

Green Building Policy Update Task Force

Meeting #2

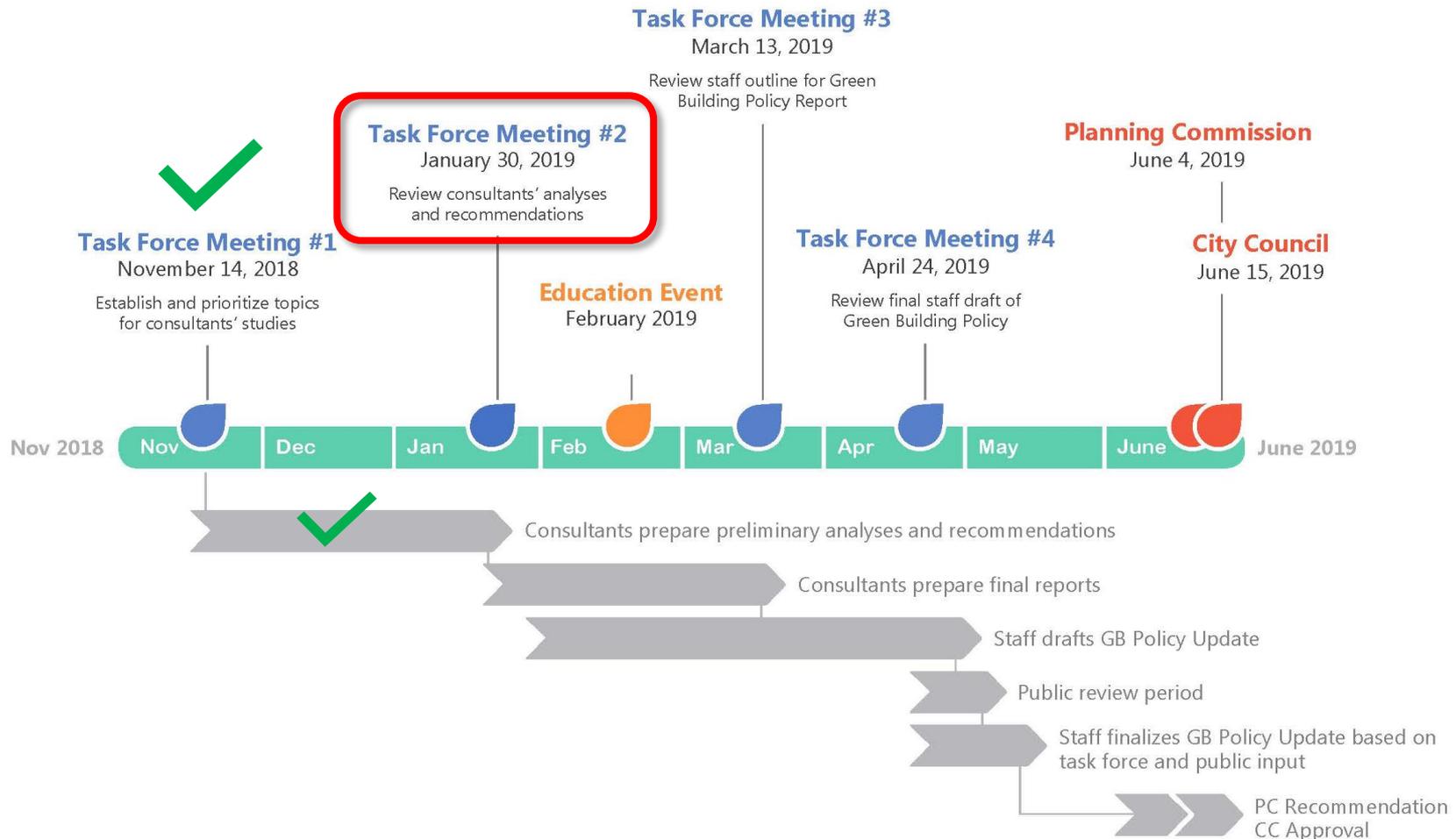
Topic: Consultants' Preliminary Analysis and Recommendations

January 30, 2019

Agenda

- | | |
|--|--------------------|
| I. Welcome | 8:30 – 8:35 a.m. |
| II. Consultants' Analyses and Recommendations | |
| A. Integral Group Presentation | 8:35 – 8:50 a.m. |
| 1. Task Force Comments | 8:50 – 9:10 a.m. |
| B. WSP Presentation | 9:10 - 9:25 a.m. |
| 1. Task Force Comments | 9:25 – 9:45 a.m. |
| III. February Education Program | 9:45 – 10:00 a.m. |
| IV. Public Comments | 10:00 – 10:10 a.m. |
| V. Adjournment | 10:10 – 10:15 a.m. |

Green Building Policy Update Workplan and Timeline



Task Force Priority Green Building Strategies

Task Force Strategy	Integral Group (Recommendations)	WSP (Cost Analysis)
Strategy A: Increase LEED or equivalent third-party green building certification standards for private development.	Combined Strategy A + D	Combined Strategy A + D
Strategy B: Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.		
Strategy C: Establish incentives for private development participation in green building certifications.		
Strategy D: Prioritizing specific green building elements in private development projects.	Combined Strategy A + D	Combined Strategy A + D
Strategy E: Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.	Split Strategy for Analysis: <ol style="list-style-type: none"> 1) Introduce voluntary green building practices for existing buildings (including historic) 2) Introduce voluntary green building practices for small buildings not subject to review. 	

Consultant Reports – Preliminary Analysis and Recommendations

Integral Group

- Analysis of the 5 priority green building strategies for recommendations that the City can consider to achieve EAP energy, water and stormwater targets in public and private buildings.

WSP

- Analysis of costs to implement green building strategies for public and private buildings
- Private development case studies
- Applicability of incentives in Alexandria

City of Alexandria Green Building Policy: Preliminary Analysis & Recommendations



INTEGRAL
GROUP

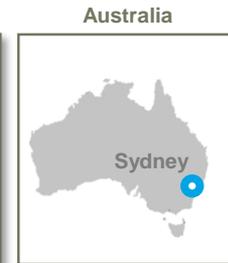


Meeting Agenda

- Who we are
- Approach
- Alexandria's Green Building Context
- Overall summary of recommendations
- Green Building certification equivalency
- Specific recommendations for each strategy
- Discussion



Integral Group – Office Locations



16
OFFICES

550
STAFF



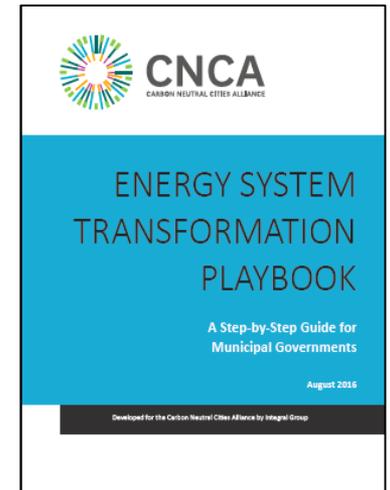
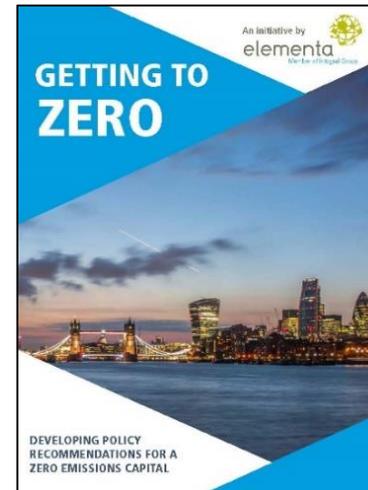
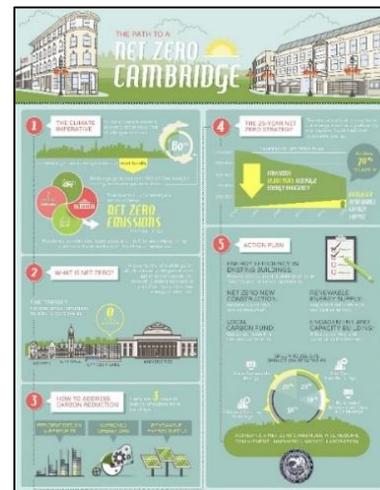
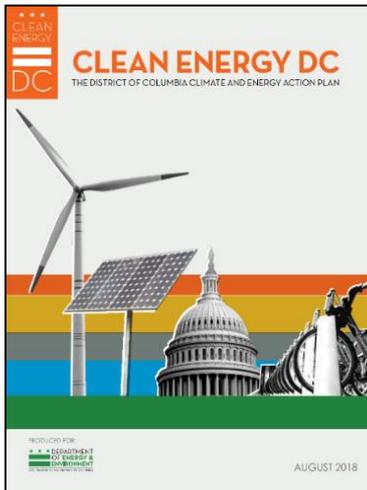
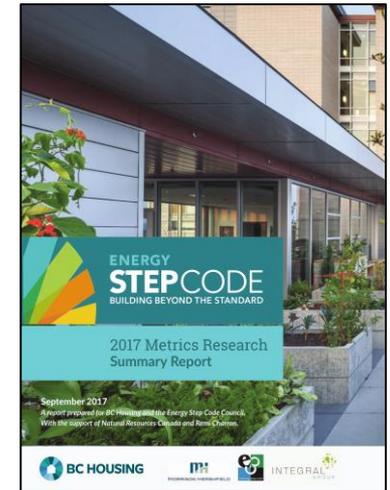
Integral Group – Deep Green Engineering



