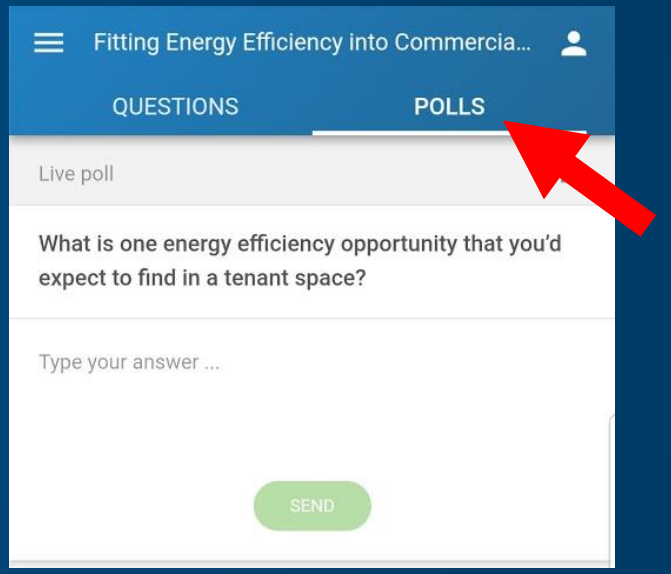
Welcome!

Please take a moment to answer our poll.

“What is a major barrier for commercial tenants in pursuing energy efficiency?”



Navigate to **Slido.com** > Polls.

Event code: **#CTP**

Wi-Fi: BEEx-Guest (no password!)

Tenant Focus:
Fitting Energy Efficiency into Commercial Tenant Fit-Outs
(The How & Why)

Sophie Cardona, NYSERDA
Kelly O'Connell, ERS
Dr. Anastasia O'Rourke, IEc

Program purpose.

Work with commercial landlords and tenants to optimize performance of tenant spaces by:

- Integrating energy efficiency in office space design
- Providing options to maximize wellness, space usage, and productivity
- Providing relevant technical support to help tenants make well-informed design choices
- Promoting employee satisfaction and engagement

Offering details.

- **Funding for energy studies in tenant spaces: up to 100% of the cost of the energy analysis**
  - ECM recommendations
  - Financial analysis
  - All levels of investigation, depending on scope
  - Capped at 50K per project
- **Tenants and building owners are eligible**
- **Total program funding: $5.75M**
  - First-come, first-serve
  - Office spaces only
  - SBC contribution required (electric)


Etsy


CK
Calvin Klein


PAUL
HASTINGS


Tarter
Krinsky
&Drogin


GLOBAL BRANDS
GROUP


IPG
Interpublic Group


citi


The Durst
Organization


JLL


WHITE & CASE


DCD


JPMORGAN CHASE & CO.


Rudin Management
Company, Inc.


VORNADO
REALTY TRUST


GEORGE COMFORT & SONS, INC


TOMMY HILFIGER


Normandy


CohnReznick


MetLife


RXR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Gensler


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GREATER
HUDSON BANK


BROWN
BROTHERS
HARRIMAN


SURDNA
ANDRUS


SURDNA FOUNDATION
Fostering sustainable communities in the United States

About Me:

Kelly O'Connell

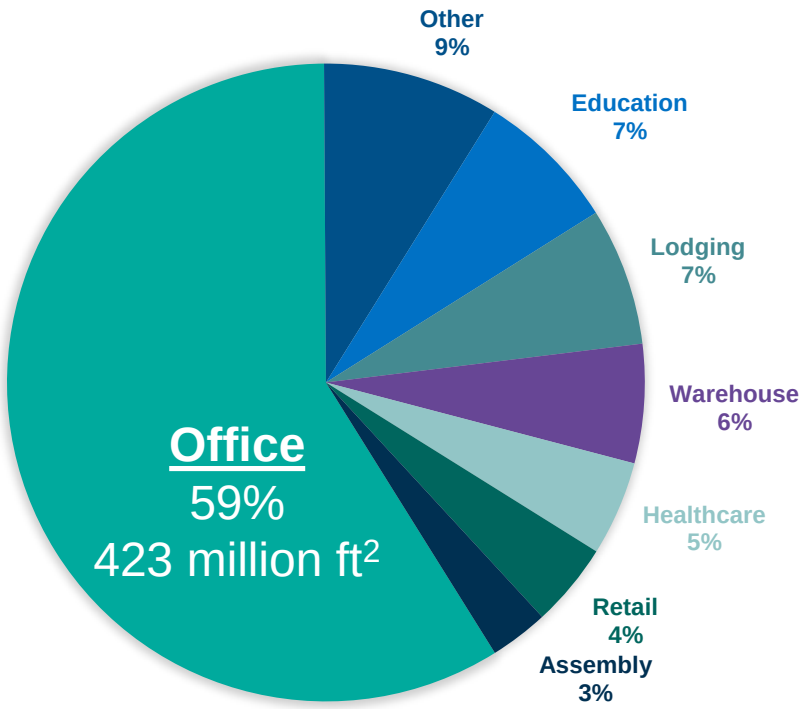
- Project Engineer II for ERS
- 3 years of experience in the energy efficiency industry
- Focus on outreach & program evaluation for NYSERDA + CT, MA, NH, and CA
- Manage ERS metering equipment efforts
- BS in Civil Engineering from Northeastern University
- President of Engineers Without Borders–Northeastern, including trips to Uganda & Honduras to install water distribution systems

Agenda

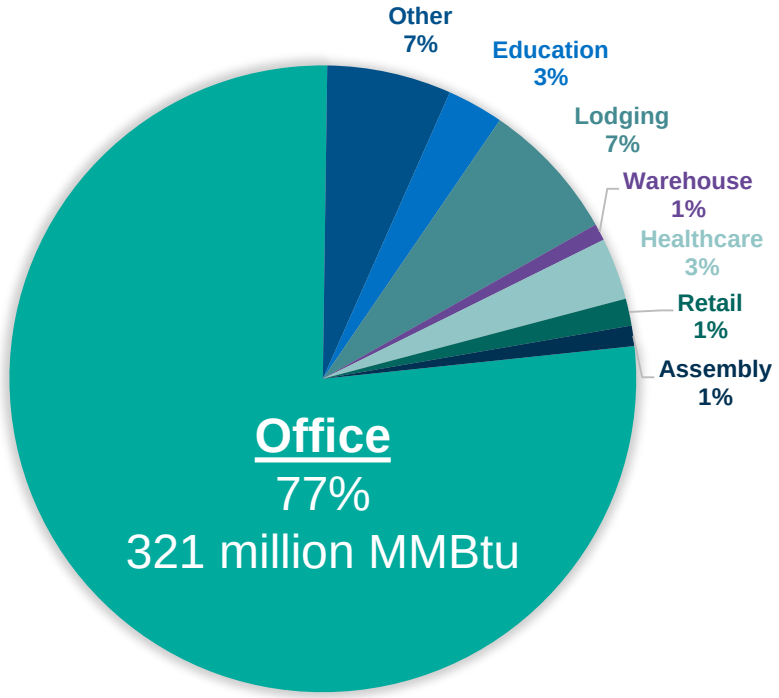
- Accessing the program
- Market potential
- Mythbusting
- Unique tenant measures
- Break (15 min.)
- Financial analysis
- Presenting your findings
- Q&A
- Recap & reflection

COMMERCIAL OFFICES HAVE MAJOR MARKET POTENTIAL.

NYC SQUARE FOOTAGE



ENERGY USE (MMBTU)



Source: NYC LL84 Benchmarking (Residential property removed)

Poll on Slido.com

Q What is a major barrier for commercial tenants in pursuing energy efficiency?

Which of these statements sound familiar?

MYTHBUSTERS

"As a tenant, our energy use is only a small portion of the whole building's."

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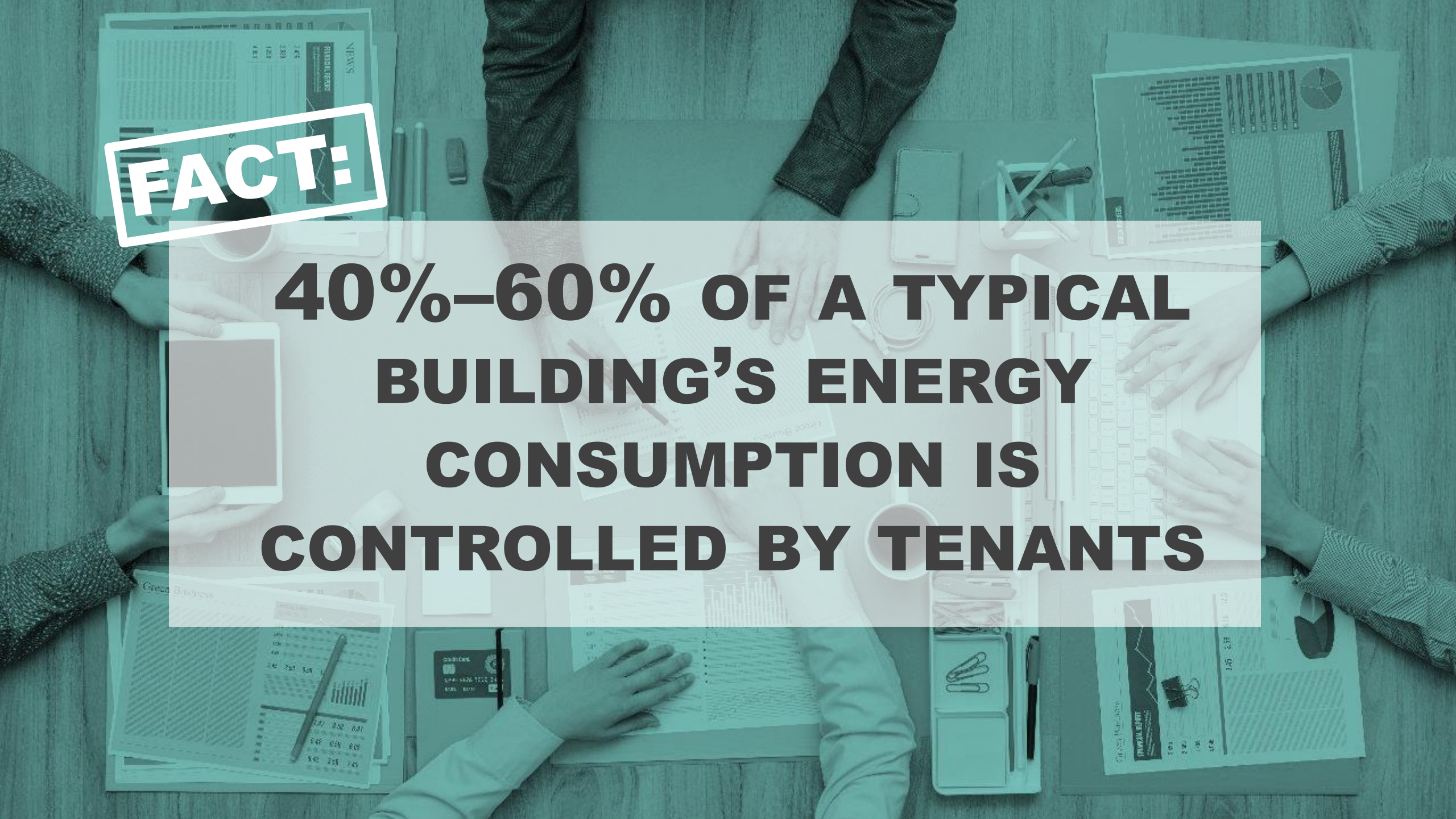
FACT:
40%–60% OF A TYPICAL BUILDING'S ENERGY CONSUMPTION IS CONTROLLED BY TENANTS

MYTHBUSTERS

"Sustainability is not our top priority."

"Energy efficiency doesn't work for my company. It cramps our style."

