



## SUMMARY REPORT

### Background

The U.S. Department of Energy (DOE) Building Technologies Program (BTP) supports the research and development of technologies that reduce buildings' energy consumption through programs such as the Building Envelope and Windows Research and Development (R&D) Program. Within the Building Envelope and Windows R&D Program, advances in window technologies offer many opportunities for energy conservation. DOE regularly holds the Window Technology Stakeholder Engagement Workshop in order to inform stakeholders of current DOE projects and gathers stakeholder feedback to help assess its current projects/technologies and to aid in advising the prioritization of future projects. This meeting was called specifically for activities within the Windows R&D Program. A list of invited stakeholders is located in the Appendix of this report.

The purpose of this Stakeholder Engagement Workshop is to document the input received regarding the DOE Windows R&D Program in regard to possible future directions of the program. The DOE appreciates receiving input based on our stakeholders' personal experience, individual advice, information, or facts regarding this topic. It is not the object of this stakeholder plan to document or indicate any group position or consensus. Rather, it was the Department's object to seek as many recommendations as possible from all individuals at the Windows R&D Program Stakeholder Engagement meeting.

### Meeting objectives/purpose

1. To provide stakeholders with an overview of the DOE Window Technology R&D Program's goals, research agenda and current R&D activities
2. To seek stakeholder feedback on DOE Windows R&D priorities to advise:
  - a. Program direction
  - b. R&D focus by identifying other areas of importance
3. To provide an opportunity for stakeholders to interact and form partnerships for future collaboration

## I. Opening Remarks

Walt Zalis brought the meeting to order and welcomed participants at 10:00 a.m. He thanked those in attendance for their interest and work in the Windows R&D Program and went over the objectives for the meeting. He also discussed the expected outcomes:

- A report that will advise future Window R&D Program priorities
- Potential new R&D focus areas for consideration

Mr. Zalis then shared the ground rules for the meeting with the participants:

- Time is limited—please be brief and to the point.
- With limited time, our goal is to gather new input. There is no time to fully resolve differences of opinion and perspective.
- Please, only one speaker at a time.
- Please note your questions on the back of your packet. If time does not permit, any unanswered questions will be collected and followed up on via email.
- Please return to the meeting on time following our break. We will need to start work within our breakout groups as soon as possible.

## II. Presentations

Alexis Abramson, the Emerging Technology Program Manager for the DOE Building Technologies Program, provided the first of six opening presentations. Researchers then followed with presentations on projects in a number of different technology areas including highly insulating windows, dynamic windows, window films, and ratings and knowledge base. A brief overview of each presentation is provided in Table 1.

**Table 1. Windows Workshop Presentations**

Presentation	Presenter	Project Purpose/Technical Objective
<b>OPENING PRESENTATIONS</b>		
<b>Building Technologies Program</b>	Alexis Abramson	Introduced the Building Envelope Prioritization Tool, which aims to provide an objective comparison of new and existing technologies/measures, and provided a brief look at the energy savings potential of various window technologies.
<b>Envelope &amp; Windows R&amp;D Program</b>	Marc LaFrance	Provided an overview of the DOE's Building Envelope and Windows R&D program, including purpose, goals, and budget.
<b>LBNL Update</b>	Steve Selkowitz	Described the major DOE window projects underway at LBNL, including projects in the areas of dynamic glazing materials, highly insulating windows, attachments and retrofits, daylighting and facades, and enabling tools. Detailed project objectives, accomplishments, and future directions.
<b>NREL Update</b>	Tim Snow/ Chai Engtrakul	Presented an overview of NREL's electrochromic dynamic windows project, including discussion of production materials and testing using the NTS differential thermal cycling unit. Also provided updates on window standards.
<b>PNNL Update</b>	Daniel Gaspar	Led a discussion of PNNL's goals and accomplishments in window technology development and deployment. Emphasized daylighting, vacuum insulated glass, and the High Performance Windows Volume Purchase Program.
<b>IEA Update</b>	Nathalie Trudeau	Reviewed 2050 energy use goals and how to achieve them, including: collaboration with stakeholders to define and analyze available technologies; developing a vision for technology deployment; and assessing policy, financial, and related needs.
<b>HIGHLY INSULATING WINDOWS PERFORMER PRESENTATIONS</b>		
<b>Traco Update</b>	Sneh Kumar	Presented an overview of efforts to design and develop R5 commercial aluminum windows.