- 100+ NET ZERO ENERGY PROJECTS
- 50+ LEED PLATINUM CERTIFIED
- 10 AIA COTE TOP TEN BUILDINGS
- 9 LIVING BUILDING PROJECTS
- 5 PASSIVE HOUSE PROJECTS



Integral Group – Policy and Planning



Overall Approach:

- Current State Review
- Best Practice Review
- Impact Assessment
- Recommendations
- Equivalency Review (where applicable)
- Additional policy options

Review of the Five Strategies

- **Strategy A:** Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development projects.
- **Strategy B:** New and Existing Public Buildings - Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.
- **Strategy C:** New Private Development (not subject to site plan review) - Introduce voluntary green building practices for small buildings not subject to site plan review.
- **Strategy D:** Existing Private Buildings (Commercial, Multifamily, and Single Family) - Introduce voluntary green building practices for existing buildings (including historic).
- **Strategy E:** Incentives for All New and Existing Privately-Owned Buildings - Establish incentives for private development to incorporate green building elements.



Alexandria and 8 peer jurisdictions on LEED policy and LEED achievement

City	Population	Area [sq. mi.]	Density [ppl/sq. mi]	LEED Certified			Energy Star Certified ²¹			Green Building Policy
				Certifications	M sq. ft.	Sq. Ft. per capita	Buildings	M sq. ft.2	Sq. Ft. per capita	
Washington, DC	693,972	68.3	10,155	1009	181.1	261.0	452	140.3	202.2 (#1)	International Green Construction Code, LEED Silver for private / LEED Gold for public, Optional NZE Code Path
Cambridge, MA	113,630	7.1	15,937	198	18.6	161.5	49	7.7	67.9 (#6)	LEED Silver , NZE goal by 2040
Boston, MA	685,094	89.6	7,644	377	100.1	146.1	187	70.8	103.3(#3)	LEED Certified plus local priority credits
Seattle, WA	724,745	83.8	8,651	400	88.8	122.5	234	65.4	90.2 (#5)	Aggressive EUI targets, LEED Gold for zoning amendments, Living Building incentives
Sunnyvale, CA	153,656	22.7	6,772	99	18.4	120.9	50	5.5	35.6 (#9)	Density bonus for LEED Gold Certification.
Alexandria, VA	160,035	15.5	10,325	87	12.6	79.0	99	15.7	97.9 (#4)	LEED Silver for Commercial / LEED Certified for Multifamily
Santa Monica, CA	92,306	8.4	10,963	63	6.7	73.1	46	6.2	67.1 (#7)	NZE for single-family and low-rise mf. Density bonus for non-residential projects that meet LEED Platinum along with other local requirements.
St. Paul, MN	306,621	56.2	5,458	37	6.8	22.1	55	13.2	42.9 (#8)	LEED Silver or better, along with local priority credits
Berkeley, CA	122,324	17.7	6,915	44	2.4	19.7	21	1.3	10.6 (#10)	LEED Gold for buildings in downtown area (LEED Certified elsewhere)



High-level Summary of Recommendations:

Strategy A: Private Development

- All projects meet LEED Silver (including multifamily)
- Minimum performance/design standards for specific elements
 - Creates a baseline performance level to prevent gaming of rating systems.
 - Growing best practice across cities.
 - It is also essential to setting any equivalence between rating systems.
 - At direction of city, focused on Energy Efficiency, Greenhouse Gas Reduction, Water Efficiency, and Stormwater Management.
- We reviewed other rating systems to determine where equivalencies exist.

Strategy B: New and Existing Public Buildings

- We recommend specific energy and water targets that exceed the level of ambition set for private development
- We recommend the city utilize performance-based procurement to get higher-performing buildings without additional costs.
- We recommend the city undertake a deep energy retrofit program for existing buildings. However, specific planning for retrofits and identification of high priority buildings was not within the scope of this project



High-level Summary of Recommendations:

Strategy C: New Private Development not subject to plan review

- Home rating and labeling programs
- Education and Capacity building

Strategy D: Existing Private Buildings

- For EAP Phase II, explore challenge programs and educational programs
- Continue to move forward on C-PACE
- Advocate for enabling legislation from Commonwealth to allow mandatory programs

Strategy E: Incentives for All New and Existing Private Buildings

- Structural Incentives
- Tax Incentives



Equivalency Review



LEED: Base certification system



Living Building Challenge: exceeds all requirements and could be accepted as an alternate compliance path



Living Building Petal Certification: could be alternate compliance path so long as buildings achieve both the energy and water petals.



Enterprise Green Communities: could be alternate compliance path so long as equivalent performance criteria and points are met or exceeded.



Green Globes could be alternate compliance path, provided the applicant achieves minimum three green globes, plus equivalent energy, water and stormwater performance—this may require verification as equivalent standards not in place for all elements.



We recommend that **Earthcraft** not be considered an equivalent standard at this time, as current maximum points fall short of the minimum requirements recommended for all performance elements.



Strategy A: New Private Development

Energy

Past Performance	Suggested Target	LEED v4 equivalence	Other Equivalence
<p>Optimize Energy Performance:</p> <p>Average achievement in Alexandria for LEED v2009 projects: 8 points = 26% reduction vs. 90.1-2007.</p> <p>3 projects <20% 4 projects 20%-30% 3 projects >40%</p>	<p>EUI targets:</p> <ul style="list-style-type: none"> • < 35 kBtu/ft² for multifamily residential • < 45 kBtu/ft² for commercial • < 30 kBtu/ft² for schools • Equivalent improvement over baseline for hospitals, food service, or energy intensive uses <p>This equates to:</p> <ul style="list-style-type: none"> • > 30% reduction relative to average 90.1-2010 performance • 18-30% improvement over code 	<p>LEED V4 Optimize Energy Performance: Minimum 12 points</p> <ul style="list-style-type: none"> • New Construction: 29% reduction • Major Renovation: 27% reduction • Core and Shell: >26% reduction • Healthcare: >22-24% reduction 	<ul style="list-style-type: none"> ✓ Living Building Challenge ✓ LBC Energy Petal ✓ Green Globes ✓ Enterprise Green Comm. × Earthcraft



Strategy A: New Private Development

Energy

Past Performance	Suggested Target	LEED v4 equivalence	Other Equivalence
Onsite Renewable Energy One project: 13% Remainder: 0%.	Buildings subject to DSUP designed to have 5% of energy supplied by onsite renewables	LEED V4 Onsite Renewable Energy: X% of total energy cost 1 point = 1% 2 points = 5% 3 points = 10%	✓ Living Building Challenge ✓ LBC Energy Petal ✓ Enterprise Green Comm. ✓ Green Globes (plus verification of installed renewable capacity) × Earthcraft: No mention
Commissioning 50% of projects achieved credit.	Undertake Enhanced Commissioning per LEED guidelines	LEED V4 Enhanced Commissioning, 3 points	✓ Living Building Challenge ✓ LBC Energy Petal ✓ Enterprise Green Comm. ✓ Green Globes × Earthcraft: No mention
Measurement & Verification 50% of projects achieved credit.	Advanced Energy Metering for the whole building and any end uses making up over 10% of the building load.	LEED V4 Advanced Energy Metering, 1 point	✓ Living Building Challenge ✓ LBC Energy Petal ✓ Enterprise Green Comm. ✓ Green Globes × Earthcraft: No mention