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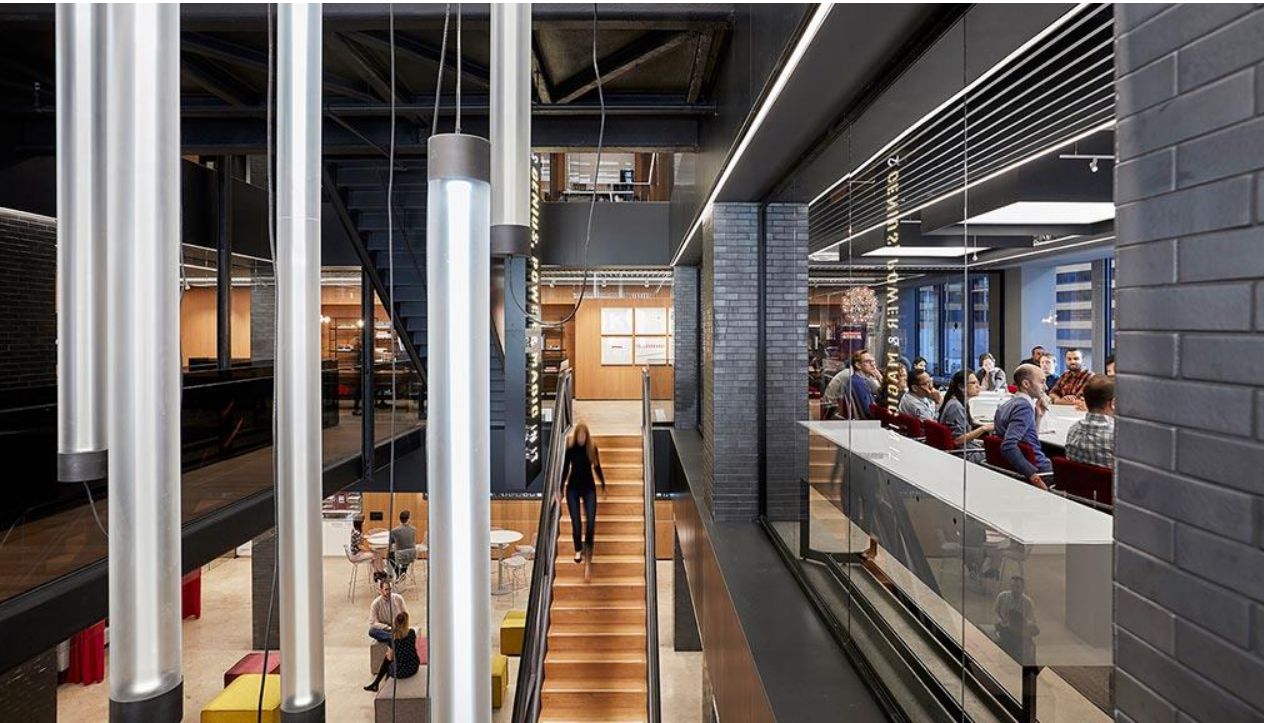
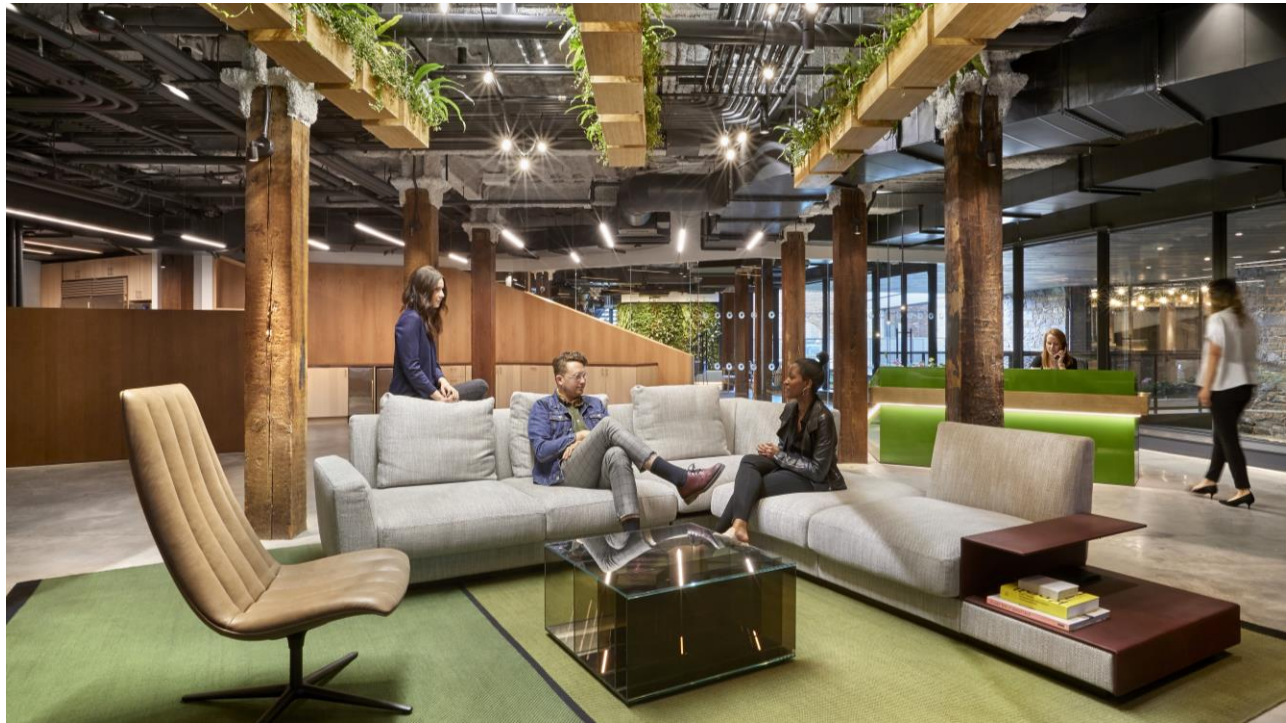
FACT:

Energy efficiency and design go hand-in-hand. Mindful design balances productivity, sustainability, and style.





MYTHBUSTERS

"It will take too long for payback to justify the initial investment."

"Landlords see most of the benefits from EE, not tenants."

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FACT:

There are many no- and low-cost measures available.

TENANT SAVINGS PACKAGE OF MEASURES Individual Energy Performance Measure (EPM)		MEASURE TYPE	DAY ONE COST $ (indicative)	ESTIMATED SAVING FUEL MBtu/yr	ESTIMATED SAVING ELEC kWh/yr	ESTIMATED SAVING ($) Per Year	ESTIMATED SAVING ($) 16yr Total	INCREMENTAL % SAVING vs Baseline
GOOD (LOW DIFFICULTY &/or HIGH IMPROVEMENT)			**$245,000**	**0**	**304,137**	**$60,827**	**$973,234**	**10.4%**
1.1	High efficiency LED lighting (as designed)	PLANT	$162,500	0	30,386	$6,077	$97,233	1.0%
1.2	Efficient tenant HVAC and motors (as designed)	PLANT	$82,500	0	136,920	$27,384	$438,147	4.7%
1.3	Lighting controls (reduce OS/VS delay to 15 minutes, as designed)	PROCESS	$0	0	136,831	$27,366	$437,854	4.7%
BETTER (MEDIUM DIFFICULTY &/or MEDIUM IMPROVEMENT)			**$268,000**	**0**	**1,349,490**	**$269,898**	**$4,318,366**	**46.0%**
all EPMs from Good Package (above); plus:			**$245,000**	**0**	**304,137**	**$60,827**	**$973,234**	**10.4%**
2.1	Virtualized servers (reducing computer room from 54kW to 18kW)	PLANT	$0	0	435,274	$87,056	$1,392,897	14.9%
2.2	Energy Star equipment (25% reduction in equipment power)	PLANT	$23,000	0	178,139	$35,626	$570,023	6.1%
2.3	Reduce occupancy to regular business hours (turning off HVAC at 6pm)	PEOPLE	$0	0	364,408	$72,882	$1,166,116	12.4%
2.4	Equipment power management (sleep mode as default)	PROCESS	$0	0	67,532	$13,506	$216,097	2.3%
BEST (HIGH DIFFICULTY &/or LOW IMPROVEMENT)			**$448,000**	**0**	**1,555,748**	**$311,149**	**$4,978,388**	**53.1%**
all EPMs from Good and Best Packages (above); plus:			**$268,000**	**0**	**1,349,490**	**$269,898**	**$4,318,366**	**46.0%**
3.1	Raise comfort cooling set-point temperature (2F increase)	PEOPLE	$0	0	17,361	$3,472	$55,559	0.6%
3.2	Enhanced LED Lighting	PLANT	$0	0	74,569	$14,914	$238,624	2.5%
3.3	Enhanced Lighting Controls (reduce OS/VS delay to 3 minutes)	PROCESS	$0	0	31,444	$6,289	$100,620	1.1%
3.4	Automatic receptacle control	PLANT	$180,000	0	80,538	$16,107	$257,710	2.7%
3.5	Raise computer & IDF room cooling set-point temperatures (4F increase)	PROCESS	$0	0	2,345	$469	$7,509	0.1%
		Total:	**$448,000**	**0**	**1,555,748**	**$311,149**	**$4,978,388**	**53.1%**
			No Cost Measure Total:		**1,055,195 68%**	**$211,041**		

FACT:

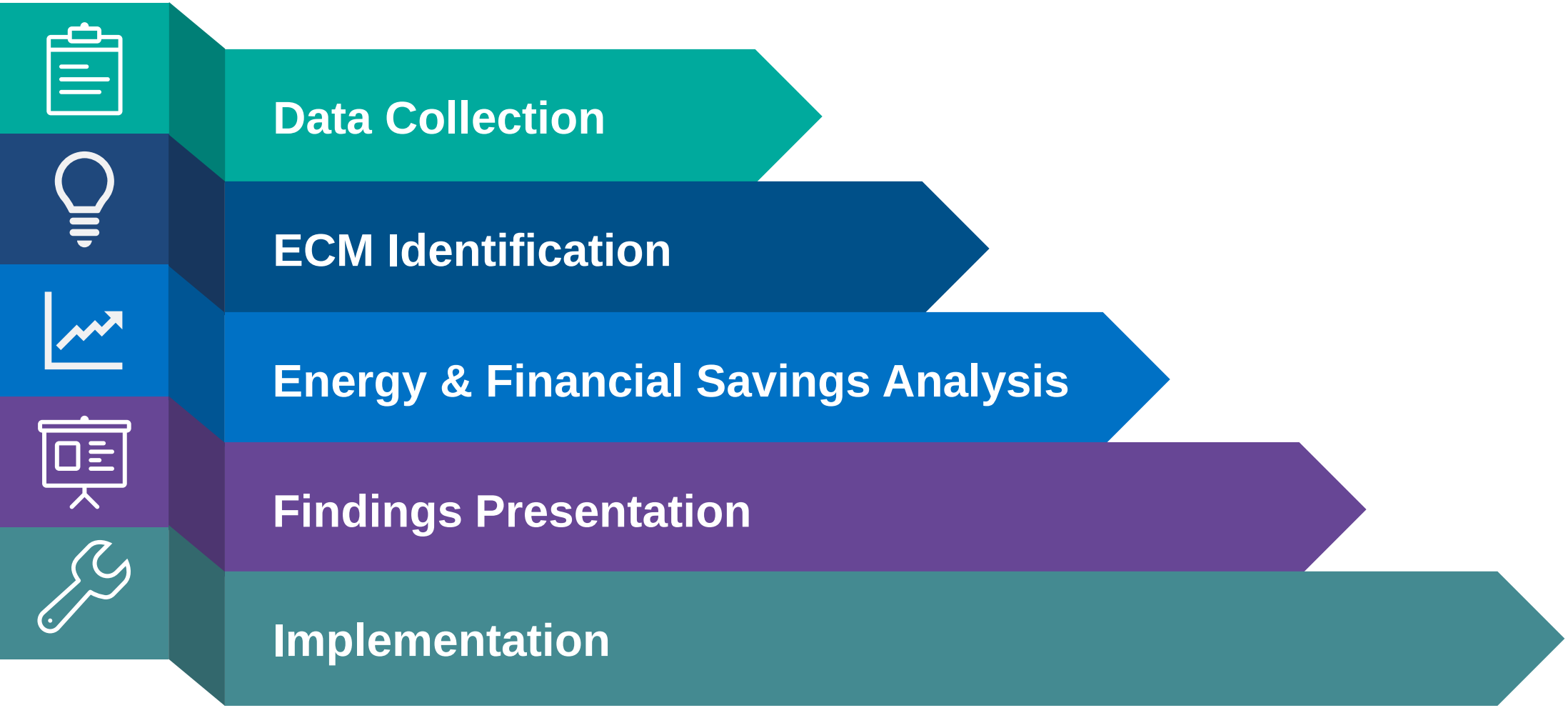
Indoor Air Quality has major impacts on cognitive function.

