



Commercial Replacement & Attachment Window Solutions Market Transformation Initiative

Appendix A: Logic Model - DRAFT

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Commercial Replacement and Attachment Window Solutions (CRAWS) - Logic Model - Draft 04.27.2026

Barriers / Opportunities

Awareness: Building owners are not aware of poor performing windows' impact on energy use even in mild climates; not aware of CSW, VIG and associated energy and non-energy benefits	High first cost relative to "do-nothing"; unfavorable ROI when HVAC benefits omitted	Non-energy benefits are key driver, but not well-quantified	CSW & VIG: immature supply chain	SB 48 and forthcoming CA policy on commercial building energy use and emissions reduction	DOE, National Labs, GSA, CEC, REEOs (MN CEE) and utilities (ComED) testing and promoting window solutions	Growing financial, technical and manufacturing investment in CSW and VIG manufacturing:	BPS nationally is driving new financial and financing models for building upgrades (Green Banks, evolving ESCO models, C-PACE, on-bill financing) enabling windows to be bundled and financed with other measures.
		High vacancy rate in commercial office space market reducing appetite for improvements	VIG: no standard methodology to rate installed performance	Meeting climate policy goals in pre-2000 buildings necessitates envelope improvement	CaMTA MTIs (CBEA and CRTU)	DOE awards to Alpen (\$5.9M for CSW) and LuxWall (\$31.7M for VIG)	

Strategic Interventions

Interventions with a focus on equity considerations

<p>Leverage Strategic Interventions of CBEA & CRTU MTIs</p> <p>CBEA interventions are aimed at catalyzing the entire ecosystem of whole building energy efficiency, which creates favorable conditions for envelope upgrades.</p> <p>Collaborate with CRTU MTI on field demonstrations that address HVAC and envelope simultaneously</p>	<p>In-field Demonstrations</p> <p>Document energy and non-energy impacts of CSW and VIG in target markets;</p> <p>Demonstrate installation simplicity</p> <p>Include sites where HVAC is being replaced.</p> <p>Engage ESCOs where possible.</p>	<p>Build "Envelope First" Business Case for Commercial Buildings</p> <p>Bundle holistic energy benefits - efficiency, HVAC downsizing and peak savings - with monetized non-energy benefits of window upgrades; contrast with HVAC only approach to demonstrate favorable ROI; identify financing options.</p> <p>Focus initially on owner-occupied MUSH market, hospitality and historic buildings</p>	<p>Awareness-Building with Strategic Partners and CA External Programs (SEM, Commercial Utility Programs, etc.)</p> <p>Engage with organizations representing architects, design-build firms, building managers, HVAC installers, and commercial real estate professionals to raise awareness of the problems and benefits associated with windows.</p> <p>Engage with BPS hubs, utility commercial efficiency programs, ESJ organizations and ESCOs.</p>	<p>Industry Engagement for Technical Support and Demand Creation</p> <p>Engage with DOE, AERC, national labs and energy efficiency organizations to prioritize research, develop VIG rating methodology, collaborate on lab and field-testing, establish ENERGY STAR category for CSW.</p> <p>Develop simplified savings calculator to aid in estimating savings for recruitment purposes and showcasing the value proposition for window upgrades</p>	<p>Supply Chain Engagement for Product Enhancement and Workforce Development</p> <p>Engage manufacturers to document and/or improve technology performance and durability; drive innovations to reduce material and installation costs and expand product feature set.</p> <p>Incentivize submission of window solutions to AERC for energy ratings.</p>	<p>Demand-Generating Marketing and Support: Awareness Building, Education and Financial Tools</p> <p>Support manufacturers in communicating the need for and benefits of window upgrades (i.e. Why Windows Matter) to the market.</p> <p>Identify funding and financing resources</p>
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Outputs

Aligned interventions and single points of contact for stakeholder engagement.	Field demonstration projects across both product categories and each MUSH market segment	Demand-side business case and case studies for each segment of the MUSH market, hospitality and historical buildings; expand later to commercial office space	MOUs	Research plans informed by results of field demonstrations	Product roadmaps, go-to-market plans and workforce development strategies	Marketing plans w/ aligned partners; collateral
CRAWS in CBEA playbook	Field test reports documenting energy savings, NEBs, costs, value proposition, best practices and lessons-learned.	Reflect unique ESJ considerations	Market-actor specific materials that communicate the value proposition for CRAWS and identify the role of and actions appropriate for each market actor to undertake in educating clients about the benefits of window upgrades.	VIG rating body identified	Manufacturer engagement plans and deliverables	Schedule of conferences and other market engagements
Documented alignment plans				CSW savings calculator	Schedule for AERC submissions	Funding and finance resources, esp for ESJ
				Training materials that HVAC professionals can use to train technicians and installers		

Outcomes

Short-Term (1-2 yrs)

<p>Awareness of problem, solutions and business case grows among:</p> <ul style="list-style-type: none"> - CRE owners, operators - BPS Hubs, accelerators - MUSH market - ESCOs - Architects, specifiers - Utility EE programs - CBOs - HVAC installers 	CRAWS included in TRM	Utility commercial EE programs include CRAWS technology in list of measures	AERC funding stable; commercial workgroup initiates VIG rating work.	Manufacturers provide installer training and DIY installation resources	Market actor offerings reflect value proposition of NEBs in determining incentives and financing terms
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Med-Term (3-5 yrs)

Municipalities include CRAWS as part of climate / energy action plans	Utility commercial EE programs increasingly offer incentives for CRAWS products.	CRAWS increasingly recommended or evaluated by architects, design firms, ESCOs, CBOs, HVAC installers (i.e., specifier and influencer engagement increases)	VIG rating method published	Increase in number of suppliers and installers selling CRAWS product	Adoption of CRAWS technology grows in:	Market Actors including Funding and Financing entities recognize monetary value of NEBs and provide mechanisms for ESJ financing
	Incentives offered for evaluating envelope as part of HVAC updates		Increase in number of manufacturers and products rated by AERC		- CRE Market	
					- MUSH Market	
					- ESCO project portfolios	

Long-Term (6-10+ yrs)

Increasing number of municipalities include CRAWS as part of climate / energy action plans	Majority of market with single pane and double pane clear windows views CSW and VIG as standard product for improving building comfort and energy efficiency and a standard practice associated with HVAC sizing	By 2045, 50% of planned HVAC replacements or upgrades include envelope evaluation.	ENERGY STAR agrees to include CSWs	Market penetration of CSW and VIG increase in target commercial building market sectors	CA BPS (or similar policy) includes CSW and VIG in prescriptive and performance-based pathways as means to meet CA state efficiency and decarbonization goals.	Increasing number of funding and financing pathways for CRAWS including ESJ solutions
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IMPACT

By 2047, over 14% of the existing commercial building sector square footage in the target market that currently has single pane or double pane clear windows utilizes CRAWS technology in line with California's overall decarbonization targets.

MTI's Role

Market's Response