<b>GED Integrated Solutions</b>	Tim McGlinchy	Illustrated work to design, develop and commercialize a high volume, low cost Insulating Glass Automation System for production of reliable highly insulating windows and to optimize a whole window with R-5 performance. The retail cost target to be < or = to \$4 per sq-ft (consumer price premium) over a conventional dual IG with low-e, argon gas filled Energy Star rated window.
<b>Southwall Update</b>	John Meade	Discussed efforts to develop a new high-performance R-10 Heat Mirror/high SHGC window design, and evaluate manufacturing solutions required for broad residential market adoption.
<b>Eversealed Update</b>	David Stark	Reviewed ongoing work to prove viability of a Vacuum Insulating Glass Unit (VIGU) which will allow a residential whole window to achieve R-10.
<b>Quanta Update</b>	Thomas Culp	Demonstrated the capability of low-e storm windows and retrofit glazing systems to improve the energy efficiency of existing residential and commercial building stock.
<b>DYNAMIC WINDOWS PERFORMER PRESENTATIONS</b>		
<b>Sage Update</b>	Neil Sbar	Designs to improve EC Window Design, Materials, and Processes for enhanced performance and value to users; to provide greater annual energy saving in buildings; and to realize lower costs through EC materials changes, faster throughput, higher yields.
<b>Soladigm Update</b>	Brandon Tinianov	Reviewed the process to transition Soladigm's prototype technology to a scalable manufacturing process at a cost and quality for mass adoption.
<b>Applied Materials</b>	Dr. B. Leo Kwak	Means by which to improve the value proposition by developing novel HVM technologies and methods to reduce cost.
<b>WINDOW FILMS PERFORMER PRESENTATIONS</b>		
<b>Solutia Update(CP Films)</b>	Steve DeBusk	Development of two products: <ul style="list-style-type: none"> <li>• A medium visible light transmission, low SHGC product for use in cooling dominated climates, mainly for use in</li> </ul>

		commercial buildings.
		<ul style="list-style-type: none"> <li>• A high visible light transmission, low reflectance, medium SHGC product for residential and commercial use in all climates, but particularly for heating-dominated climate zones.</li> </ul>
<b>3M Update</b>	Chris Haak and Susan Kent	The objective of this project is to develop a polymeric multilayer infrared reflecting film that is essentially clear and colorless in the visible portion of the electromagnetic spectra (visible light transmission of about 89%) while reflecting 90-95% of the infrared energy in the 850 nm to 1830 nm specified spectra.
<b>RATINGS AND KNOWLEDGE-BASE PROGRAMS PERFORMER PRESENTATIONS</b>		
<b>NFRC Update</b>	Jim Benney	Review of fenestration energy research and implementation.
<b>EWC Update</b>	John Carmody and Neal Humphries	The Efficient Windows Collaborative (EWC) is a coalition of window, door, skylight, and component manufacturers, federal, state and local government agencies, research institutions, and others who partner to educate consumers and professionals to expand the market for energy efficient window products.

### III. Workshop Presentation Stakeholder Feedback

Participants rated the perceived importance and value of the project within each of the workshop presentations given. The average ratings for each project are listed in Table 2.

