**GPG FINDINGS**

The GPG program enables GSA to make sound investment decisions in next generation building technologies based on their real world performance.

www.gsa.gov/gpg

**OPPORTUNITY**

How much energy is lost through inefficient windows in commercial buildings?

**TECHNOLOGY**

How do Window Panel Retrofits save energy?

**IMPROVE THERMAL PERFORMANCE WITH LOW-E WINDOW PANELS**

**PRE-MANUFACTURED LIKE STORM WINDOWS, SIMPLIFYING INSTALLATION**

**M&V**

Where did Measurement and Verification occur?

**RESULTS**

How did Window Panel Retrofits perform in M&V?

**41% HEATING SAVINGS IN WINTER**

Estimated savings for entire building heating and cooling: 11%[^2]

**QUICK INSTALLATION**

Improved visual and thermal comfort[^5]

**<9 YEARS PAYBACK FOR TRIPLE-PANE; DOUBLE-PANE WILL BE SHORTER**[^6]

**DEPLOYMENT**

Where does M&V recommend deploying Window Panel Retrofits?

**BUILDINGS IN COLD CLIMATES WITH SINGLE-PANE WINDOWS**

Double-pane retrofits recommended, as triple-pane offers diminishing returns. Site-specific evaluation is critical.

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[^1]: HIGHLY INSULATING WINDOW PANEL ATTACHMENT RETROFIT. CHARLIE CURCIJA, HOWDY GOODEY, ROBIN MITCHELL, ERIN DICKERHOFF LBNL, DECEMBER 2013, p.3
[^2]: Ibid, p.26
[^3]: Ibid, p.39
[^4]: Ibid, p.7
[^5]: Ibid, p.28, 35
[^6]: Ibid, p.2

**Savings Diminish with Triple-Pane Hi-R Window Panel Retrofit**

COMFEN results compared to base configuration of single pane with bronze film

<table>
<thead>
<tr>
<th>Window Type</th>
<th>Heating Savings</th>
<th>Installation</th>
<th>Payback Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Bronze</td>
<td>39%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-Pane Panel</td>
<td>51%</td>
<td>Improved</td>
<td>&lt;9</td>
</tr>
<tr>
<td>Double-Pane Panel</td>
<td>53%</td>
<td>Shorter</td>
<td></td>
</tr>
</tbody>
</table>

**Where did Measurement and Verification occur?**

LAWRENCE BERKELEY NATIONAL LABORATORY assessed the impact of Hi-R Low-e window panel retrofits provided by Serious Energy in a Provo, Utah federal office building.

**How much energy is lost through inefficient windows in commercial buildings?**

Energy used to heat & cool buildings is lost through inefficient windows.

<table>
<thead>
<tr>
<th>Window Type</th>
<th>Energy Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Bronze</td>
<td>23%</td>
</tr>
<tr>
<td>Single-Pane Panel</td>
<td>31%</td>
</tr>
<tr>
<td>Double-Pane Panel</td>
<td>53%</td>
</tr>
<tr>
<td>Triple-Pane Panel</td>
<td>50%</td>
</tr>
</tbody>
</table>

**Where does M&V recommend deploying Window Panel Retrofits?**

LAWRENCE BERKELEY NATIONAL LABORATORY assessed the impact of Hi-R Low-e window panel retrofits provided by Serious Energy in a Provo, Utah federal office building.


**Ibid, p.26**

**Ibid, p.39**

**Ibid, p.7**

**Ibid, p.28, 35**

**Ibid, p.2**

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