Cognitive performance scores for the participants who worked in the green+ environments were, on average, **double** those of participants who worked in conventional environments; scores for those working in green environments were **61% higher**. Measuring nine cognitive function domains, researchers found that the largest improvements occurred in the areas of:

Cognitive Function	Green Building	Green + Building
Crisis response	+97%	+131%
Strategy	+183%	+288%
Information usage	+172%	+299%

Study conducted by Environmental Health Perspectives, 2015.

The Audit Process



What are the energy efficiency opportunities?

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Energy Efficiency Measures

- High-efficiency lighting
- Daylight harvesting and controls
- Equipment power management
- ENERGY STAR equipment
- IT virtualization
- Automatic shade controls
- Window film
- Occupancy/vacancy sensors
- Temperature set points & thermostats
- High-efficiency HVAC equipment (HVAC, motors, VFDs, data centers)
- Demand-controlled ventilation
- Automated BMS
- Space utilization/optimal layouts
- Reduce occupancy outside of business hours
- Sub-metering
- Third-party commissioning

Unique Measures to Consider

Equipment

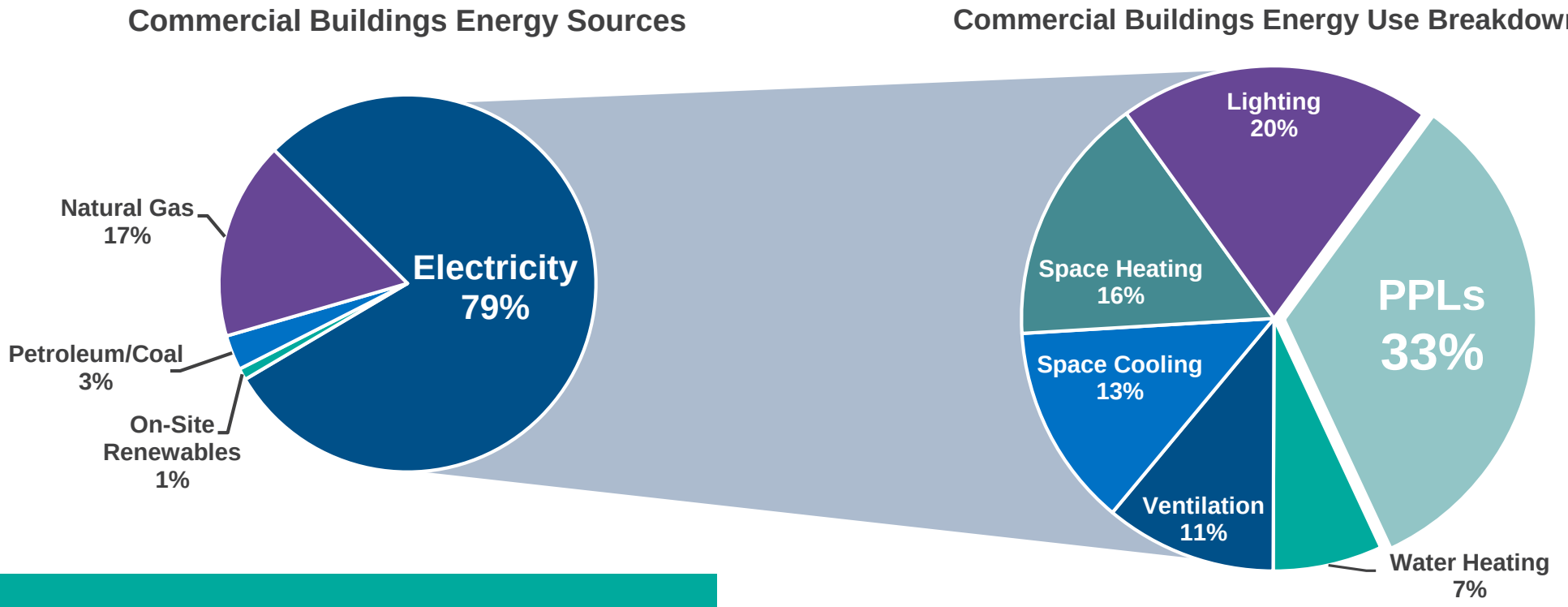
Upgrading to energy efficient devices, lights, motors, etc.

Behavior

Changing employee habits to reduce waste and increase awareness.

Process

Small deviations from “business as usual” practices have major impacts.



Addressing the Vampire in the Room

- Plug and process loads (PPLs) account for 33% of commercial building electricity consumption.
- Plug load management is becoming increasingly important for energy efficiency.

Source: NREL

Plug Load Management

	Advanced Power Strips (APS)	Receptacle Control
Master controlled	Tier 1 power strips ▪ Controlled peripheral outlets are turned off when master device is turned off. 	Smart plugs ▪ Remotely monitor, control, and analyze plugs loads. 
Occupancy sensing	Tier 2 power strips ▪ Power strip looks for signs of activity and turns off outlets if no activity is detected. 	Receptacle controls ▪ Control plug loads through building management systems. 

Estimating Tier 1 APS Savings

$$\Delta kWh = units \times \begin{bmatrix} \Delta kW_{wkday} \times (hrs_{wkday} - hrs_{wkday-open}) \\ + \\ \Delta kW_{wkend} \times (hrs_{wkend} - hrs_{wkend-open}) \end{bmatrix} \times \frac{8,760}{168}$$

Where,

ΔkW_{wkday}	=	0.0315
ΔkW_{wkend}	=	0.0067
hrs_{wkday}	=	106
hrs_{wkend}	=	62

Example:

- 100 employees in office
- 1.2 strips/employee
- 12 hour weekdays + 5 hour weekends
- 95 kWh/strip saved

= **11,456 kWh/yr saved**

Source: NY TRMv6

Plug Load Management Case Studies

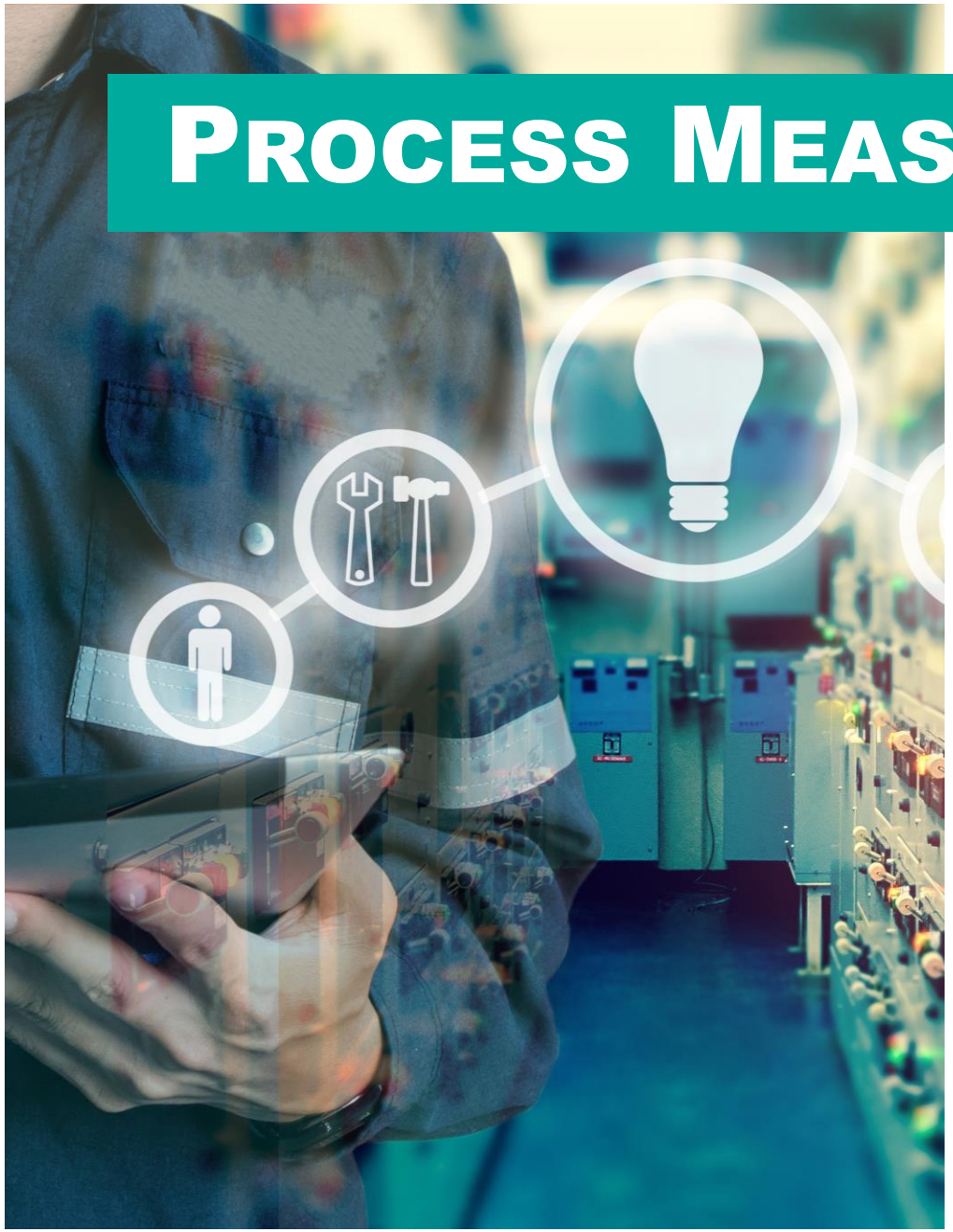
Plug Load Management Measures	White & Case Law Firm		Gensler Architecture Firm	
	kWh Savings	% Savings	kWh Savings	% Savings
ENERGY STAR equipment	520,191	6%	185,313	34%
Equipment power management (sleep mode as default)	333,746	4%	49,474	9%
Automatic receptacle control	211,352	2%	179,632	33%
Total	**1,065,289**	**12%**	**414,419**	**76%**

Remember: Coupling measures increases overall savings but decreases individual savings.

Behavior Measures

Case Study: Paul Hastings

Implemented Measures	Benefits
▪ Open cubicles & communal workspace around perimeter	▪ “Premium real estate” available to more staff
▪ Glass-walled offices occupy interior areas	▪ Natural daylight fills entire floor, not just executive offices
▪ Encourage after-hours work in designated communal areas	▪ Reduce HVAC and lighting hours in unoccupied spaces



Process Measures

Its All About Controls

- Raise setpoints
- Reduce occupancy sensor timing
- Networked lighting controls
- Default computer settings
- Third-party commissioning

Data to Collect

Determine lease type & discuss relationship with landlord/ building manager

- Gross lease
- Net lease
- Modified gross lease

Data to Collect: Whole Building

- Heating fuel (gas, electric, fuel, district steam)
- HVAC systems (type, configuration, capacity, age, control strategies)
- Thermal envelope details (insulation, window types, window coverings)

Data to Collect: Tenant Space

- Square footage (by space type)
- Operating hours (business and realistic hours)
- Team placement (Who works late? Do they sit near each other?)
- Plug load types & quantities (computers, monitors, printers, task lighting, projectors, break room devices)
- Employee preferences (bright/dim, warm/cool, noisy/quiet)
- HVAC systems (type, configuration, capacity, age, control strategies)
- Lighting technology & controls (sensors, daylighting)

Analysis Toolbox

Technical Reference Manual

Algorithms for estimating variety of deemed measure savings

ENERGY STAR

Wide variety of resources: certified appliances, savings calculators, portfolio benchmarking, etc.

