant and can affect value and risk positively or negatively for all buildings, not just "green" ones. But regulatory and market changes over the past 40 years have led to increased commoditization of appraisals and greater standardization of appraisal documents. This, combined with an aging and more skeptical workforce, creates a difficult environment in which to introduce change (Alschuler et al. 2016).

Yet opportunities to easily incorporate energy and green factors exist throughout the existing appraisal process. The DOE Better Buildings Alliance has been working to raise awareness among building owners to include energy information for high performance buildings in their scopes of work for valuation. Building owners should also make requests for energy-trained practitioners, generating demand for competent appraisers capable of valuing green/HP features (Alschuler et al. 2016). On the education front, DOE worked with influential members of the appraisal industry to develop the *Energy Matters!* training course specifically for commercial appraisers to advance their expertise in analyzing energy characteristics and apply their knowledge in the three approaches to valuation (Earth Advantage 2018).

## **Next Steps: Catalyzing New Research and Industry Action**

### **Collaboration with the Real Estate Research Institute (RERI)**

Following on momentum from the academic workshop, DOE explored several avenues to fund nascent research on the priority areas described in prior sections, one being a partnership with the Real Estate Research Institute (RERI). RERI is a non-profit organization whose mission is to stimulate high-quality research using analytical techniques around real estate investment performance that can be applied to real estate investment decision-making. DOE became aware that RERI funds an annual request for research proposals across major real estate themes. As data access and transparency is a key challenge for academics in this space, RERI partners with a large number of third-party data providers who agree to give access to their data to selected grantees to use for the scope of the project. Each spring, RERI invites the award winners to present their findings to a mixed audience of real estate academics and industry representatives who are keen on understanding new data trends and findings. Each presentation is followed by an industry interpretation from a mentor who describes the relevance to investment decision making and potential impacts to the market.



Because RERI's mission aligns closely with the type of research DOE and market partners have prioritized, DOE was eager to explore a collaboration that would catalyze research around energy metrics and financial performance of commercial buildings. Based on their experience working with market stakeholders in the buildings space, LBNL was directed to develop a scope of work with RERI where a special request for proposals (RFP) would be advertised to RERI's large network of academic researchers. LBNL took into consideration the literature review findings and priority setting with academics at the UNC workshop when crafting the RFP language. As of the writing of this draft, the RFP with RERI has just been published with a proposal deadline of mid-April 2018. Details about which awards were selected, their project objectives, and potential impact for the industry will be included in the final draft of this paper.

## **Industry actions**

Research can only go so far in influencing the decision making behind capital improvements. Those in the energy efficiency industry know full well that making the business case for energy efficiency technologies is far more arduous than more aesthetic capital investments, such as a marble lobby. It is worth noting, however, that within the past decade a number of commercial real estate industry groups have formed to foster information exchange around energy efficiency and sustainability strategies.

The DOE Better Buildings Initiative collaborates with commercial building owners and managers to share energy efficiency success strategies and recognize market leaders who have set challenge energy reduction goals across their portfolio of buildings. The Commercial Real Estate steering committee is comprised of twelve owners and managers who meet to offer insights on industry trends and challenges and to assist DOE annually in setting priorities for tackling barriers to energy efficiency implementation for real estate. The steering committee works closely with the Better Buildings Market Solutions teams, comprised of DOE's national lab scientists and sustainability consultants, to create solutions for non-technology related barriers to adoption. In the past few years, these groups have focused on energy in commercial mortgages, brokerage, appraisal and valuation, leasing and tenant energy efficiency, and broader research efforts (BBA 2018).

Several influential real estate industry groups have recently engaged with Better Buildings and LBNL to present on market-related resources and efforts to work with the real estate industry. The National Association for Real Estate Managers (NAREIM) provides a forum for education for its member firms that range in size from half a billion to over \$100 billion in managed assets. For the past two years, NAREIM has hosted a Sustainability & Investment Management meeting for investment managers to share sustainability initiatives and insights. The National Council of Real Estate Investment Fiduciaries (NCREIF) is an association of institutional real estate professionals and organizations involved in real estate pension fund investments. DOE and LBNL were invited by both groups in 2018 to present on research and appraisal efforts.

With regard to properly evaluating energy risk in real estate transactions, the government-sponsored multi-family lending enterprise, Fannie Mae, is paving the way as an industry innovator with its green financing program. Fannie's green loans are secured by multi-family properties with 20% or greater reductions in energy or water consumption. Over the past

few years, Fannie's Green Financing program has been one of the most competitive and robust players in the commercial real estate industry, with an issuance of over \$10 billion in the first half of 2017 (Croce 2017). While it is still a nascent market, Fannie's success should eventually make its way through the CRE food chain and influence other investment decision makers to focus on energy in a similar manner.

Since real estate is a multitrillion dollar market, those who invest in real estate are a considerable lever of influence for market transformation. The Global Real Estate Sustainability Benchmark (GRESB) is a reporting platform and portfolio benchmark report targeted for an investor audience, featuring survey questions asked of real estate companies that cover environment, social, and governance (ESG) topics overall. The goals of the benchmark are trifold: to benchmark a company's ESG performance, to determine actions that will produce the greatest returns, and to communicate sustainability messages to investment decision-makers (GRESB 2018). In the 2017 GRESB Assessment, 850 property companies and real estate funds worldwide completed the survey, representing 77,000 assets with a value over \$3.7 trillion combined. The survey has made great strides in North America, a region which historically has lagged in sustainability and environmental metrics compared to European counterparts. Over 200 companies completed the benchmark in 2017, with more than 90% reporting that their organizations had data management systems in place to measure energy and water consumption across their portfolios. In 2012, that figure was less than 25% (Borchersen-Keto 2017).

Finally, it is worth mentioning the growing role that climate change and natural disaster mitigation is having on real estate investment and financing. Academic studies are starting to document the negative impact of sea level rise (SLR) on home valuation, with homes exposed to SLR selling at a 7% discount relative to equivalent unexposed properties equidistant from the beach (Bernstein et al 2017). National Real Estate Advisors, a real estate investment entity with \$5.3 billion in gross assets under management, has stated that it will no longer invest in South Florida properties. Its decision was based on findings from an analytic tool that evaluates portfolios using catastrophic risk models typically utilized by insurance companies (Kanne 2017).

## **Conclusion**

The green building industry and research around it has come a long way in the past decade. There exists a strong body of research showing that buildings with green building certifications command higher rent and use less energy and resources. Less is known about the effects of certification on existing buildings, market segments beyond Class A office, and tenant decision making, as well as the underlying energy and building performance impacts on financial value. Building owners, decision makers, and academics alike agree that additional insights are needed, but that the proprietary nature of CRE data is a major impediment to conducting research. DOE and LBNL are developing efforts to increase transparency and information exchange for research, and a new collaboration between LBNL and RERI will yield new research projects in prioritized areas in the next year. More research, however, can only move the needle so far. Many industry groups are working to engage stakeholders on energy and sustainability benchmarking, share information, and better understand the connections between green, energy, and value.

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