Strategy A: New Private Development

Water Efficiency

Past Performance	Suggested Target	LEED v4 equivalence	Other Equivalence
<p>Water Use Reduction LEED v2009 average 16% reduction over baseline</p> <p>50%: 0% 50% achieved 30%-35%</p>	<p>Indoor water use reduction Minimum 40% better than baseline</p>	<p>LEED V4 WEc2: Minimum 4 points 40% better than baseline</p>	<ul style="list-style-type: none"> ✓ Living Building Challenge ✓ LBC Water Petal ✓ Green Globes × Enterprise Green Communities: Maximum points for only 30% reduction currently × Earthcraft: No performance criteria
<p>Water Efficient Landscaping LEED 2009 AVERAGE 80% reduction in potable water use</p>	<p>Outdoor water use reduction: Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period. OR 50% reduction in landscape water requirement from the calculated baseline for the site's peak watering month.</p>	<p>LEED V4 WEc1: Option 1. No Irrigation Required (2 point): Show that the landscape does not require permanent irrigation OR Option 2. Reduced Irrigation (1-point): Reduce the project's landscape water requirement by at least 50% from calculated baseline</p>	<ul style="list-style-type: none"> ✓ Living Building Challenge ✓ LBC Water Petal ✓ Enterprise Green Communities ✓ Green Globe (verify % reduction) × Earthcraft: No mention



Strategy A: New Private Development

Stormwater

- Alexandria revised stormwater requirements less than 1 year ago, and State law limits local flexibility. Propose to maintain existing requirements for short term:
 - *“A minimum of 65% of total phosphorus (TP) removal required by the Virginia Stormwater Management Program (VSMP) must be achieved using non-proprietary surface BMPs approved by the Virginia Stormwater BMP Clearinghouse.*
 - *A maximum of 25% of the TP removal required by the VSMP may be achieved using [Manufactured Treatment Devices] MTDs and/or sand filters approved by the Virginia Stormwater BMP Clearinghouse.*
 - *Any Approved BMP may be used to meet the balance of the Alexandria Water Quality Volume Default (WQVD).*
 - *MTDs may not be used on single-family detached residential projects.”*



Strategy A: New Private Development

Energy and Water Impacts

- **Energy:**

- Will reduce EUI of new commercial and multifamily buildings between **18%-33%** depending on building type, relative to VA energy code
- **20%** reduction in total energy use of buildings forecast in small area plans, avoiding **592 billion** BTU of energy use per year

- **Climate:**

- **20%** reduction in GHGs from new construction, relative to BAU, avoiding Will **63,000** metric tons per year
- **3%** reduction in citywide GHG emissions, compared to citywide BAU
- Comparable to similar savings seen for similar policies in other jurisdictions

- **Water:**

- **29%** reduction in indoor water use from new construction, relative to BAU, avoiding use of over **421 million** gallons of water a year
- **9%** reduction in indoor water use by multifamily and commercial sectors in Alexandria, relative to BAU
- Does not include savings from irrigation



Strategy B: Public Buildings

New Public Buildings

Item	Achievement target	Exceeds private sector?
Green Building Certification	Lead by example by being certified at LEED Gold level	Yes
Energy Performance	Be designed to achieve net zero energy (NZE) through a combination of energy efficiency and renewable energy systems, either on-site or sited on other City properties.	Yes
Renewable energy & energy storage	Examine the feasibility, costs and benefits of installation of on-site solar and storage for all new projects, and include where feasible	Yes
Indoor water use	Reduction minimum 40% better than baseline (per LEED V4 baseline values)	Equal
Outdoor water use	Reduce irrigation water use by at least 50% relative to the calculated baseline for peak watering month, and where possible, use plants that require no irrigation with potable water after a maximum two-year establishment period.	Equal
Stormwater management	Meet 100% of the stormwater treatment requirements for sites with green infrastructure and evaluate options for overtreating and/or detaining additional rainwater on site to the greatest extent feasible.	Yes



Strategy B: Public Buildings

Net Zero Energy

- A **Net-Zero Energy (NZE)** building: highly energy-efficient building where 100% of the site energy use is met with renewable energy in net over the course of a year, either from on-site or off-site renewable energy.
- A **Net-Zero Energy-ready** building is a building with a sufficiently low EUI (often <25 kBTU/ft²) that it could be NZE if solar were added.
- Leading net zero energy certification programs require buildings to be **all-electric** and have **no on-site fuel combustion**.
- Certification programs **now allow for off-site renewable energy** to count for net zero energy certification in certain conditions and as long as they are from **long-term contracts (PPAs)**
- **Integrated Design** allows delivery of NZE buildings at no additional cost



Strategy B: Public Buildings

Performance-Based Procurement for New Construction

PERFORMANCE-BASED PROCUREMENT PROCESS:

1. Select the Project Delivery Method
2. Develop Performance Goals:
3. Include Performance Goals in the RFP/Contract
4. Manage Design and Construction to Ensure Goals Are Met
5. Verify Performance Post-Occupancy

- **Tier 1: “Mission Critical”**
outlines performance targets that are required in all buildings
- **Tier 2: “Highly Desirable”**
outlines performance targets that represent a more ambitious level of performance overall
- **Tier 3 “If Possible”**
outlines performance targets that are considered “best in class”

- **Benefits:**

- **Lower Risk:**

- Owner input into preliminary design
 - Assign firm fixed price for design
 - Bestows contractual responsibility for meeting or exceeding expectations to design team

- **Reduced time and cost**

- Fosters innovation and creativity
 - Creates significant reductions in design and construction costs
 - No contingency use
 - Reduces or eliminates claims, controversies and change orders

- **Higher Performance**

- Requires end-use metering to verify performance
 - Subcontractors must substantiate that design meets requirements



Strategy B: Public Buildings

Existing Public Buildings

- EAP calls for a 20% reduction in energy use in existing public building portfolio by FY 2023
- Can be achieved through a combination of:
 - Basic energy efficiency measures such as lighting retrofits
 - Optimizing operations and maintenance across portfolio
 - Deep energy retrofits in select buildings
 - Deep energy retrofits target a 30%-50%+ improvement
- Alexandria already benchmarks all its buildings
 - Regular QA/QC of this data is best practice
- Strategic Energy Management Plan
 - Rocky Mountain Portfolio Optimization program is a good option
 - City is already pursuing
- Need to align City's asset valuation to prioritize green investments.



Strategy C: New Private Buildings not subject to plan review

- **Home Rating and Labeling Programs**
 - Targeting single-family market
 - HERS Index or DOE Home Energy Score
 - Ratings incentivize improvements, and inform buyers of opportunities
 - State enabling legislation needed for any mandatory program
 - Alexandria could work with MRIS to incorporate into home listing regardless
- **Education and Capacity Building – Private Sector**
 - Education programs for industry, including developers, architects and engineers
 - Improve the local capacity to deliver high performance buildings.
 - Training can include classes, direct TA, and online resources
- **Education and Capacity Building – Public Sector**
 - City staff need training to stay updated on standards and best practices
 - Recommend City offer training on updated Green Building Policy for relevant staff
 - Recommend permit review staff get training in reviewing energy models, or an additional staff member with this expertise hired



Strategy D: Existing Public Buildings

Voluntary Programs

- **Challenge Programs / Benchmarking**
 - Can be effective way to promote benchmarking without mandate.
 - Arlington Green Games – between buildings
 - Better Buildings Challenge – between communities
- **Educational Programs**
 - Sustainability Guide for Historic Properties (DC has good model guide)
- **Tenant Build-Out**
 - Many commercial tenant spaces turn over every 7 years
 - Tenant turnover is critical time for upgrades
 - Promote ENERGY STAR Tenant Star program as new rating system for tenant spaces
 - Provide education and resources on Green Leasing / Energy-aligned Leasing, which aligns incentives of owners and tenants for building upgrades.
 - Recent study found green leases could cut commercial energy use by 11% to 22%.
- **C-PACE (Property-Assessed Clean Energy)**
 - Alexandria already exploring introduction of C-PACE
 - Will need dedicated staff resources, strong partnerships with private sector, and outreach to entities needing off-balance-sheet credit, such as affordable housing.