Plug Load Tool

In-depth spreadsheet tool to guide data collection & savings estimation

DesignLights Consortium

Live database listing tested & certified LEDs

Break

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About You. Raise your hand if...

About Me: Anastasia O'Rourke

- Almost 20 years working in sustainability, starting with the Sydney Olympics "Green Games"
- BA from Sydney University, MSc from Lund University, and PhD from Yale University
- Senior Consultant with Industrial Economics, Inc. in Cambridge MA www.indecon.com
  - Valuation
  - Evaluation
  - Program Design
- My focus is on sustainability and energy: program strategy and evaluation.
- Clients include: GSA, EPA, NYSERDA, California Energy Commission, Microsoft, Samsonite, Dunkin', UN Environment Program, others.
- Taught courses in making the "business case" for sustainability

IEc

What is Value?

Value = Benefit – Cost

Financial Value, Non-Financial Value, Societal Value

What is a "Value Proposition"?

A clear statement of how your service adds value and solves a problem for the client.

Building an Effective Value Proposition

1. First rule of Building Value: It's not about you!
2. Understand who are your clients, what are their goals, and who makes the decisions?

→ Building owners

→ Tenants

→ Consultants/contractors

→ Brokers

Typical Steps For Tenants

1 Pre-Lease

- Select team
- Select office space
- Negotiate lease

2 Design/Construction

- Design
- Commissioning
- Specification
- Procurement
- Build out / construction

3 Occupancy

- Move in
- Maintain equipment
- Use space
- Retro / continuous commissioning
- Expire lease (start over)

Adapted from: ULI Tenant Optimization Program: 10 Steps to Savings

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Commissioning
Specification
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Expire lease (start over)

Opportunities for Integrating Energy Conservation Measures (ECMs)

Criteria for team selection
Criteria for site selection
Add ECM terms to lease

Set ECM goals
Model ECM options & potential ROI
Make decisions on ECMs
Select construction contractor
Monitor construction
Integrate ECMs into O&M plan

Execute occupancy plan
Equipment maintenance
Training & communications
Measure, track, verify performance
Communicate results
Gain recognition

Adapted from: ULI Tenant Optimization Program: 10 Steps to Savings

Value Proposition For Energy Conservation Measures

FOR TENANTS

Reduced:

Operating expenses

Moves (& costs associated with moving)

Increased:

Employee satisfaction

Employee productivity

Employee comfort

Access to favorable financing

Accelerated depreciation (decrease taxes in near term)

FOR BUILDING OWNERS

Reduced:

Operating expenses

Tenant turnover

Duration of vacancies

Increased:

Asset value

Net Operating Income (NOI)

Occupant satisfaction

Rental rates

Quality tenants (superior credit-worthiness)

Access to favorable financing

Accelerated depreciation (decrease taxes in near term)

Value for Building Owners

Building Owner Financial Performance

Cash Flow

Net Operating Income (NOI)

Rental income

- Rental rates
- Occupancy
- Tenant quality
- Occupant comfort and productivity

Operating expenses

- Utility costs
- Accelerated depreciation (lower taxes)
- Access to favorable financing

Asset Value

Market Value

- Sales price
- Cap rates

Capital equipment

Development costs

- Construction costs

Financial Performance for Building Owners – NOI

Net Operating Income (NOI) =

Gross Operating Income – Operating Expenses (OpEx)

Effective Rental Income
(Potential Rental Income – Vacancy & Credit Losses)
+
Other Income

Contingent on the type of lease:

- Absolute gross lease – owner pays all OpEx
- Negotiated or hybrid lease – Owner/tenant divide up OpEx
- Absolute net lease – tenant pays all OpEx

Reduce Energy Use > Reduce OpEx> Increase NOI!

Value for Tenants

Tenant Financial Performance

Cash Flow

Reduced operating expenses

- Reduced utility costs
- Accelerated depreciation (reduced taxes)
- Access to favorable financing

Employees

- Employee productivity
- Employee comfort
- Recruiting
- Retention and loyalty
- Less disruption due to moves

Beyond the Audit: Building a Business Case

1. **Establish an energy baseline for the space:**
   a. How much and what types of energy are used? How much does energy cost? Who pays the bills?
2. **Identify potential energy conservation measures and potential savings.**
3. **Look at the lease:**
   a. How does the lease structure affect who pays and who benefits from a specific project?
   b. Are there existing capital expense recovery clauses to allow owners to pass project costs to tenants?
   c. Who bears common area maintenance (CAM) costs
   d. Could ECM projects lower these costs?
4. **Do homework about the tenants and owners:**
   a. Understand the project planning and budgeting cycle for tenant and building owner.
   b. What is the planning process for operational expenses (OPEX) and capital expenses (CAPEX)?
   c. Identify existing working capital, available cash flow, how to account for depreciation.
5. **Explore financing options:**
   a. Identify utility incentives available to offset upfront costs.
   b. Find financing resources available for ECM projects - e.g. Property Assessed Clean Energy (PACE) financing, Utility on-bill financing and on-bill repayment options, State loan programs, Operating and capital leases, Energy Performance Contracts (EPCs) through Energy Service Contractors (ESCOs), Energy service agreements through other service providers, Traditional lenders
6. **Complete a comprehensive financial analysis:**
   a. Determine financial targets for metrics such as ROI, payback period, NPV, IRR, and the discount rate for a specific project.
   b. Calculate key metrics for energy conservation measures.
7. **Present financial benefits in terms that are meaningful to stakeholders and easy to understand.**

Adapted from "Tailoring the Business Case for Efficiency to Fit Your Capital Budget (https://betterbricks.com/resources/tailoring-the-business-case-for-efficiency-to-fit-your-capital-budget)

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Key Financial Calculation Measures

- Payback Period
- Return on Investment (ROI)
- Net Present Value (NPV)
- Internal Rate of Return (IRR)

Payback

Payback Period:

- Length of time needed to recover an initial investment through profit or savings generated
- Tells you the point in time at which you “break even”
- Treats money only in its nominal value; ignores the fact that money changes value over time (“a dollar today is worth more than a dollar tomorrow”)
- May not account for benefits over the full lifespan of the ECM
- Measured in years

$$Payback\ period\ (yrs) = \frac{Cost\ of\ investment\ (\$)}{annual\ savings\ (\$/yr)}$$

Return on Investment (ROI)

Return on Investment (ROI)

- Measures the return of an investment relative to its cost
- Does not take time value of money into account
- Measured as a percentage or ratio

$$ROI\ (\%) = \frac{Gain\ from\ investment\ (\$) - cost\ of\ investment\ (\$)}{Cost\ of\ investment\ (\$)}$$

Net Present Value (NPV)

- Measures the present value of a series of future payments at a specific discount rate
- Recognizes time value of money
- Allows for comparison between different options when costs and benefits accrue at different times (e.g., when projected savings are not the same in all years, or when ECMs have different lifespans)
- It takes into account equipment life, risk of the investment, and when the energy savings will be delivered
- Measured as a $ figure as of a specific point in time

$$NPV = \sum_{t=1}^{T} \frac{\text{Cash Flow}_t}{(1+i)^t} - \text{Initial Cash Investment}$$

t = Cash Flow Period
i = Interest Rate Assumption

	A	B	C	D	E	F	G
1		**NPV**		**=NPV(rate,value1,value2)**			
2		Calculates the net present value.					
3							
4		Cash Flows		rate		Formula	Result
5		500		0.08		=NPV(D5,B5:B10)	$1,387.20
6		250					
7		250					
8		250					
9		250					
10		250					

Internal Rate of Return (IRR)

- The discount rate at which NPV = 0
- The higher the cash flows after the initial investment, the higher the discount rate needed to achieve NPV of zero, so a higher return
- Indicates whether funds to be spent on ECMs could be better deployed in other projects, or in an interest-bearing deposit
- Investments are compared against a required rate of return that a client sets for proposals ("hurdle rate")
  - If a project's internal rate of return is greater than the required rate of return, then it can be accepted
  - If it falls below the required rate of return, then it can be rejected
- Can be calculated in Excel using IRR and XIRR functions

	IRR	Investment today	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Project A	21%	($100k)	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k
Project B	49%	($100k)	$50k	$50k	$50k	$50k	$50k	$50k	$50k	$50k	$50k	$50k

Comparison of Methods

Method	Benefits	Disadvantages
Payback	▶ Easy to compute ▶ Easy to understand	▶ Ignores the benefits that occur after the payback period ▶ Ignores the time value of money
Return on Investment	▶ Relatively easy to compute and understand	▶ Doesn't take into account variation in savings by year ▶ Ignores the time value of money
Net Present Value	▶ Accounts for changing value over time, i.e. time value of money	▶ Need to select an appropriate discount rate
Internal Rate of Return	▶ Provides a benchmark for what should and should not be invested in	▶ Need to select an appropriate benchmark IRR ▶ Doesn't give an indication of the absolute value of a project

Example of NPV vs Payback

- You are competing with other investments, these may have faster payback but worse IRR
- For example, let's compare these two projects that both require an initial investment of $100,000

	Payback	NPV	Investment today	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Project A	2	($12k)	($100k)	$50k	$50k								
Project B	2	$188k	($100k)	$50k	$50k	$50k	$50k	$50k	$50k	$50k	$50k	$50k	$50k

- The projects are equal when using payback period, but project B is clearly superior.
- Projects with identical simple payback period can be ranked by calculating the present value of future cash flows.

Benefits and Costs to Consider

Costs could include (but are not limited to):

- Purchase price of the ECM / asset
- Installation cost
- Cost of alterations to existing capital assets
- Maintenance & repair costs
- Consulting fees

Benefits could include (but are not limited to):

- Reduced energy use (gas, electricity, fuels)
- Reduced maintenance costs
- Savings from not having to purchase carbon offsets (if applicable)

Data Required For Your Analysis

Costs

- Upfront cost of ECM – Should include all relevant costs, e.g., installation as well as equipment purchase cost
- Total costs *by year, e.g. maintenance and repair*

Benefits

- Estimated energy savings for each ECM *by year* (kwh/yr, CCF/yr, or gal/yr)
- Other benefits that you can access (e.g., rebates)
- Energy prices for the type of energy being saved (electricity, natural gas, heating oil)