**Table 2. Workshop Presentation Stakeholder Feedback**

Presentation/Project	Presenter	Average Rating
Building Technologies Program	Alexis Abramson	4.45
Envelope& Windows R&D Program	Marc LaFrance	4.33
LBNL Update	Steve Selkowitz	4.52
NREL Update	Tim Snow/Chai Engtrakul	3.42
PNNL Update	Daniel Gaspar	3.21
IEA Update	Nathalie Trudeau	3.11
Traco Update	Sneh Kumar	3.50
GED Integrated Solutions	Tim McGlinchy	3.47
Southwall Update	John Meade	3.53
Eversealed Windows Update	David Stark	3.79
Quanta Update	Thomas Culp	3.11
Sage Update	Neil Sbar	3.42
Soladigm Update	Brandon Tinianov	3.47
Applied Materials Update	Dr. B. Leo Kwak	2.94
Pleotint Update	Harlan Byker	3.26
Solutia Update	Steve DeBusk	3.17

3M Update	Chris Haak & Susan Kent	3.11
NFRC Update	Jim Benney	3.44
EWC Update	John Carmody & Neal Humphries	3.78

*1 = very low, 2 = low, 3 = undecided, 4 = high, 5 = very high*

### **Workshop Comments on Stakeholder Presentations**

- Include insulating coatings
- Combine high SHGC windows with new thermal storage technologies
- Establish minimum VLT levels
- Set window-to-wall ratios
- Investigate the impacts of the window-to-wall interface on performance
- Conduct more work on high performance frame and its impact on performance
- Develop energy simulation by orientation models

## IV. DOE's Window Technology Research Portfolio Feedback

Participants evaluated the DOE Window Technology Research Portfolio by rating each project on the following criteria:

- Importance of the research presented
- Appropriateness of DOE's role in supporting the research
- Relevance of the research to industry's needs

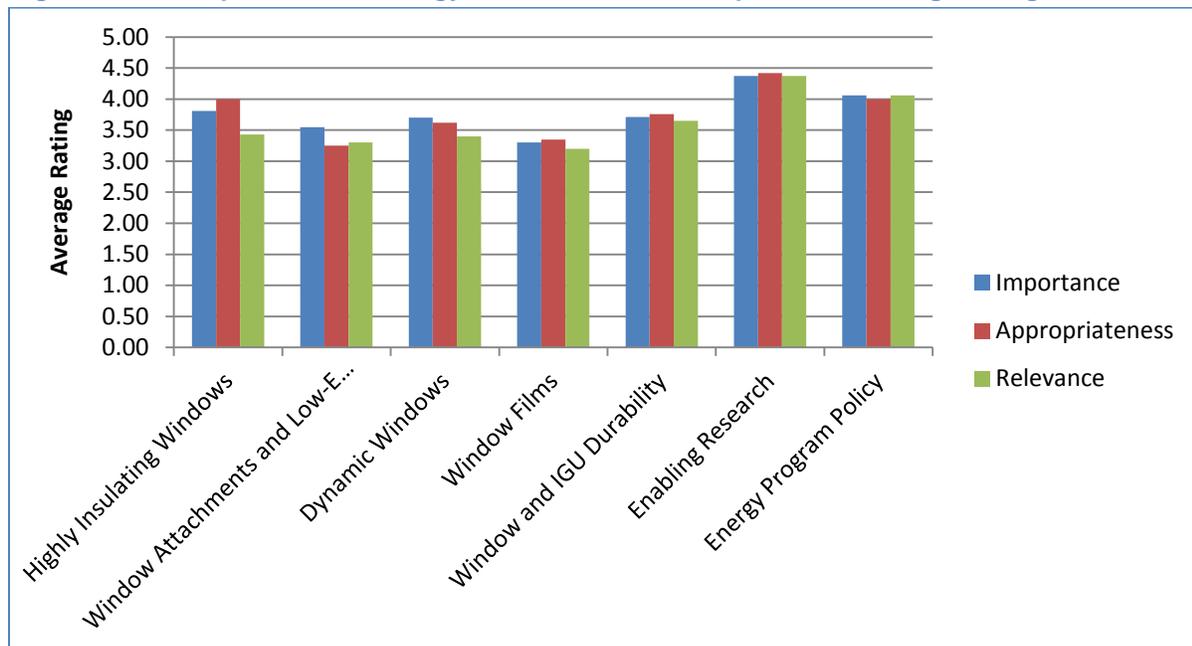
Average ratings on the importance, appropriateness, and relevance of each project are depicted in Table 3 and Figure 1.