Items Alexandria could advocate for with Virginia General Assembly, working with other jurisdictions:

- Enabling local jurisdictions to require owners of large private buildings to annually benchmark and report their energy and water performance, and authorizing public disclosure.
- Enable local jurisdictions to require energy performance disclosure by home sellers to home buyers.
- Allow owners of large portfolios to install and interconnect solar systems on buildings that exceed 105% of the building's annual electricity demand, to serve other buildings in their portfolio.
- Make it easier of large users to purchase renewable energy directly from third parties via Power Purchase Agreements.
- Continue to adopt the most recent model energy codes, without weakening amendments.



Strategy E: Incentives

- **Structural Incentive: Floor area exclusions for passive design elements**
 - Exclude passive design elements, such as thicker walls or rain screens, from calculation of Floor Area Ratio
 - Promotes buildings with better insulation (instead of all-glass)
- **Structural Incentive: Density and/or Height bonus**
 - Important to not conflict with city's existing bonuses for affordable housing
 - Green density bonuses best when the stack on affordability bonuses
 - Can be useful for non-residential buildings and/or in areas of the city with greater potential for additional density, such as Potomac Yards
 - A Green Zone could be used to structure such a bonus
 - Recommend District Energy Analysis also be required for large projects
- **Tax Incentives**
 - Tax incentives important especially for smaller developments
 - Tax incentive are best when carefully targeted to promote achievement well above requirements, such as NZE buildings and deep green building.



Discussion

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GREEN BUILDING STRATEGIES COST ANALYSIS

City of Alexandria

Jan. 30th, 2019

WSP

WSP

PROJECT OBJECTIVES

Green Building Cost
Analysis

- Provide analysis to support the Green Building Policy Task Force policy recommendations
- Estimate costs of green building strategies (certifications, energy, water, and stormwater) from the perspective of developers and the City
- Build on existing pro forma analysis to assess financial impacts on new construction
- Evaluate potential use of incentives

AGENDA

Green Building Cost
Analysis

1. Green building costs for new construction
2. Managing green building costs
3. Green building costs for the City and potential incentives
4. The Green Building Cost Matrix
5. Questions and next steps

GREEN BUILDING COST ANALYSIS SCOPE

Green Building Cost
Analysis

1. Certifications
2. Individual and integrated strategies
3. Wide range of building types
4. Cost ranges and trade-offs

GREEN BUILDING COST ANALYSIS SCOPE

Green Building Cost
Analysis

STRATEGY	
CERTIFICATIONS	LEED v4 Certified
	LEED v4 Silver
	LEED v4 Gold
	LEED v4 Platinum
	Net-Zero Energy

GREEN BUILDING COST MATRIX ASSUMPTIONS

Green Building Cost Analysis

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STRATEGY	SUMMARY			NEW PRI		
	0	0	0	OFF		LOW
	Δ	\$	I	LOW	HIGH	LOW
CERTIFICATIONS						
LEED v4 Certified				-\$209,000	\$104,500	-\$386
LEED v4 Silver				\$0	\$104,500	\$0
LEED v4 Gold				\$104,500	\$418,000	\$120
LEED v4 Platinum				\$313,500	\$1,045,000	\$360
Net-Zero Energy				-\$418,000	\$1,672,000	-\$480
ENERGY / GSG						
TOTAL				\$560,239	\$3,217,321	448
Improved Building Envelope				\$0	\$360,000	\$0
Efficient Building Systems				\$150,000	\$861,244	120
Integrated Building Controls				\$75,000	\$240,000	\$60
Commissioning (Fund + Enhanced)				\$30,000	\$90,000	\$24
Ongoing Performance / M&V				\$50,239	\$114,833	\$40
Energy Intensity Targets (EUI)				\$255,000	\$1,551,244	204
WATER						
TOTAL				\$37,636	\$185,656	\$30
Outdoor Water Savings				-\$9,330	\$63,158	-\$7
Indoor Water Savings				\$1,378	\$9,818	\$1
Process Water Savings				\$373	\$23,684	\$26
Commissioning				\$17,943	\$35,885	\$14
Ongoing Performance / M&V				\$17,943	\$25,120	\$14
Water Metering & Performance				\$9,330	\$27,990	\$7
STORMWATER						
TOTAL				\$129,187	\$416,268	\$103
Green Infrastructure (Ground)				\$35,885	\$200,957	\$28
Green Infrastructure (Wall)				\$43,062	\$86,124	\$34
Rainwater Collection				\$50,239	\$129,187	\$40

STRATEGY	BASELINE	ASSUMPTIONS		HIGH COSTS	
		LOW COSTS	HIGH COSTS	ASSUMPTIONS	HIGH COSTS
LEED v4 Certified		LEED v4 Silver + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$209,000	LEED v4 Platinum + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$1,045,000
LEED v4 Silver		LEED v4 Silver + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$0	LEED v4 Silver + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$104,500
LEED v4 Gold	LEED 2009 Gold + M&V	LEED v4 Gold + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$104,500	LEED v4 Gold + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$418,000
LEED v4 Platinum		LEED v4 Platinum + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$313,500	LEED v4 Platinum + Enhanced Energy + Enhanced Building Envelope + Enhanced Water + Enhanced Stormwater	\$1,045,000
Net-Zero Energy		Net-Zero energy projects can be designed and constructed to energy savings. Achieving net-zero energy requires identifying energy use patterns for a building type, a climate zone and the applicable energy codes.	\$418,000	Some projects are designed to not only be net-zero energy but also to generate energy. This is achieved through the use of renewable energy sources.	\$1,672,000
ENERGY / GSG					
Improved Building Envelope	ASHRAE 90.1-2010 Energy code compliant or better, 10% EUI	2% improvement in envelope, 4% improvement in lighting, 4% improvement in mechanical, 4% improvement in electrical, 4% improvement in plumbing, 4% improvement in fire, 4% improvement in elevator, 4% improvement in other building systems	\$0	5% improvement in envelope, 4% improvement in lighting, 4% improvement in mechanical, 4% improvement in electrical, 4% improvement in plumbing, 4% improvement in fire, 4% improvement in elevator, 4% improvement in other building systems	\$360,000
Efficient Building Systems	ASHRAE 90.1-2010 Energy code compliant or better, 10% EUI	Improved MEP systems and controls, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$150,000	Improved MEP systems and controls, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$861,244
Integrated Building Controls	Stratex BAS and controls, very high building performance	Stratex BAS and controls, very high building performance	\$75,000	Stratex BAS and controls, very high building performance	\$240,000
Commissioning (Fund + Enhanced)	LEED 2009 Fundamentals Commissioning	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$30,000	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$90,000
Ongoing Performance / M&V	LEED 2009 Fundamentals Ongoing Performance / M&V	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$50,239	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$114,833
Energy Intensity Targets (EUI)	LEED 2009 Fundamentals Energy Intensity Targets (EUI)	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$255,000	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$1,551,244
WATER					
Outdoor Water Savings	ASHRAE 90.1-2010 Energy code compliant or better, 10% EUI	10% reduction in outdoor water use	-\$9,330	10% reduction in outdoor water use	\$63,158
Indoor Water Savings	ASHRAE 90.1-2010 Energy code compliant or better, 10% EUI	10% reduction in indoor water use	\$1,378	10% reduction in indoor water use	\$9,818
Process Water Savings	ASHRAE 90.1-2010 Energy code compliant or better, 10% EUI	10% reduction in process water use	\$373	10% reduction in process water use	\$23,684
Commissioning	LEED 2009 Fundamentals Commissioning	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$17,943	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$35,885
Ongoing Performance / M&V	LEED 2009 Fundamentals Ongoing Performance / M&V	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$17,943	LEED v4 Platinum + Enhanced O&M, 10% improvement in lighting, 10% improvement in mechanical, 10% improvement in electrical, 10% improvement in plumbing, 10% improvement in fire, 10% improvement in elevator, 10% improvement in other building systems	\$25,120
Water Metering & Performance	ASHRAE 90.1-2010 Energy code compliant or better, 10% EUI	10% reduction in water use	\$9,330	10% reduction in water use	\$27,990
STORMWATER					
Green Infrastructure (Ground)	LEED 2009 Fundamentals Green Infrastructure (Ground)	10% reduction in stormwater runoff	\$35,885	10% reduction in stormwater runoff	\$200,957
Green Infrastructure (Wall)	LEED 2009 Fundamentals Green Infrastructure (Wall)	10% reduction in stormwater runoff	\$43,062	10% reduction in stormwater runoff	\$86,124
Rainwater Collection	LEED 2009 Fundamentals Rainwater Collection	10% reduction in stormwater runoff	\$50,239	10% reduction in stormwater runoff	\$129,187