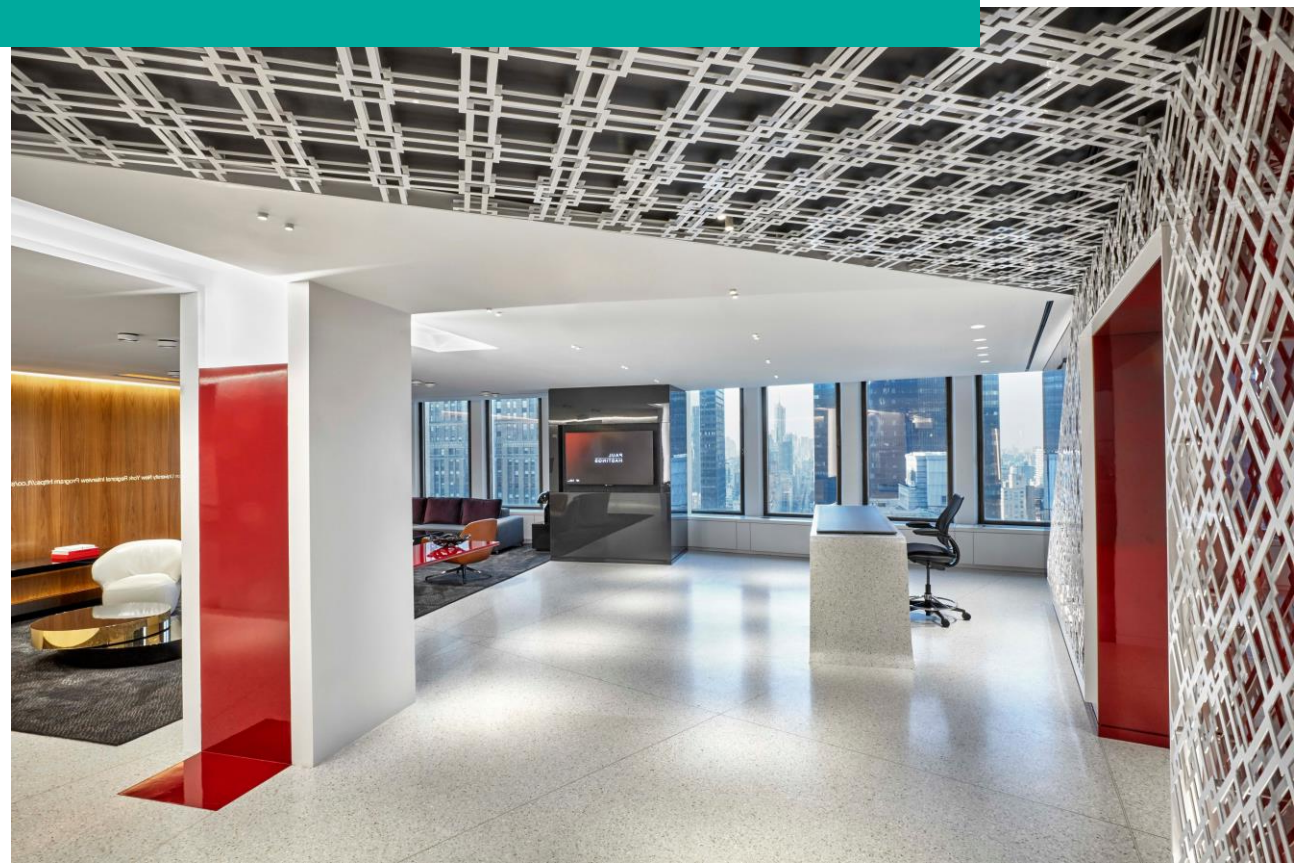
Time period to be evaluated

- Lifespan of the equipment being purchased
- Length of the lease

Discount rate or interest rate (for NPV and IRR calculations)

Case Study: Paul Hastings

- Medium-sized law firm office fit out
- New space
- 10 year lease
- Want to promote green credentials – attract and retain talent, impress clients with diligence, save some money
- Energy analysis done, options identified in the audit report
- Calculate ROI and payback
  - No pre-defined threshold for minimum ROI or maximum payback period
- Certain options will yield energy savings for the building (not just the tenant)



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Energy Conservation Measures Identified in Case

Requires initial investment
1. Automatic receptacle controls (turn off non-essential plug loads when not in use)
2. Efficient HVAC (for supplemental floor-level equipment)
3. ENERGY STAR equipment (computers, monitors, etc.)
4. LED lighting (basic)
5. LED lighting (enhanced)
6. Lighting controls (basic)
7. Lighting controls (enhanced)
8. Virtualized servers (reduces number of physical servers)

Does not require initial investment
9. Adopt regular business hours (turn off HVAC @ 6 p.m., rather than maintaining typical law firm hours)
10. Equipment power management settings (computers, printers, TV screens, etc.)
11. Raise cooling set-point temperature 2°F (from 73°F to 75°F during business hours)
12. Raise computer and IDF room cooling set-point temperature 4°F

Exercise

- On worksheet you will see the list of energy conservation measures (ECMs) – one per row.
- Fill in the blanks to calculate ROI and payback period for each option.
- You can use a calculator on your phone, tablet, or laptop.
- Row 1 provides formulas to use in the calculations for each column.
- Additional questions are at the bottom of the worksheet – answer these on your worksheet and then we will discuss as a group.
- You have 10 minutes.

WORKSHEET

$$Payback\ period\ (yrs) = \frac{Cost\ of\ investment\ (\$)}{annual\ savings\ (\$/yr)}$$

$$ROI\ (\%) = \frac{Gain\ from\ investment\ (\$) - cost\ of\ investment\ (\$)}{Cost\ of\ investment\ (\$)}$$

Tenant

		Tenant						
			Ertimated Savings, kWh/yr	Ertimated Savings, $/yr	ROI			Payback Period (yrs)
Inu	Energy Conservation Measure	Upfront Cost			Total Savings (10	Net Savings (Cost)	ROI (10 years)	
1	*Calculated as:*	*Given*	*Given*	*kWh/yr x $0.200/kWh*	*$/yr Savings x 10*	*Total Savings - Upfront Cost*	*Net Savings (Cost) + Upfront Cost*	*Upfront Cost ÷ $/yr Savings*
2	*Energy Star equipment*	$40,000	100,000	$20,000	$200,000 - $40,000	$200,000 - $40,000	$160,000 ÷ $40,000 = 4.0 = 400%	$40,000 ÷ $20,000 = 2 yrs
3	Automatic receptacle controls (assumes equipment power management settings are used)	$160,000	80,000	$16,000				
4	Efficient HVAC	$100,000	125,000	$25,000				
5	LED lighting (basic)	$120,000	30,000	$6,000				
6	*Enhanced LED lighting (incremental on top of LED lighting)*	$40,000	75,000	$15,000			[redacted]	[redacted]
7	Enhanced LED lighting, combined: add basic and enhanced packages together	$160,000	105,000	$21,000				
8	Lighting controls (basic)	$10,000	50,000	$10,000	$100,000	$90,000	900.0%	1.0
9	*Enhanced lighting controls (incremental on top of lighting controls)*	$5,000	40,000	$8,000	$80,000	$75,000	[redacted]	[redacted]
10	Enhanced lighting controls, combined: add basic and enhanced packages together	$15,000	90,000	$18,000	$180,000	$165,000	1100.0%	0.8
11	Virtualized servers	$40,000	400,000	$80,000	$800,000	$760,000	1900.0%	0.5
12	Adapt to regular business hours (turn off HVAC @ 6 p.m.)	$0	300,000	$60,000	[redacted]			
13	Equipment power management settings	$0	60,000	$12,000				
14	Raise cooling set-point temperature 2°F	$0	15,000	$3,000				
15	Raise computer and IDF room cooling set-point temperature 4°F	$0	2,500	$500				
16	**Total**	$515,000	1,277,500	$255,500				

Building

Building		Tenant + Building				
Ertimated Savings, kWh/yr	Ertimated Savings, $/yr	ROI				Payback Period (yrs)
		Ertimated Savings, $/yr	Total Savings (10	Net Savings (Cost)	ROI (10 years)	
Given	*kWh/yr x $0.200/kWh*	*Tenant $/yr Savings + Bldg $/yr Savings*	*$/yr Savings x 10*	*Total Savings - Upfront Cost*	*Net Savings (Cost) + Upfront Cost*	*Upfront Cost + $/yr Savings*
15,000	$3,000	$20,000 + $3,000 = $23,000	$23,000 x 10 = $230,000	$230,000 - $40,000 = $190,000	$190,000 ÷ $40,000 = 475%	$40,000 ÷ $23,000 = 1.74 yrs
8,000	$1,600					
5,000	$1,000					
4,000	$800	$6,800	$68,000	($52,000)	-43.3%	17.6
5,000	$1,000	$16,000	$160,000	$120,000	[redacted]	
9,000	$1,800	$22,800	$228,000	$68,000	42.5%	7.0
5,000	$1,000	$11,000	$110,000	$100,000	1000.0%	0.9
2,000	$400	$8,400	$84,000	$79,000	[redacted]	
2,000	$400	$18,400	$184,000	$169,000	1126.7%	0.8
3,000	$600	$30,600	$306,000	$766,000	1915.0%	0.5
[redacted]						

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Results: ROI and Payback

Row	Energy Conservation Measure	Tenant							Building		Tenant + Building				
					ROI						ROI				
		Upfront Cost	Estimated Savings, kWh/yr	Estimated Savings, $/yr	Total Savings (10 years)	Net Savings (Cost)	ROI (10 years)	Payback Period (yrs)	Estimated Savings, kWh/yr	Estimated Savings, $/yr	Estimated Savings, $/yr	Total Savings (10 years)	Net Savings (Cost)	ROI (10 years)	Payback Period (yrs)
1	*Calculated as:*	*Given*	*Given*	*kWh/yr * $0.20/kWh*	*$/yr Savings * 10*	*Total Savings - Upfront Cost*	*Net Savings (Cost) ÷ Upfront Cost*	*Upfront Cost ÷ $/yr Savings*	*Given*	*kWh/yr * $0.20/kWh*	*Tenant $/yr Savings + Bldg $/yr Savings*	*$/yr Savings * 10*	*Total Savings - Upfront Cost*	*Net Savings (Cost) ÷ Upfront Cost*	*Upfront Cost ÷ $/yr Savings*
2	*Energy Star equipment*	*$40,000*	*100,000*	*$20,000*	*$20,000 x 10 = $200,000*	*$200,000 - $40,000 = $160,000*	*$160,000 ÷ $40,000 = 4.0 = 400%*	*$40,000 ÷ $20,000 = 2 yrs*	*15,000*	*$3,000*	*$20,000 + $3,000 = $23,000*	*$23,000 x 10 = $230,000*	*$230,000 - $40,000 = $190,000*	*$190,000 ÷ $40,000 = 475%*	*$40,000 ÷ $23,000 = 1.74 yrs*
3	Automatic receptacle controls (assumes equipment power management settings are used)	$160,000	80,000	$16,000	$160,000	$0	0.0%	10.0	8,000	$1,600	$17,600	$176,000	$16,000	10.0%	9.1
4	Efficient HVAC	$100,000	125,000	$25,000	$250,000	$150,000	150.0%	4.0	5,000	$1,000	$26,000	$260,000	$160,000	160.0%	3.8
5	LED lighting (basic)	$120,000	30,000	$6,000	$60,000	($60,000)	-50.0%	20.0	4,000	$800	$6,800	$68,000	($52,000)	-43.3%	17.6
6	*Enhanced LED lighting (incremental on top of LED lighting)*	$40,000	75,000	$15,000	$150,000	$110,000			5,000	$1,000	$16,000	$160,000	$120,000		
7	Enhanced LED lighting, combined: add basic and enhanced packages together	$160,000	105,000	$21,000	$210,000	$50,000	31.3%	7.6	9,000	$1,800	$22,800	$228,000	$68,000	42.5%	7.0
8	Lighting controls (basic)	$10,000	50,000	$10,000	$100,000	$90,000	900.0%	1.0	5,000	$1,000	$11,000	$110,000	$100,000	1000.0%	0.9
9	*Enhanced lighting controls (incremental on top of lighting controls)*	$5,000	40,000	$8,000	$80,000	$75,000			2,000	$400	$8,400	$84,000	$79,000		
10	Enhanced lighting controls, combined: add basic and enhanced packages together	$15,000	90,000	$18,000	$180,000	$165,000	1100.0%	0.8	2,000	$400	$18,400	$184,000	$169,000	1126.7%	0.8
11	Virtualized servers	$40,000	400,000	$80,000	$800,000	$760,000	1900.0%	0.5	3,000	$600	$80,600	$806,000	$766,000	1915.0%	0.5
12	Adopt regular business hours (turn off HVAC @ 6 p.m.)	$0	300,000	$60,000											
13	Equipment power management settings	$0	60,000	$12,000											
14	Raise cooling set-point temperature 2°F	$0	15,000	$3,000											
15	Raise computer and IDF room cooling set-point temperature 4°F	$0	2,500	$500											
16	**Total**	$515,000	1,277,500	$255,500											

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Discuss Your Recommendations

1. Which options had the best ROI and payback period?
    a. For the tenant?
    b. For the building?
2. Based on the 10-year ROI, which ECMs would you recommend to a tenant?
3. Suppose the tenant had a 5-year lease (not 10). Would that change any of your recommendations?
4. Many of the ECMs provide savings to the building as well as the tenant.
    a. When should the building owner consider sharing the savings with the tenant?
    b. What are some mechanisms to do that?
5. How would you present the financial implications of the EPMs in rows 12–15 in discussions with a tenant?
6. What non-financial considerations should you take into account in presenting results?