**Table 3. U.S. Department of Energy Windows Research Portfolio Feedback**

Technology	Average Importance Rating	Average Appropriateness Rating	Average Relevance Rating
Highly Insulating Windows	3.81	4.00	3.43
Window Attachments and Low E-Storms	3.55	3.25	3.30
Dynamic Windows	3.70	3.62	3.40
Window Films	3.30	3.35	3.20
Window and IGU Durability	3.71	3.76	3.76
Enabling Research	4.37	4.42	4.37
Energy Program Policy	4.06	4.00	4.06

1 = very low, 2 = low, 3 = undecided, 4 = high, 5 = very high

**Figure 1. U.S. Department of Energy's Windows research portfolio: average ratings**



## V. DOE Expert Meeting Feedback

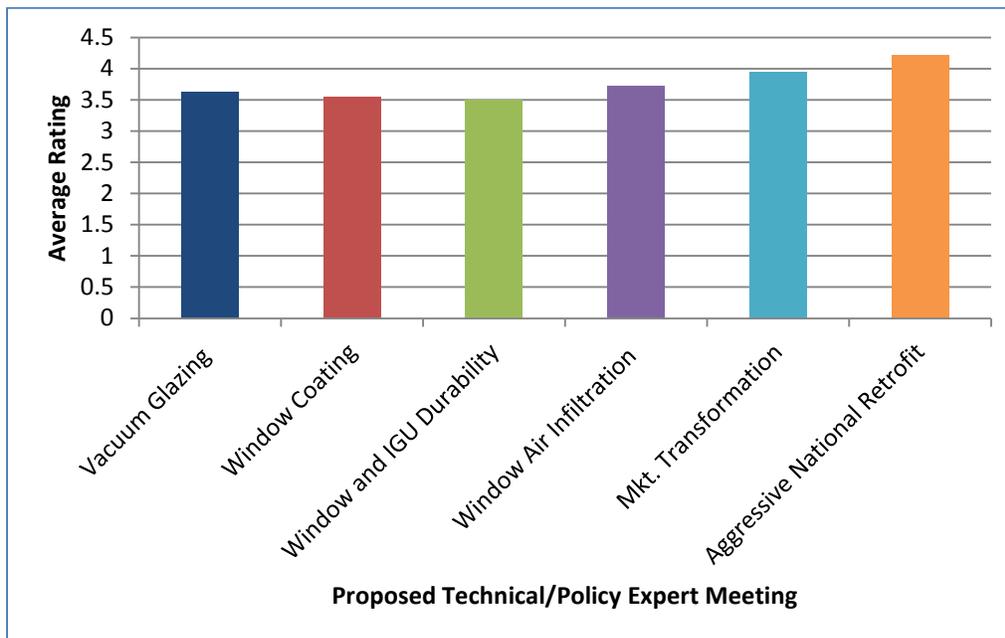
Participants ranked proposed window technology expert meeting topics based on priority. As Table 4 and Figure 2 illustrate, participants rated the proposed Aggressive National Retrofit expert meeting as the highest priority and the Window Air Infiltration expert meeting as the lowest.

**Table 4. U.S. Department of Energy Windows R&D Expert Meeting Feedback**

Possible Meeting	Average Priority Rating
Vacuum Glazing	3.63
Window Coating	3.56
Window and IGU Durability	3.50
Window Air Infiltration	3.72
Market Transformation	3.95
Aggressive National Retrofit	4.21

*1 = none, 2 = low priority, 3 = undecided, 4 = high priority, 5 = first priority*

**Figure 2. Priority for Possible DOE-Hosted Windows R&D Technical/Policy Expert Meetings**



### Stakeholder recommendations: Topics for future expert meetings

- Daylighting design for residential buildings
- Role of fenestration in green homes/net zero homes and other buildings
- Building integrated photovoltaics, specifically for windows, doors, and other attachments.
- Dynamic shuttering
- The relationship of windows to passive solar buildings
- Air infiltration
- Improved frame technologies