GREEN BUILDING COST MATRIX ASSUMPTIONS

Green Building Cost Analysis

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		TOTAL			\$560,239	\$3,217,321
ENERGY / GSG	Improved Building Envelope				\$0	\$360,000
	Efficient Building Systems				\$150,000	\$861,244
	Integrated Building Controls				\$75,000	\$240,000
	Commissioning (Fund. + Enhanced)				\$30,000	\$90,000
	Ongoing Performance / M&V				\$50,239	\$114,833
	Energy Intensity Targets (EUI)				\$255,000	\$1,551,244



GREEN BUILDING COST MATRIX ASSUMPTIONS

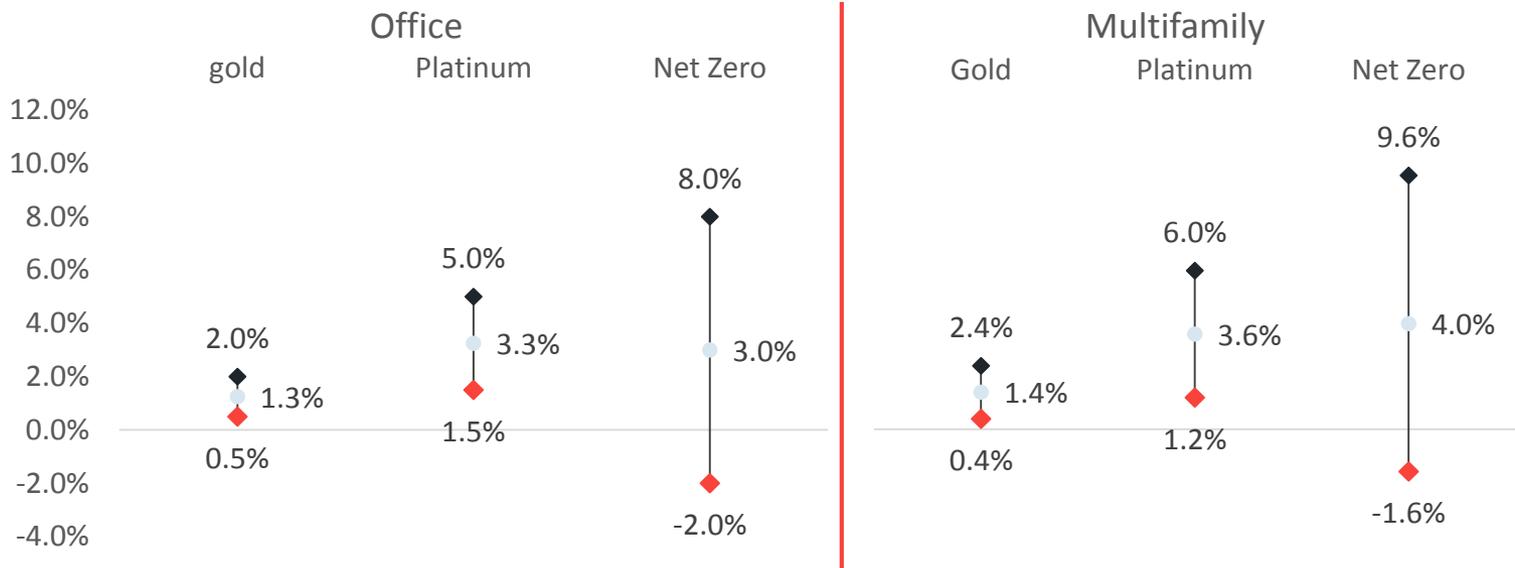
Green Building Cost Analysis

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ENERGY / GSG	Improved Building Envelope	ASHRAE 90.1 2010 energy code baseline w/ 60% WTW ratio	50% improvement in window, wall, and roof R-values. Light to Solar Gain ratio for glazing above 2.1. WTW ratio reduced to 40%. 35% reduction in heating and cooling load associated with building envelope.	\$0	50% improvement in window, wall, and roof R-values. Light to Solar Gain ratio for glazing above 2.1. WTW ratio remains the same. 35% reduction in heating and cooling load associated with building envelope.	\$250,800
	Efficient Building Systems	ASHRAE 90.1 20X10 energy code baseline for Water-cooled DX w/ VAV's	Improved MEP systems achieve 30% improvement in annual energy cost (for energy associated with HVAC systems) and are "right-sized" to meet reduced building loads.	\$104,500	Improved MEP systems achieve 30% improvement in annual energy cost (for energy associated with HVAC systems) and are <u>not</u> "right-sized" to meet reduced building loads.	\$600,000
	Integrated Building Controls	Standard BMS and controls. Very limited submetering for lighting and HVAC.	Smart BMS and energy management system provides real-time energy monitoring, alerts, and insights. System is operated to manage and reduce annual energy use.	\$52,250	Smart BMS and energy management system provides real-time energy monitoring, alerts, and insights. System is <u>not</u> operated effectively to manage and reduce annual energy use.	\$167,200
	Commissioning	LEED 2009 Fundamental Commissioning	LEED v4 Fundamental + Enhanced Cx. w/ strong Cx team providing insights that reduce annual energy use.	\$20,900	LEED v4 Fundamental + Enhanced Cx. w/ typical Cx team focused on LEED cert.	\$62,700
	Ongoing Performance / M&V	LEED 2009 Measurement & Verification Plan developed but not implemented.	LEED v4 Monitoring-Based Cx + Advanced Metering + 2-year M&V / performance contract	\$35,000	LEED v4 Monitoring-Based Cx + Advanced Metering + 2-year M&V contract	\$80,000
	EUI Target - 30% reduction	See baseline assumptions above. *	30% reduction in EUI beyond LEED 2009 baselines. *	\$177,650	30% reduction in EUI beyond typical code compliant building.	\$1,080,700
	EUI Target - 38 kBtu / SF / Yr.	See baseline assumptions above. *	Highly integrated D&C team with low-energy building experience. Very good building envelope, efficient "right-sized" systems, 45%-50% reduction in annual energy use.	\$313,500	Typical D&C team, limited low-energy building experience. Very good building envelope, efficient, systems not "right-sized", 45%-50% reduction in annual energy use.	\$636,000

GREEN BUILDING COSTS FOR NEW CONSTRUCTION

- Our team's research resulted in the likely range of increased development costs by certification level



GREEN BUILDING COST RANGES

Green Building Cost
Analysis



10% Costs



2% Savings

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- What makes the difference?
 - Context dependent
 - Geographic, project specific, logistical, building codes, market forces
 - Not context dependent
 - Integrating the building design and systems
 - Right-sizing systems and the design
 - Green building as a program issue, not an added requirement

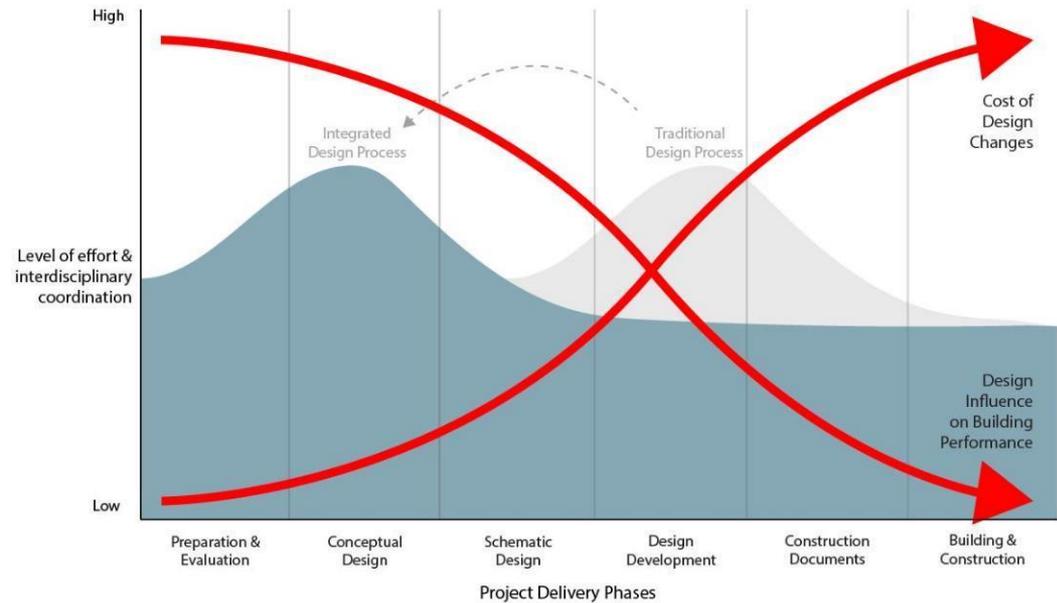
BEST PRACTICE: INTEGRATED GREEN BUILDING STRATEGY