Payback vs. ROI Example

Solar PV System:

- A payback period of 10 years
- IRR over the lifetime of a solar PV system for 25 years is 8.8%

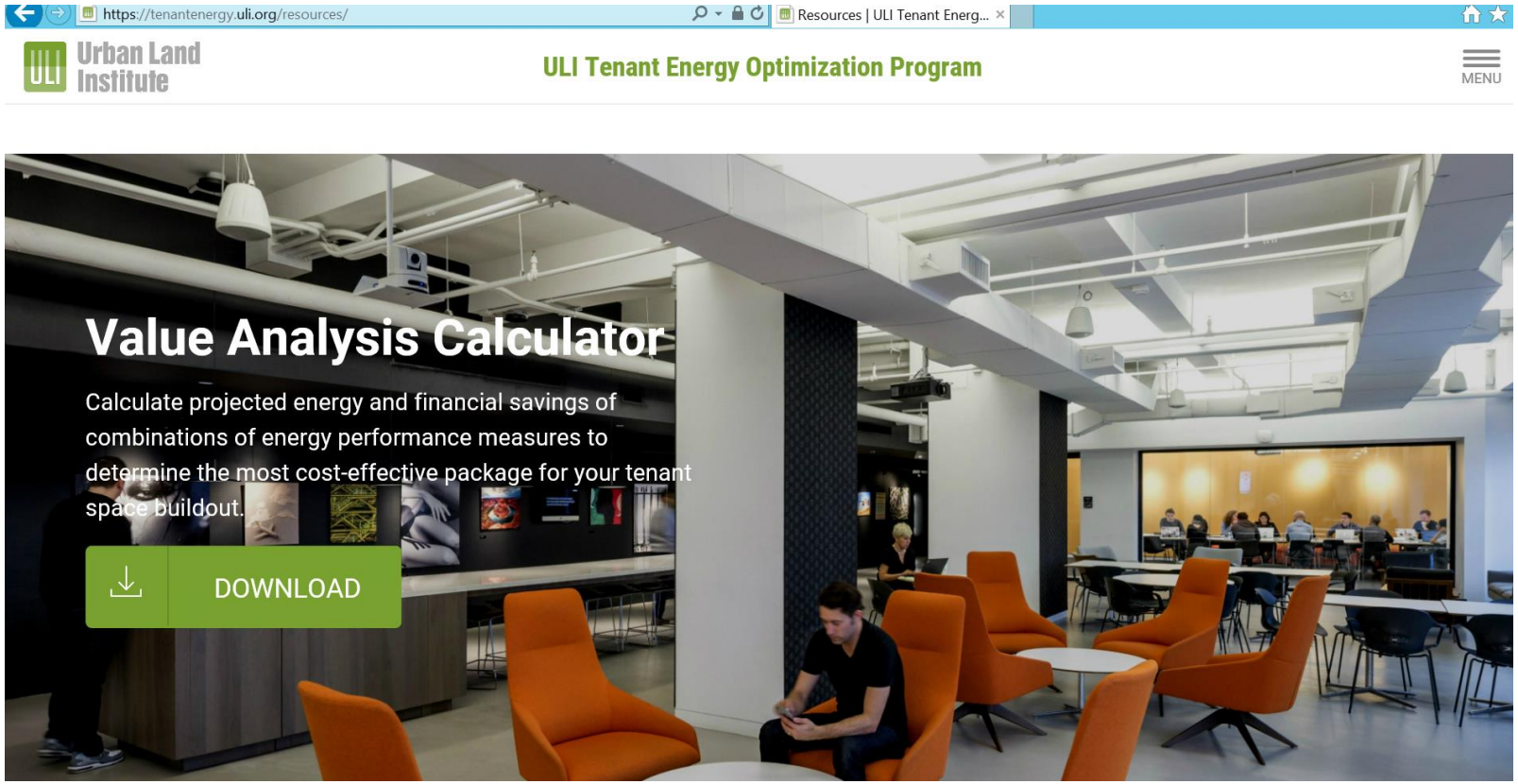
The best savings accounts available today are providing far less than half of this interest rate.

High Impact Presentation of Results

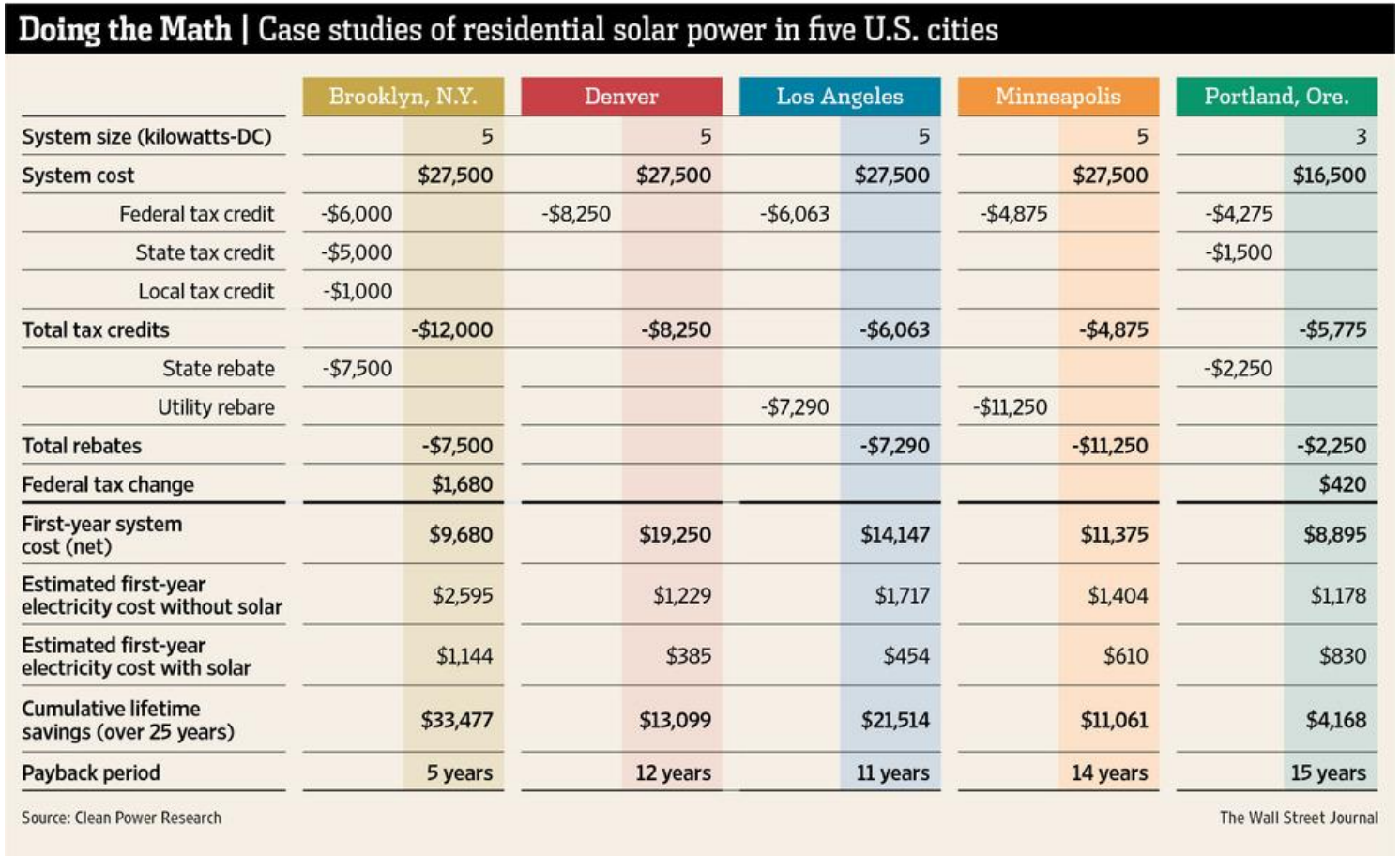
1. Before you start making graphs and tables, think about:
    1. What metrics and format does the client (and/or the decision maker) typically use?
    2. Think about how and where the information will be used. What format? Will you be presenting it in person, a document, a webpage, or all of the above?
    3. Apply principles of good visual design!
        1. What is the one message you want to convey for each graph or table?
        2. What information needs to be there?
        3. What does NOT need to be there (and is therefore distracting)?
        4. Big numbers tend to grab people's attention. Then they will look for detail.
        5. Color should have a purpose. Use it wisely.
2. Let's look at some examples

A Useful Template

https://tenantenergy.uli.org/resources/



Presenting ROI Using Tables



Doing the Math | Case studies of residential solar power in five U.S. cities

	Brooklyn, N.Y.		Denver		Los Angeles		Minneapolis		Portland, Ore.	
System size (kilowatts-DC)		5		5		5		5		3
System cost		$27,500		$27,500		$27,500		$27,500		$16,500
Federal tax credit	-$6,000		-$8,250		-$6,063		-$4,875		-$4,275	
State tax credit	-$5,000								-$1,500	
Local tax credit	-$1,000									
Total tax credits		-$12,000		-$8,250		-$6,063		-$4,875		-$5,775
State rebate	-$7,500								-$2,250	
Utility rebare					-$7,290		-$11,250			
Total rebates		-$7,500				-$7,290		-$11,250		-$2,250
Federal tax change		$1,680								$420
First-year system cost (net)		$9,680		$19,250		$14,147		$11,375		$8,895
Estimated first-year electricity cost without solar		$2,595		$1,229		$1,717		$1,404		$1,178
Estimated first-year electricity cost with solar		$1,144		$385		$454		$610		$830
Cumulative lifetime savings (over 25 years)		$33,477		$13,099		$21,514		$11,061		$4,168
Payback period		5 years		12 years		11 years		14 years		15 years