## VI. Meeting Logistics

Stakeholders evaluated the logistics of this and future program meetings:

- Meeting length: 71% of respondents desired a longer meeting; one participant specifically requested more time for breakout sessions and discussions.
- Meeting frequency: 38% of respondents prefer annual meetings; 31% desire semiannual meetings; and the remaining 31% prefer biannual meetings.
- Program communications: most participants listed email as their preferred method of communication, followed by conferences and reports. The average rating for the effectiveness of program communications was a 3.40, based on a scale of 1 (poor) to 5 (very good).

### Stakeholder Recommendations: Program Communications

- Support education initiatives and public outreach
- Develop focused listserves
- Produce a newsletter to provide updates to stakeholders
- Create webinars to supplement meeting presentations

## VII. Workshop Breakout Groups

Participants participated in six pre-determined breakout groups to identify objectives, problems, barriers, tasks, outcomes, and potential partnerships for various window technology areas (highly insulating windows; dynamic shading and daylighting; low e-storms and attachments; ratings, labels, and market-based programs; software tools; and window and IGU durability). The results of those breakout groups are listed in Tables 5–10.

**Table 5. Topic 1: Highly Insulating Windows**

Focus Area	Stakeholder Feedback
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Reduce cost</li> <li>• Increase market share of high R windows</li> </ul>
<b>Problems We Need to Solve</b>	<ul style="list-style-type: none"> <li>• Solve technology and production high cost drivers</li> </ul>
<b>Barriers</b>	<ul style="list-style-type: none"> <li>• High insulating gas cost</li> <li>• Durability</li> <li>• Efficient manufacturing</li> </ul>
<b>Tasks</b>	<ul style="list-style-type: none"> <li>• Complete KY project (LBNL)</li> <li>• Develop durability matrix for whole window</li> <li>• Automation, quality</li> </ul>
<b>Desired Outcomes</b>	<ul style="list-style-type: none"> <li>• Affordability (demonstrated) → LCA, 10 Yr + picture</li> <li>• Education/ marketing → beyond energy benefits</li> <li>• Frame material improvement → new material R&amp;D</li> <li>• Lenient energy code/ cost → More stringent code paced by technology availability</li> </ul>
<b>Potential Partnerships</b>	<ul style="list-style-type: none"> <li>• <i>Not applicable</i></li> </ul>

**Table 6. Topic 2: Dynamic Shading & Daylighting**

Focus Area	Stakeholder Feedback
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Vision: put dynamic shading/daylighting on every building</li> <li>• Achieve energy savings while maintaining occupant comfort</li> </ul>
<b>Problems We Need to Solve</b>	<ul style="list-style-type: none"> <li>• Aesthetics</li> <li>• Cost</li> <li>• Quality—switching, color consistency, pin holes, etc.</li> <li>• Need realistic ROI including full LCA.</li> <li>• Develop capability for modeling and develop window control algorithm</li> <li>• No Education</li> <li>• Widespread market adoption</li> <li>• High volume manufacturing</li> <li>• System installation and commissioning</li> <li>• Integration (controls)</li> </ul>

Focus Area	Stakeholder Feedback
<b>Barriers</b>	<ul style="list-style-type: none"> <li>• Cost/Value</li> <li>• Market acceptance/education</li> <li>• Modeling tools</li> <li>• Materials development</li> </ul>
<b>Tasks</b>	<ul style="list-style-type: none"> <li>• Software to easily estimate/generate unit performance (PANELITE)</li> <li>• Materials and process within 5 years</li> <li>• Validation projects now- 2-10 over 18 months</li> <li>• Full LCA &amp; ROI</li> <li>• Assess value chain</li> <li>• Education/outreach to general public, end users, architects</li> </ul>
<b>Desired Outcomes</b>	<ul style="list-style-type: none"> <li>• Algorithms for control and methods as measuring performance</li> <li>• Advanced development partnership</li> <li>• Incentive programs</li> <li>• Cost competitive dynamic windows</li> <li>• Updated building codes &amp; LEED standards</li> <li>• Educated public</li> <li>• Change building design</li> </ul>
<b>Potential Partnerships</b>	<ul style="list-style-type: none"> <li>• Labs</li> <li>• DOE</li> <li>• Urban Land Institute</li> <li>• NFMA</li> <li>• Materials developers</li> <li>• IGU manufacturers</li> <li>• Window manufacturers</li> </ul>