1. Integrated team

- Early goal-setting and decision-making
- Maximize collaboration
- Avoid costly last minute additions

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Cost and Impact of Green Building Strategies



BEST PRACTICE: SHIFT THE MINDSET FROM BURDEN TO BENEFIT

2. Green building is a program issue...

...not an added requirement

- Treat sustainability as an **investment** to be maximized not a **cost** to be minimized
- Focus on building **performance outcomes** and increases project value to owner, users, operators
- Set **qualitative or quantitative goals** included in the building program accounts for emissions, energy, water, waste, occupant health, etc.

THREE EXAMPLES: HARD COSTS

Green Building Cost Analysis

- We applied these findings to three case study developments in Alexandria to test development financial sensitivity
- Development cost increases ranged from \$3.00-\$4.00/SF for LEED v4 Gold and \$8.00-\$10.00/SF for Platinum

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Project	Square Feet	Gold	Platinum	Net Zero
Type 1: Office w/GF retail	100,000	\$391K	\$992K	-\$600K - \$2.4M
		\$3.83/SF	\$9.72/SF	-\$5.89/SF - \$24/SF
Type 2: Multifamily w/GF retail	300,000	\$1.2M	\$3.1M	-\$1.4M - \$8.2M
		\$3.91/SF	\$10.06/SF	-\$4.47/SF - \$27/SF
Type 3: For-Sale Attached Residential	120,000	\$356K	\$923M	-\$210K - \$2.7M
		\$3.02/SF	\$7.82/SF	-\$1.78/SF - \$23/SF



THREE EXAMPLES: FINANCIAL RETURN

Green Building Cost Analysis

- Applicable profitability metrics include
 - internal rate of return (IRR) - all three projects
 - Yield on cost (YOC) – rental income profiles
 - Return on investment (ROI) – projects w/sales revenue

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Project	Base Case IRR	Gold IRR	Platinum IRR	Net Zero IRR	Base Case YOC	Gold YOC	Platinum YOC	Net Zero YOC	Base Case ROI	Gold ROI	Platinum ROI	Net Zero ROI
Type 1	10.7%	10.5%	10.2%	9.6 – 10.9%	7.9%	7.8%	7.7%	7.4 - 8.0%	-	-	-	-
Type 2	8.2%	8.2%	8.0%	7.3 - 8.5%	5.9%	5.9%	5.8%	5.6 - 6.0%	-	-	-	-
Type 3	5.0%	4.7%	3.7%	0.6 – 5.9%	-	-	-	-	8.2%	7.8%	6.1%	1.1 – 9.6%



FINDINGS AND RECOMMENDATIONS: NEW CONSTRUCTION

Green Building Cost
Analysis

Experienced, integrated project teams more likely to achieve the lower costs



Updating to LEED v4 will likely have minimal cost impact for new development projects



FINDING

The City can support the integrative design process through incentives and technical support

The City updates to LEED v4 and considers increasing certification level for most project types

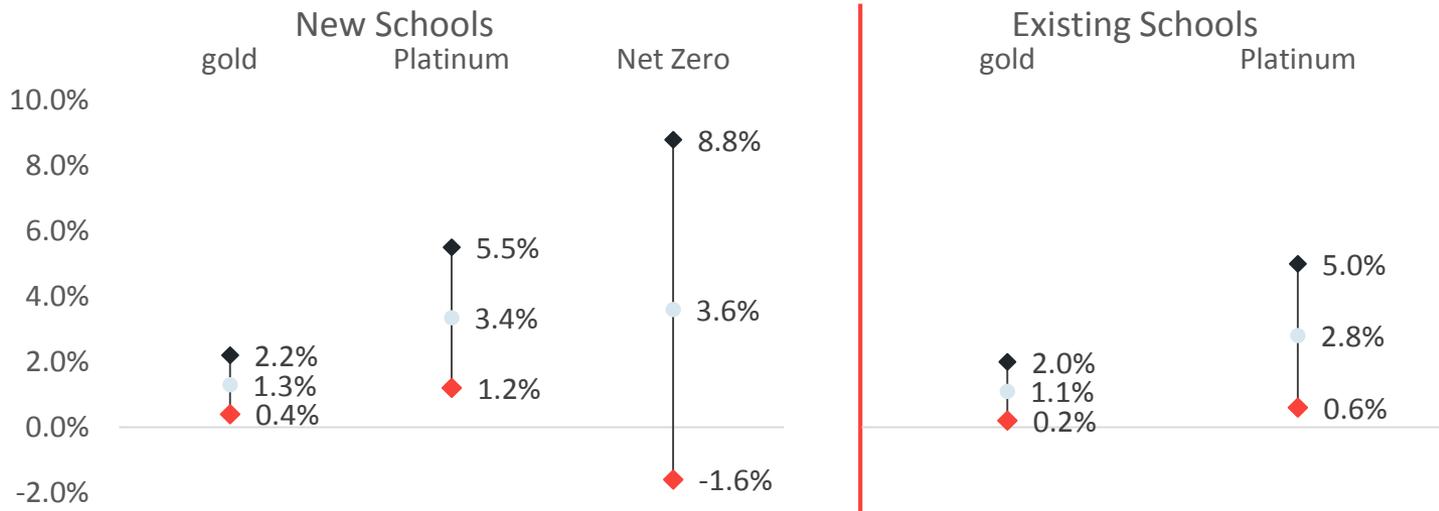
RECOMMENDATION

CITY COST OF GREEN BUILDING: PUBLIC BUILDINGS

Green Building Cost
Analysis

- The incremental costs for public buildings is similar to private developments
- A preliminary review of the 10-year Capital Improvement Program (CIP) suggests an additional \$25-\$40M from increased green building requirements

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FINDINGS AND RECOMMENDATIONS

Green Building Cost
Analysis

The City's increased public building costs could range from \$25 to \$40M over the next 10 years, depending on the level of green building certification

FINDING



Further refine this estimate with City staff and evaluate financial impacts on 10-year CIP, including debt capacity, bonding ratio, and prior capital commitments

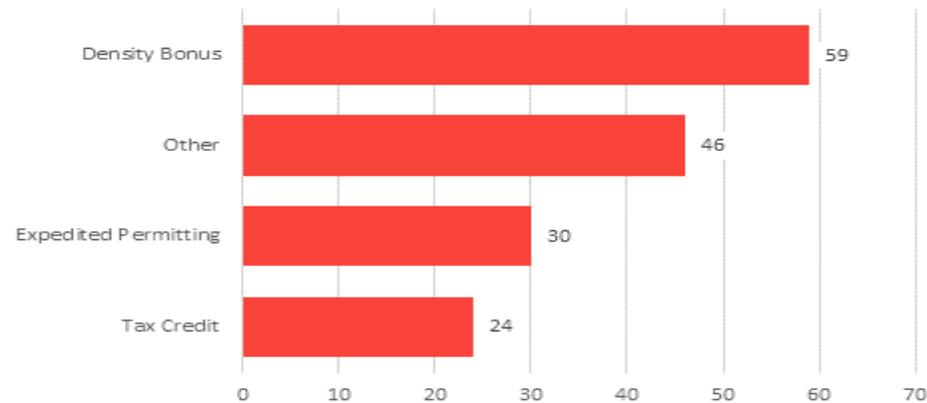
RECOMMENDATION

POTENTIAL INCENTIVE PROGRAMS

Green Building Cost
Analysis

- Density bonuses are the most commonly offered green building incentive at the local government level
- Density bonuses are classified as structural incentives, which require minimal direct cost to the City, as opposed to financial incentives such as tax credits
- Density bonuses are very attractive to developers, but a green building bonus must be structured in a way that does not force a decision between it and the City's existing affordable housing bonus program

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FINDINGS AND RECOMMENDATIONS

Green Building Cost
Analysis

The City's increased public building costs could range from \$25 to \$40M over the next 10 years, depending on the level of green building certification

There is broad appeal for density bonus incentive mechanisms from developers and municipalities alike

FINDING



Further refine this estimate with City staff and evaluate financial impacts on 10-year CIP, including debt capacity, bonding ratio, and prior capital commitments

Consider implementing a green building density bonus structured to ensure that it complements the affordable housing program, rather than competing with it

RECOMMENDATION

Thank you!