Source: Clean Power Research

The Wall Street Journal

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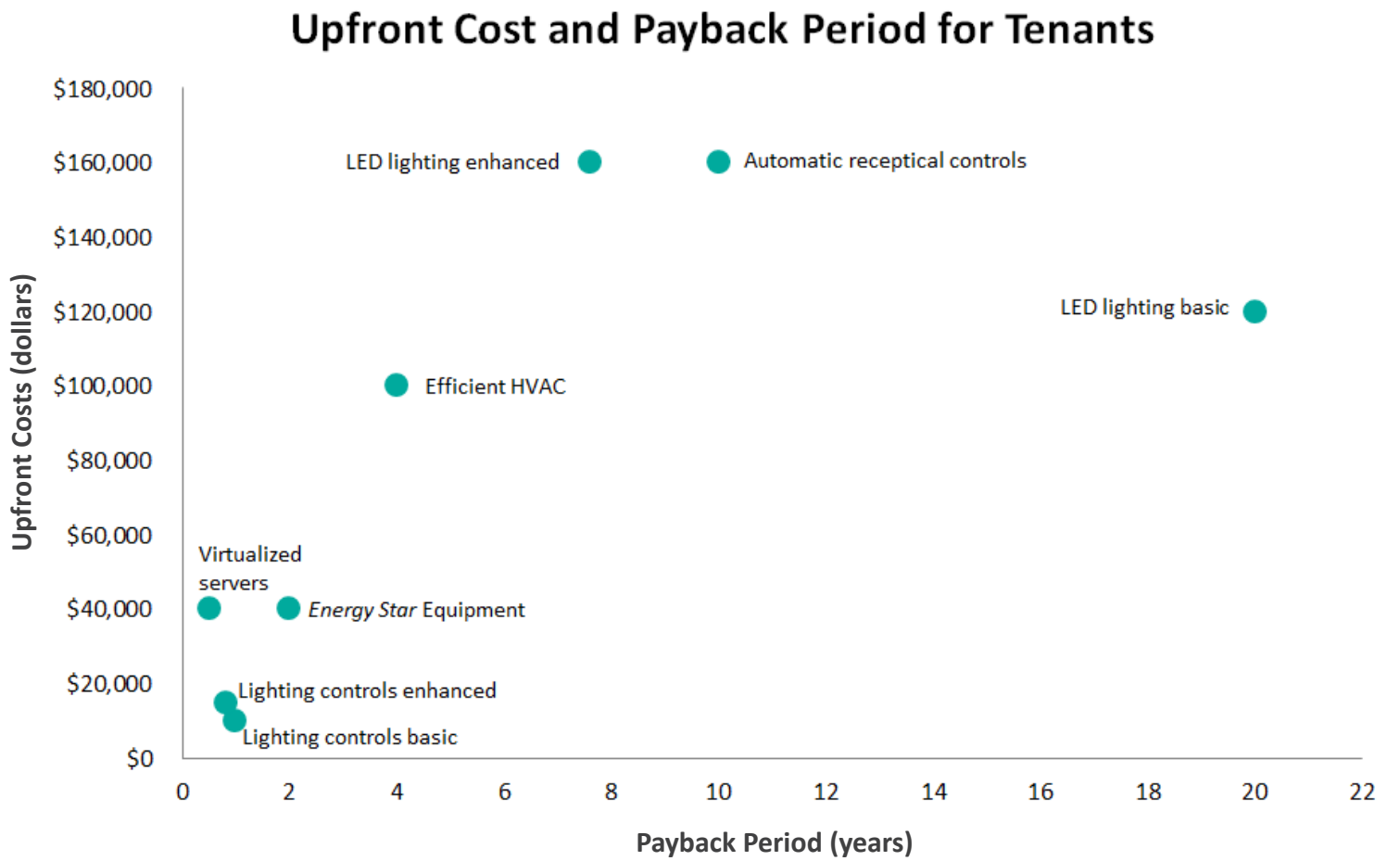
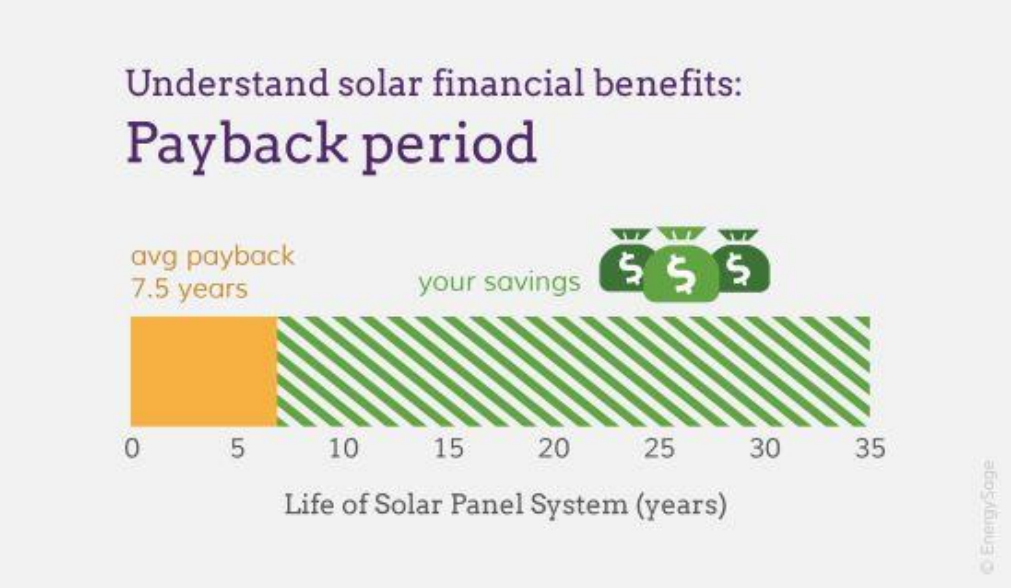
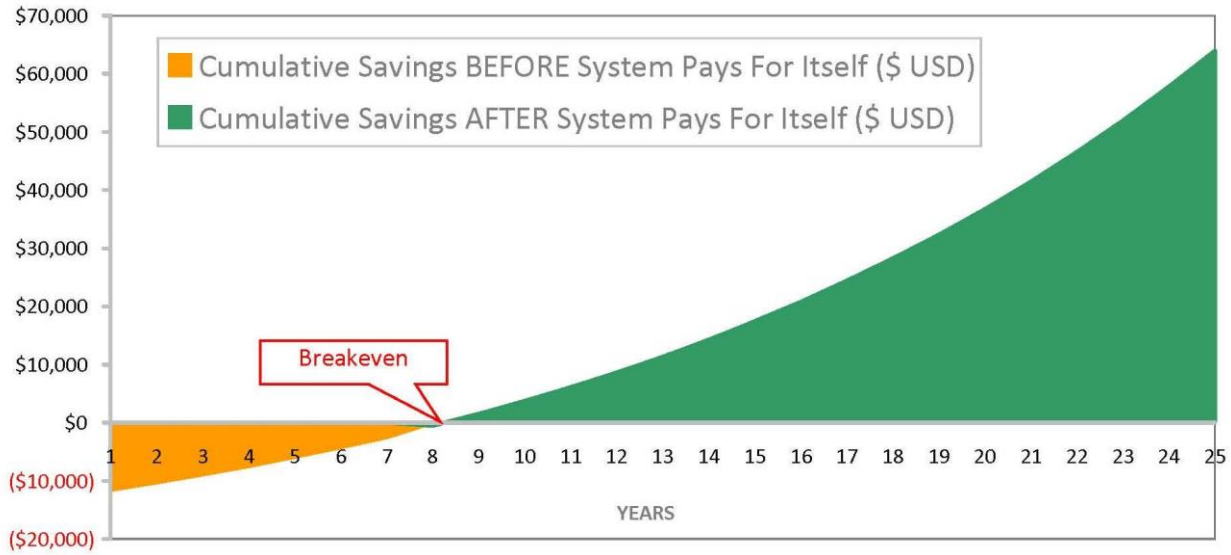
Presenting Payback Period



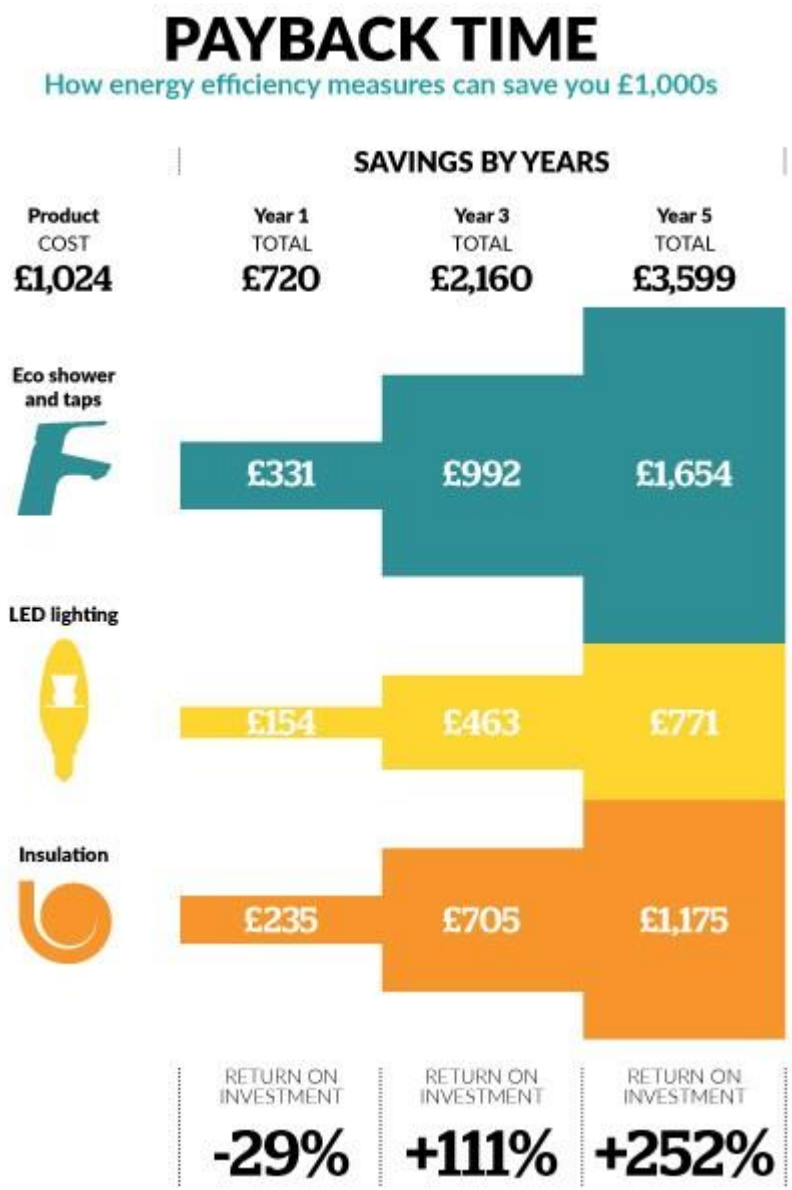
Presenting Payback Period





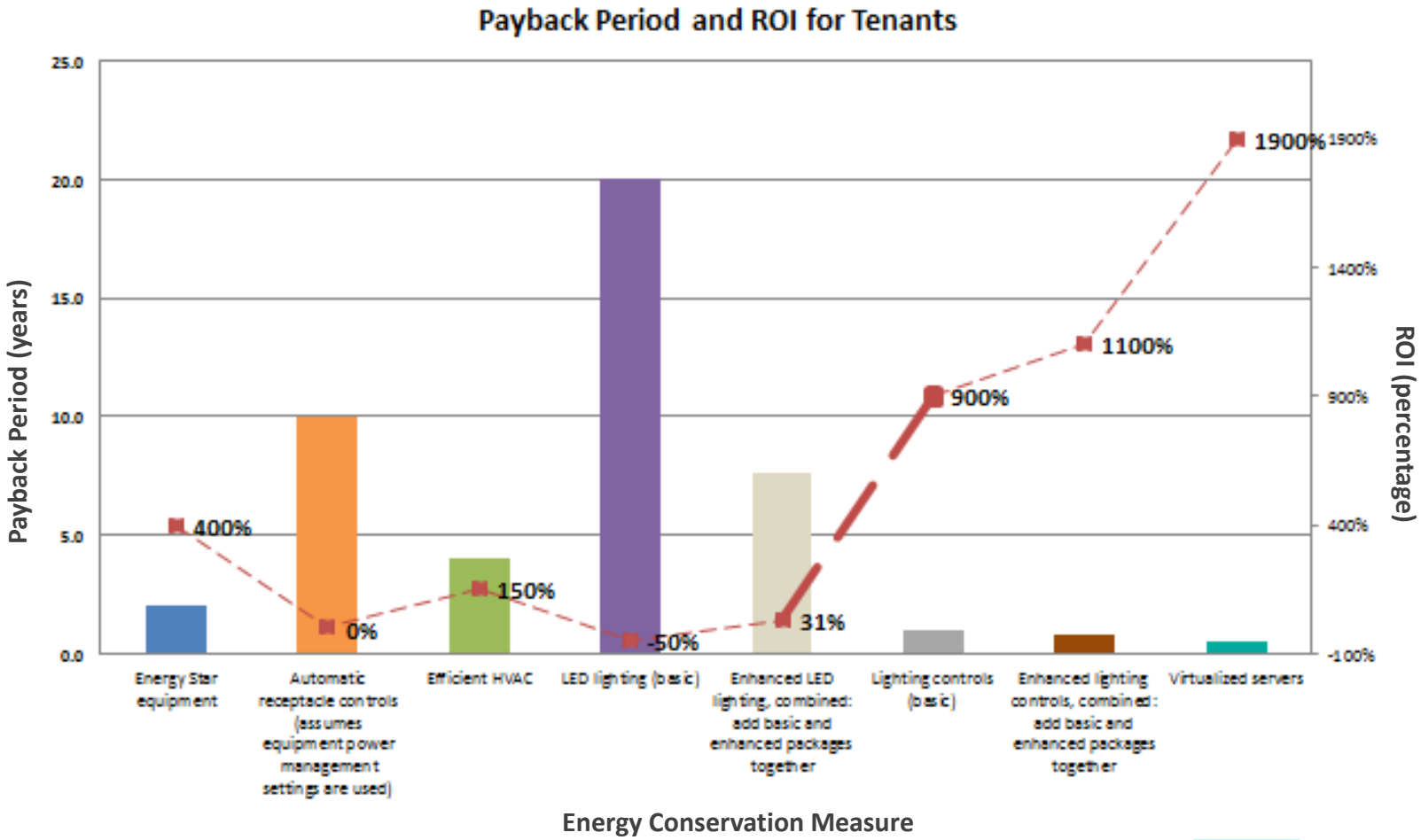
Presenting Cumulative ROI

- Showing cumulative ECM ROI over 3 years, with different ECMs
- Good use of color