**Table 7. Topic 3: Low E-Storms and Attachments**

Focus Area	Stakeholder Feedback
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Increased deployment of product solutions to save energy (cost effectively)</li> </ul>
<b>Problems We Need to Solve</b>	<ul style="list-style-type: none"> <li>• Communicating benefits of this class of products- Architects/code officials/ homeowners</li> <li>• Low penetration of efficient attachments</li> </ul>
<b>Barriers</b>	<ul style="list-style-type: none"> <li>• Technology models (more accurate)</li> <li>• Lack of standard rating system</li> <li>• Lack of code recognition</li> <li>• Lack of consumer awareness</li> <li>• Operational unknowns</li> <li>• Durability- effects on prime window</li> <li>• Capital cost</li> <li>• Expensive automation</li> </ul>

Focus Area	Stakeholder Feedback
<b>Tasks</b>	<ul style="list-style-type: none"> <li>• Develop models and procedures ASAP</li> <li>• Develop standardized rating system</li> <li>• Education materials/ Demonstration projects</li> <li>• Low cost controls and smart algorithm</li> </ul>
<b>Desired Outcomes</b>	<ul style="list-style-type: none"> <li>• Drill down on barriers and solution</li> <li>• Credible rating system</li> <li>• Easily accessible education materials</li> <li>• Cost-effective automated dynamic shading system</li> </ul>
<b>Potential Partnerships</b>	<ul style="list-style-type: none"> <li>• Industry</li> <li>• NFRC</li> <li>• National labs</li> </ul>

**Table8. Topic 4: Ratings, Labels, & Market-based Programs**

Focus Area	Stakeholder Feedback
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Agree on a common goal</li> <li>• Save energy or push technology</li> <li>• Push vs. pull</li> </ul>
<b>Problems We Need to Solve</b>	<ul style="list-style-type: none"> <li>• Replace inefficient products with current, cost effective technology-both commercial and residential</li> <li>• DOE needs to support infrastructure → NFRC, EWC, Energy Star</li> </ul>
<b>Barriers</b>	<ul style="list-style-type: none"> <li>• Code enforcement (see Florida)</li> <li>• Lack of incentives</li> <li>• Lack of CMA tool</li> </ul>
<b>Tasks</b>	<ul style="list-style-type: none"> <li>• Fund software tools (CMA window/thermal)</li> <li>• Outreach to enforcement</li> <li>• Support education</li> </ul>
<b>Desired Outcomes</b>	<ul style="list-style-type: none"> <li>• Save energy- by reducing consumption</li> <li>• Replace inefficient product w/ code or Energy Star compliant</li> </ul>
<b>Potential Partnerships</b>	<ul style="list-style-type: none"> <li>• Utilities</li> <li>• State energy agencies</li> <li>• Industry</li> </ul>