Questions?

wsp.com



Task Force Discussion – Integral Group Recommendations

Strategy:

Strategy A (A+D Combined):

Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

Strategy B:

Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

Strategy C (Partial E):

Introduce voluntary green building practices for small buildings not subject to review.

Strategy D (Partial E):

Introduce voluntary green building practices for existing buildings (including historic).

Strategy E (Former C):

Establish incentives for private development participation in green building certifications.

Recommendations to Consider:

- All private development (residential and non-residential) achieve LEED Silver certification as a minimum with energy and water performance targets that equate to specific LEED credits.
- No additional requirements over and above the City's current standards for stormwater (updated April 2018).
- All new public development projects, including schools, be certified at the LEED Gold level, as well as be designed to achieve net zero energy (NZE), water, and stormwater performance targets.
- Home Rating and Labeling Programs, and Education and Capacity Building for small buildings not subject to site plan review.
- Establishing challenge and benchmarking programs, educational programs, and green leases as voluntary green building practices for existing buildings, including historic.
- Incentives such as FAR exclusions, tax reductions, and/or density/height bonuses in designated areas of the City "stacked" with affordable housing bonuses.

Task Force Discussion – WSP Cost Analysis

Strategy:

Strategy A (A+D Combined):

Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

Strategy B:

Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

Strategy C:

Establish incentives for private development participation in green building certifications.

Strategy E:

Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.

Summary WSP Analysis:

- Costs associated with increasing certification standards can range from -2% to +13% with many of the variables that impact first costs can be managed by an experienced, integrated project team.
- Water efficiency strategies have the lowest up-front costs to implement but have the lowest operational cost savings.
- Energy upgrades and ongoing performance verification of energy systems have the highest up-front costs but have the largest operational savings.
- An increased standard for public buildings has the potential to increase City capital costs by \$25-\$40 million over the next ten years.
- Incremental cost increases for new private development are nearly equivalent to that of new public development for levels of green building certification greater than or equal to LEED Gold with NZE performance targets.
- A green building density bonus is an effective mechanism for private development but has the potential to impact existing affordable housing density program unless the combine to meet the parcel's maximum FAR.
- Smaller scale incentives such as tax credits or fee reductions/waivers are most effective in gaining participation in voluntary green building practices.



Green Building Education Event

Topic: *Building Green*

Program Focus:

Provide builders, developers, and property owners with examples of building green for residential properties, public facilities, and private large-scale developments.

Date and Time:

February 28 from 6:30 to 8:30 p.m.

Location:

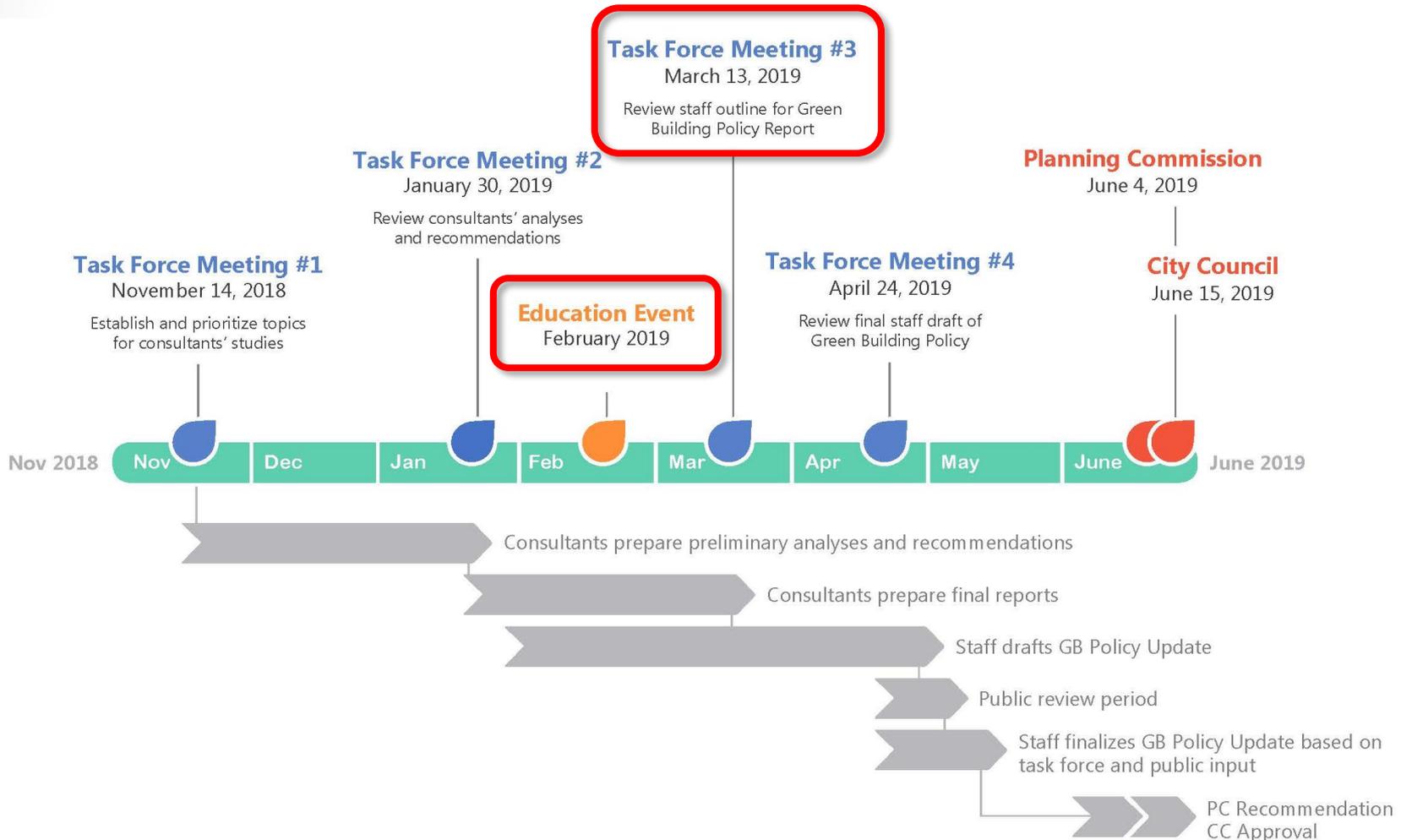
Alexandria Renew Enterprises,
1800 Limerick Street (LEED Platinum)



Public Comments

Green Building Policy Update

Next Steps



Five Priority Green Building Strategies

Task Force Meeting #1:

Strategy A: Increase LEED or equivalent third-party green building certification standards for private development.

Strategy B: Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

Strategy C: Establish incentives for private development participation in green building certifications.

Strategy D: Prioritizing specific green building elements in private development projects.

Strategy E: Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.

Integral Group (Recommendations):

Strategy A (A+D Combined): Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

Strategy B: Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

Strategy C (Partial E): Introduce voluntary green building practices for small buildings not subject to review.

Strategy D (Partial E): Introduce voluntary green building practices for existing buildings (including historic).

Strategy E (Former C): Establish incentives for private development participation in green building certifications.