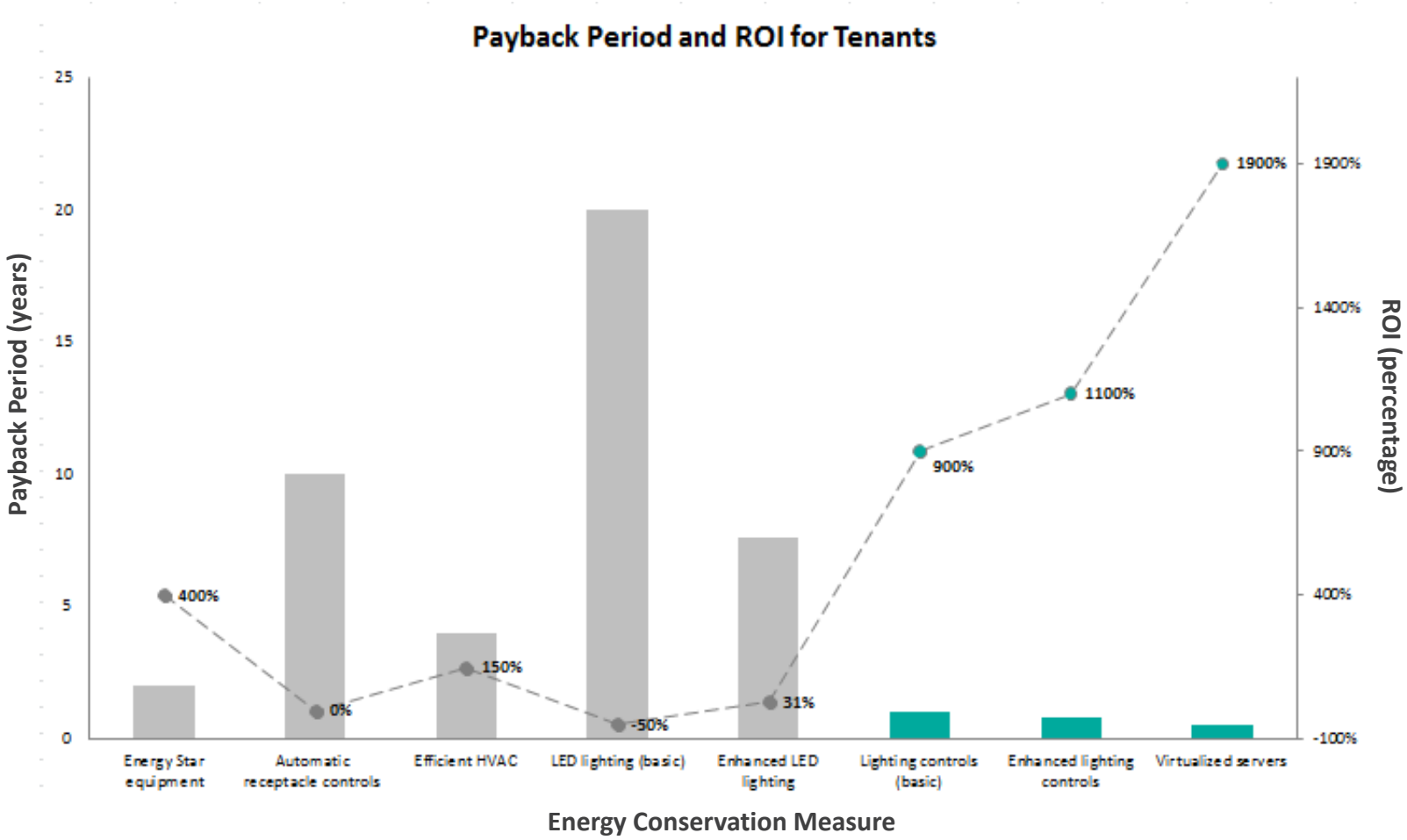
Presenting ROI

- All graphs are not created equal



Presenting ROI

- This version simplifies the labels, streamlines the colors, and highlights the recommended measures



Presenting Results

SNAPSHOT RESULTS

Training Case Study | Virtualized Servers for Tenants

FINANCIAL RESULTS

Payback Period	.5 years
ROI	1900%
Savings per year	$80,000

TYPES OF BENEFITS

ENERGY SAVINGS

400,000 kWh

=

a year of energy use for 32 homes

SOURCE: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Giving Context to Your Numbers

Make sure your recommendations CLEARLY STATED:

- Therefore we recommend “XYZ” bundle of ECMs.
- Supported by both qualitative and quantitative rationale.
- Big numbers will grab attention.

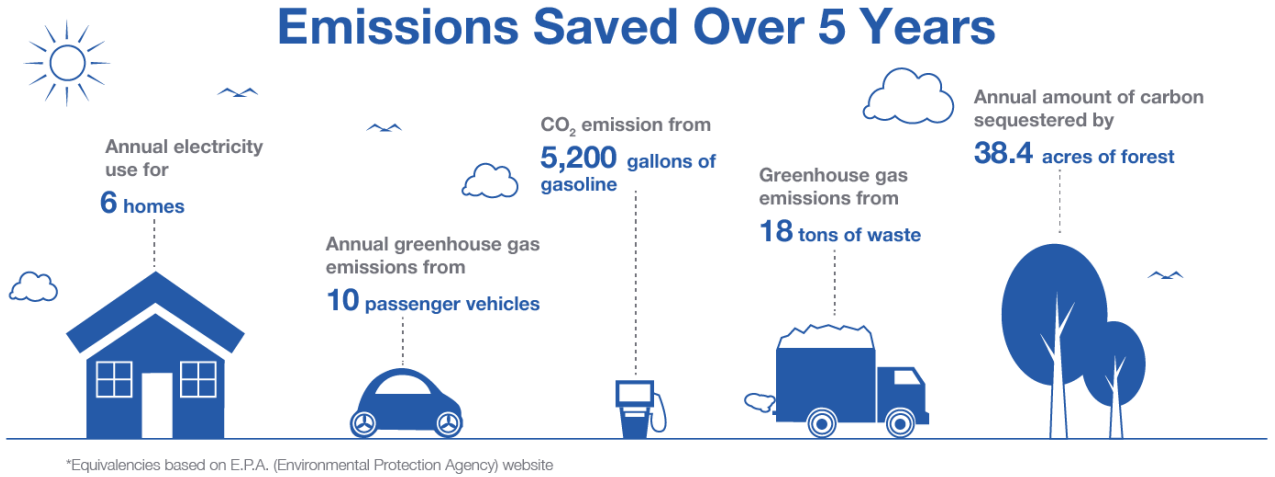
Show how the financial results compare to:

- Alternative investment options for the building, or the tenants
- Relative costs of the fit-out
- The equivalent growth in sales, or NOI
- What others are achieving
- Co-benefits

Giving Context to Your Numbers

What the outcomes might generate in social value / co-benefits (“social math”)

- Include only if the client or their stakeholders have social/environmental goals, such as reducing GHG emissions
- Don’t just report on the GHG emissions saved, also show some equivalents.
- https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references



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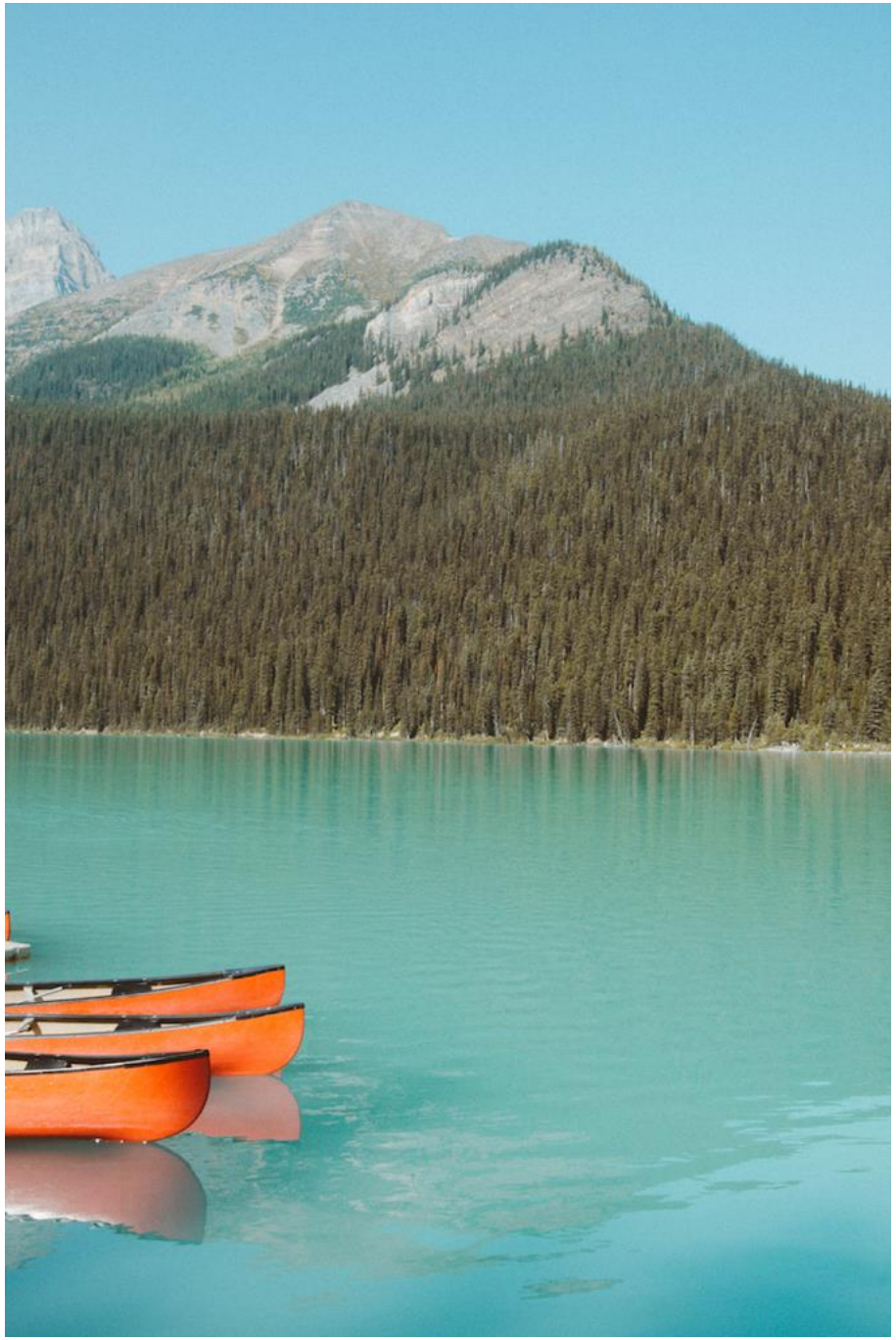
Open Discussion

Recap

1. Commercial offices = 59% of NYC square footage
2. EE & design go hand-in-hand
3. Plug loads = 33% of a building's energy use
4. Changes to behavior and process can have major impacts
5. Value proposition → Know your audience!
6. NPV & IRR > Payback
7. Use design and big numbers to convey your message



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