**Table 9. Topic 5: Software Tools**

Focus Area	Stakeholder Feedback
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Perimeter zone energy performance simulation including lighting and energy systems</li> </ul>
<b>Problems We Need to Solve</b>	<ul style="list-style-type: none"> <li>• Optics usability</li> <li>• CR modeling/ rating</li> <li>• Comfort modeling- thermal/glare</li> <li>• Validation of high performance modeling (RIO)</li> <li>• Simulation tools that pertain specifically to the 30' perimeter zone</li> </ul>
<b>Barriers</b>	<ul style="list-style-type: none"> <li>• Optics usability</li> <li>• Comfort modeling</li> <li>• CR modeling</li> <li>• Validation for high performance product modeling</li> <li>• Highly detailed fenestration simulation being reduced to averages in building energy simulation.</li> </ul>
<b>Tasks</b>	<ul style="list-style-type: none"> <li>• ASAP—improve user interface</li> <li>• Quantify additional benefits of both thermal and glare</li> <li>• 4<sup>th</sup> surface low-e, better understanding of interior film</li> <li>• Develop a method to confirm the modeling is accurate for RIO products</li> <li>• Extend COMFEN to the 30' perimeter zone including all systems</li> <li>• Address old existing systems when performing retrofit analysis</li> </ul>
<b>Desired Outcomes</b>	<ul style="list-style-type: none"> <li>• Simpler interface</li> <li>• Recognition of comfort benefits</li> <li>• A more useable rating</li> <li>• Confidence in the models</li> <li>• An orientation specific all systems inclusive energy simulation</li> </ul>
<b>Potential Partnerships</b>	<ul style="list-style-type: none"> <li>• DOE national labs</li> <li>• NFRC</li> <li>• Industry NFRC labs</li> <li>• Lighting and lighting controls</li> <li>• Photo sensors</li> <li>• IGU manufacturers</li> <li>• Frame, window, curtainwall manufacturers</li> <li>• Dynamic shading manufacturers</li> </ul>

**Table 10. Topic 6: Window & IGU Durability**

Focus Area	Stakeholder Feedback
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Identify means of evaluation of new technology on durability</li> </ul>
<b>Problems We Need to Solve</b>	<ul style="list-style-type: none"> <li>• Effect of new technology on IG &amp; Windows</li> </ul>
<b>Barriers</b>	<ul style="list-style-type: none"> <li>• Defining durability</li> <li>• Lack of data</li> </ul>
<b>Tasks</b>	<ul style="list-style-type: none"> <li>• Class thermal stress effects from attachments</li> <li>• Insulation- window</li> <li>• Education</li> <li>• Existing standards, codes</li> <li>• Air leakage testing- at different temperatures</li> <li>• Exotic gas determination, retention</li> <li>• Multiple cavity IG's</li> <li>• Durability testing</li> </ul>
<b>Desired Outcomes</b>	<ul style="list-style-type: none"> <li>• Understand impact of durability of new technology on window system prior to endorsing or changing criteria</li> </ul>
<b>Potential Partnerships</b>	<ul style="list-style-type: none"> <li>• Industry Associations</li> </ul>

## VIII. Wrap-Up and Next Steps

This workshop verified that the Windows Technologies R&D Program is aligned with stakeholders, as evidenced by their feedback. Based on both presentation and portfolio feedback, stakeholders appear to be very interested in energy program policy and enabling research.

DOE will consider the workshop feedback when making future program decisions, and will follow up on the recommendations of the breakout groups with future technology-specific meetings. DOE will also investigate the logistics behind an aggressive national retrofit expert meeting, with other another expert meeting concerning market transformation in the future.

Finally, DOE will continue to hold stakeholders workshops on a yearly basis or as necessary to gain stakeholder feedback. Comments on this report will be accepted at [wzalis@energetics.com](mailto:wzalis@energetics.com).