WSP (Cost Analysis):

Strategy A (A+D Combined): Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

Strategy B: Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

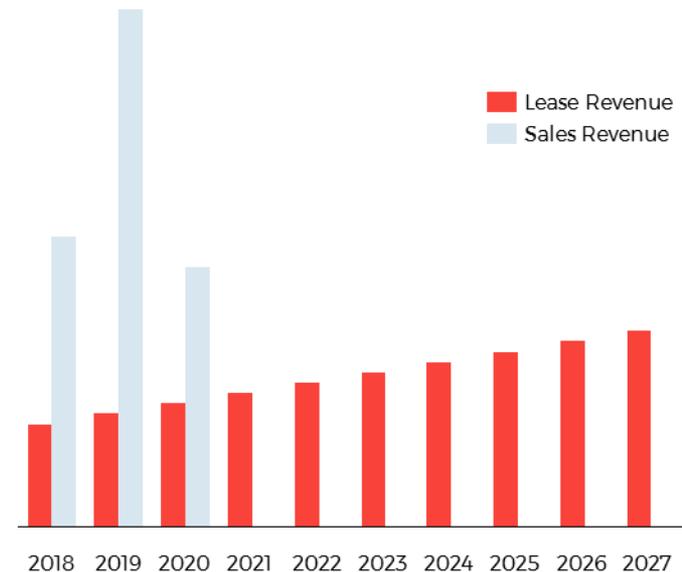
Strategy C: Establish incentives for private development participation in green building certifications.

Strategy E: Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.

Appendix: Applicable profitability metrics vary by project-specific revenue profile

– Project type (for-sale vs. lease) results in very different cash flows

- Project list includes diverse mix of revenue profiles:
- **Lease revenue** (office, retail, apartments)
- **Sales revenue** (for-sale residential – condominiums and townhomes)
- **Blended revenue** (for-sale residential w/retail)
- Certain profitability metrics are more/less applicable depending on the revenue profile



Appendix: definition of selected profitability metrics

- Yield on cost (YOC)
 - AKA return on cost (ROC)
 - AKA rate of return (ROR) on total capital
 - Straightforward metric for projects generating *lease revenue only*
 - $YOC = \text{stabilized net operating income (NOI) divided by total project costs (YOC = NOI / Total Cost)}$
 - Developers typically seek YOC ~200bp higher than current cap rates
- Internal rate of return (IRR)
 - Measures % return of total cash flows over time (upfront capital investment and ongoing net revenue from sales and/or leases)
 - Target IRR contingent upon various factors including perceived project risk, land use, debt structure (unleveraged vs. leveraged IRR), etc.
 - Unleveraged IRR calculated for each project
 - eliminates speculative debt structure assumptions
 - but does require disposition assumptions for lease revenue projects (e.g. sale year, sale price/cap rate, etc.)
 - Leveraged IRR higher than unleveraged
- Return on investment (ROI)
 - best/simplest for for-sale projects, but only one project had revenue exclusively from sales
 - $ROI = \text{total project revenue divided by total development costs (or investment) (ROI = total revenue / total cost)}$

Appendix: Pro forma quantitative data inputs gathered and analyzed in previous work

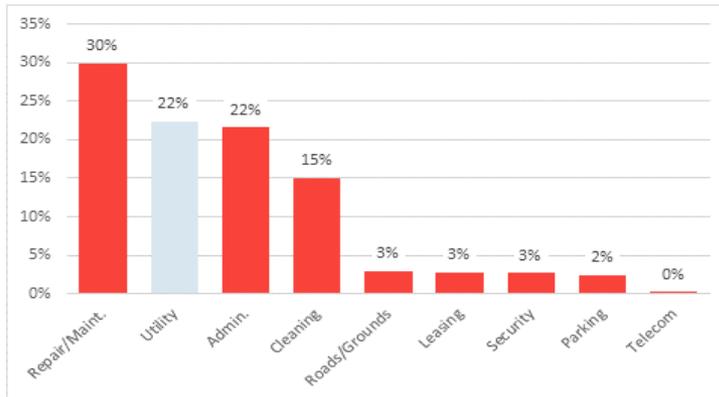
Revenue assumptions	<ul style="list-style-type: none">▶ Rental properties: submarket-level lease trends and property-specific lease data from CoStar to estimate project-specific annual gross revenue▶ For-sale properties: Publicly available transaction or list price data for for-sale residential
Construction costs	<ul style="list-style-type: none">▶ 2018 RSMeans Square Foot Costs – industry standard resource for all commercial and residential formats with ability to tailor by location, scale, finish levels, and several other criteria
Operating costs	<ul style="list-style-type: none">▶ Operating costs by land use / format (not including for-sale residential):<ul style="list-style-type: none">▶ Apartments – National Association of Apartment (NAA) 2017 Income & Expense Survey for properties in DC region▶ Commercial – Building Owners and Managers Association (BOMA) 2017 Experience Exchange Report (EER) for DC region properties
Land acquisition costs	<ul style="list-style-type: none">▶ Actual transaction data from Alexandria assessor’s office

APPENDIX: OPERATING COSTS

- Research on typical operating costs shows that the lifecycle cost benefits of green building differ by land use
- Utility costs (energy / water) are higher for commercial vs. multifamily uses (where costs are typically passed on to tenants)

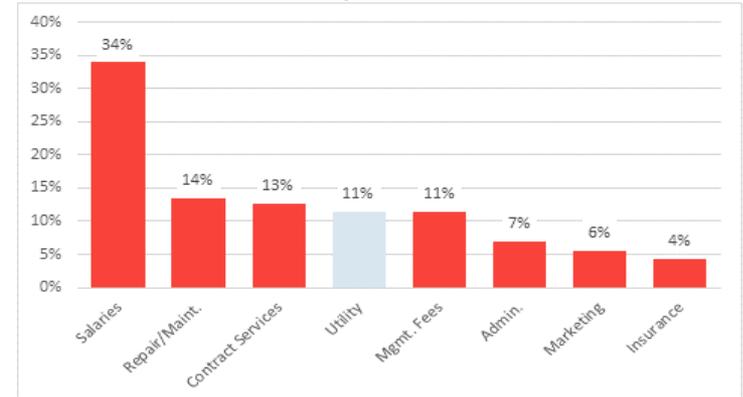
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Share of Commercial Operating Costs by Category, Northern Virginia, 2017



Source: BOMA

Share of Apartment Operating Costs by Category, Washington, DC Region, 2017



Source: National Apartment Association



PROJECT OVERVIEW

Green Building Cost Analysis

Pro forma analysis

Preliminary Cost Analysis

Final Cost Analysis

Response to Review

Final Report

12-18:
Preliminary
Report Draft 1

1-16-19:
Preliminary
Report Draft 2

1-30-19
Presentation of
Findings

TEAM

Green Building Cost
Analysis



Sarah Buffaloe

Project Manager



Narada Golden

Green Building
Strategy Lead



Tim Thornton

Financial Analysis Lead



Erika Duran



Chris Edmonds

Green Building Strategy Analysts

TASK FORCE BACKGROUND

Green Building Cost Analysis

- In 2009, Green Building Policy
- FY2019 update to the Green Building Policy
- Task Force to provide guidance to staff
- The Department of Planning and Zoning requested cost analysis to evaluate implementation cost of each strategy

METHODOLOGY: GREEN BUILDING STRATEGY

- New Private Development
 - Office (OFF)
 - Multifamily (MF)
 - Small Buildings (SML)
- Existing Private Development
 - Commercial (COM)
 - Multifamily (MF)
 - Single-family residential (SF)
- New Public Buildings
 - Schools (SCH)
 - Fire/Police (FIRE)
- Existing Public Buildings
 - Schools (SCH)
 - Fire/Police (FIRE)

METHODOLOGY: GREEN BUILDING STRATEGY

CERTIFICATIONS	ENERGY/GHG	WATER	STORMWATER
<ul style="list-style-type: none"> • LEED v4 Certified • LEED v4 Silver • LEED v4 Gold • LEED v4 Platinum • Net-Zero Energy 	<ul style="list-style-type: none"> • Improved Building Envelope • Efficient Building Systems • Integrated Building Controls • Commissioning (Fundamental & Enhanced) • Ongoing Performance/M&V • Energy Use Intensity (EUI) 	<ul style="list-style-type: none"> • Outdoor Water Savings • Indoor Water Savings • Process Water Savings • Commissioning • Ongoing Performance / M&V • Water Metering & Performance • Water Use Intensity (WUI) 	<ul style="list-style-type: none"> • Green Infrastructure (ground) • Green Infrastructure (roof) • Rainwater Collection