## Appendix

### List of Invited Stakeholders

Name	Organization
Alexis Abramson	Department of Energy
Rich Anton	Quanex Building Products
Rick Audsley	Sierra Pacific Windows
David Bailey	Larson Manufacturing Company
James C. Benney	NFRC
Mike Billingsley	Windsor Windows, Inc
Gary Blad	Loewen Windows
Jim Blakely	Element Materials Technology
Eva Blanchard	Marvin Windows and Doors
Emmanuelle Bourlier	Panelite Los Angeles
Stephen Brandt	Kop-Coat
Daniel Braun	Architectural Testing, Inc.
Mike Broekhuis	Pleotint
Val Brushaber	Hurd Windows & Doors, Inc.
Emory Budzinski	Weathershield Manufacturing Inc.
Harlan Byker	Pleotint
John Carmody	EWC - University of Minnesota
Tim Clancy	Guardian Industries
Ron Clawson	Kop-Coat, Inc.
Walt Clevenstine	Bayer MaterialScience LLC
David Cooper	Guardian Industries Corp.
Thomas Culp	Quanta
Steve DeBusk	Solutia
Jeff DeLonay	Kolbe & Kolbe Millwork Co Inc
Katy Devlin	Glass Magazine/Window & Door magazine
Patrick Donahue	Natural Resources Research Institute
Ann Duebner	Eggers Industries
John Dulac	IEA
Matt Eddy	Dow Corning
Chaiwat Engtrakul	NREL
Tom Essen	Franklin International
Mark Gallant	Mikron Industries
Ray Garries	Jeld-Wen
Dan Gaspar	PNNL
Kate Graham	Andersen Corporation
Dianne Griffiths	Steven Winter Associates, Inc.
Chris Haak	3M RED - Renewable Energy Division

Name	Organization
Jeff Haberer	Cardinal Glass Industries, Inc.
Kerry Haglund	LEED AP BD+C Center for Sustainable Building Research
Steve Harp	Associated Materials Inc
Tony Hester	Bright Wood Corp.
Steve Hojnowski	Jeld-Wen, Inc.
Bill Hooper	Alcoa-Traco
Neal Humphrey	EWC - Alliance to Save Energy
Eric Jackson	Quanex Building Products
Dan Johnson	Architectural Testing, Inc.
Steve Johnson	Andersen Windows, Inc.
Susan Kent	3M RED - Renewable Energy Division
Jon Kimberlain	Dow Corning Corporation
Mike Koenig	Andersen Corporation
Duane Koop	Loewen
Jim Krahn	Marvin Windows and Doors
Mark Kristo	Amesbury
Sneh Kumar	Alcoa - Traco
B. Leo Kwak	Applied Materials
Paul LaBerge	Apogee Enterprises, Inc.
Marc LaFrance	Department of Energy
Jim Larsen	Cardinal Glass Industries, Inc.
Roger LeBrun	VELUX America Inc.
Jeff Lowinski	WDMA
Lori Marino	Schnee-Morehead
John McFee	WDMA
John McLelland	Ames Laboratory-DOE
John Meade	Southwall Technologies Incorporated
Christopher Meiorin	Euro Vinyl Windows & Doors Inc
Mark Mikkelson	Andersen Corporation
Christian Mitman	Panelite Los Angeles
Roger G. Morse	Morse Zehnter Associates
Greg Novak	Cardinal LG Company
Raghu Padiyath	3M Renewable Energy Division
Annie Perkins	Anderson Corporation
Tom Prince	Veka Inc.
Doug Pruess	Midwest Efficiency Supply
Dan Raap	Amesbury Group
Damoder Reddy	
Tracy Rogers	Quanex Building Products
Helen Sanders	SAGE Electrochromics, Inc.

Name	Organization
Mohan Sasthav	Eastman Chemical Co.
Jeff Sawyers	Quanex Building Products
Neil Sbar	Sage Glass
Jim Schone	H.B. Fuller Company
Selkowitz	LBNL
Steve Shields	Lonza Wood Protection
Tim Snow	NREL
David Stark	Everseal
Stratmoen	Larson Manufacturing Company
Steve Strawn	JELD-WEN inc.
Robert Stuart	TruStile Doors, LLC
Erica Terrini	USGlass Magazine
Brandon Tinianov	Soladigm
Nathalie Trudeau	IEA
Kevin Vilhauer	Milgard Manufacturing, Inc.
Subid Wagley	Department of Energy
Mike Wakumoto	Automated Testing Solutions, Inc.
Rich Walker	American Architectural Manufacturers Association
John Walsh	Sunrise Windows
Emma Weaver	Energetics Incorporated
Margaret Webb	IGMA
Martin Wesemann	Pella Corporation
Ken Wilcox	Kolbe & Kolbe Millwork Co., Inc.
Emily Zachery	D&R International
Walt Zalis	Energetics Incorporated
Ben Zurn	Cardinal IG