Building Technologies Program

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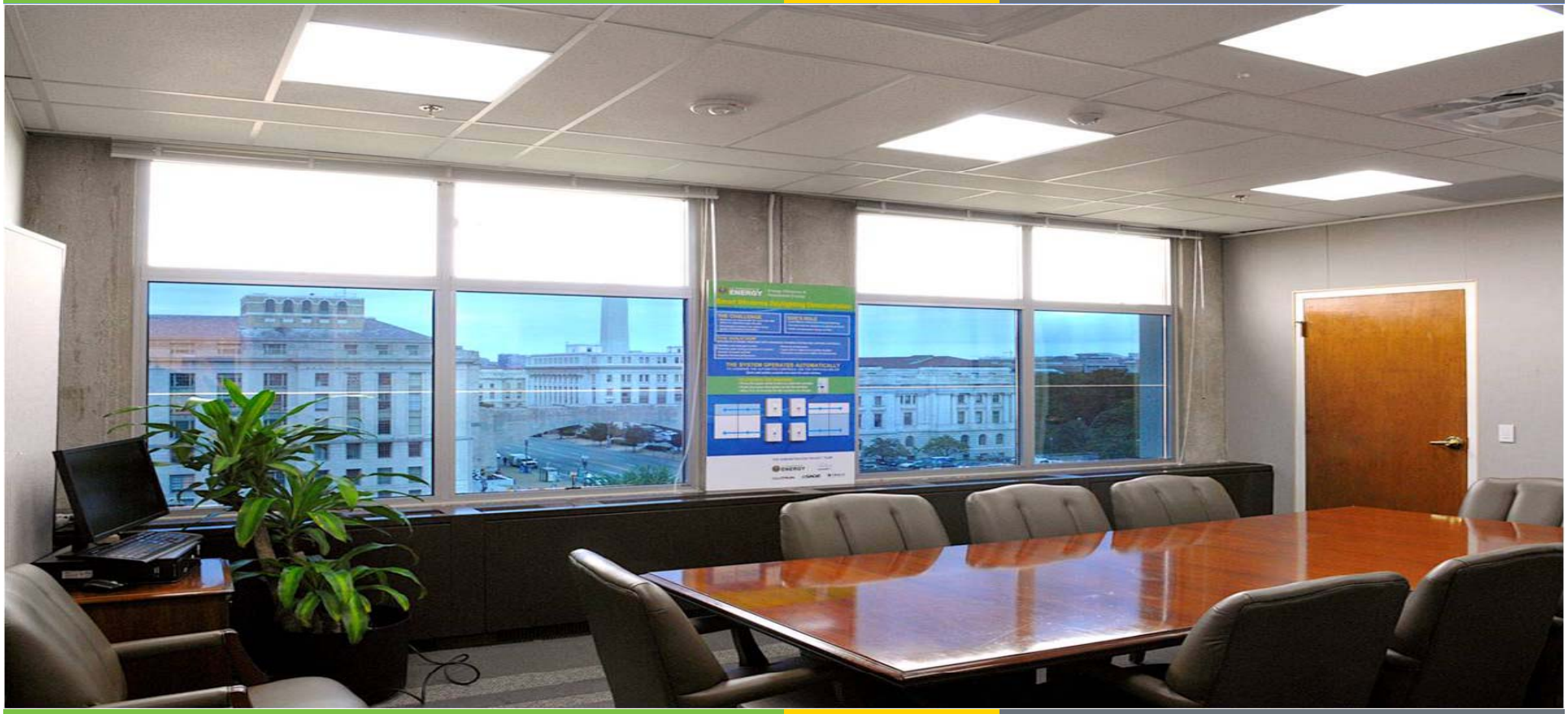

DOE Initiatives for Energy Efficiency and Windows

Presented at the Quanex GlassBuild Reception

Las Vegas, NV

Graham Parker
Senior Staff Engineer
Pacific Northwest National Laboratory

September 15, 2010

Outline

- DOE Windows Programs Overview
- High Performance (R-5) and Low-E Storm Windows Volume Purchase Program: Phase I
- Volume Purchase: Phase II

Integrated Programs to Reduce Price of Highly Insulating Windows

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Technical Support

Building America demonstrations/ production housing for easy markets

High-performance specs in LEED for Homes & NGBS

Production Engineering RFP – 50% Cost Share

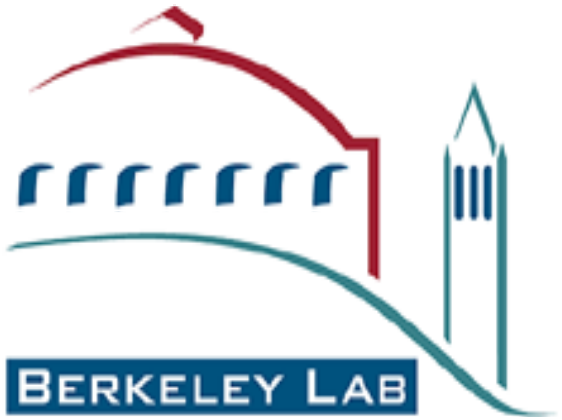
Technology Procurement/Volume Purchases

Support utility programs for advanced windows

ENERGY STAR spec revision

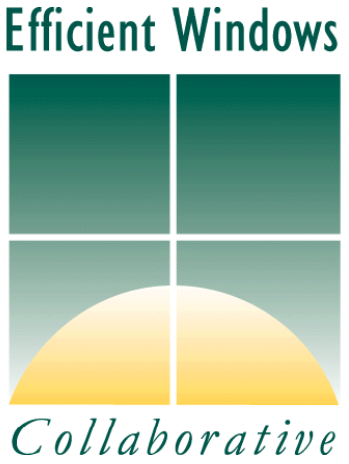
ENERGY STAR Phase II

DOE Assists with Technical Support Activities



http://windows.lbl.gov/software

www.nfrc.org



www.efficientwindows.org

- Full range of software support tools, education materials and expansion to new product categories
- Continued financial support to assist industry in rating, certifying and promoting efficient products

Whole Building Demonstrations

- Determine system affects – reduced ducting, HVAC capacity & improved comfort
- Next projects
  - Highly insulating (>R5) and dynamic solar control, using products from production engineering solicitation.
  - Factory-built housing in Pacific Northwest (joint funded by BPA)

Next Generation of Windows: Production Engineering

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- Highly Insulating
  - Goal is U-factor 0.10
  - Possible vacuum glazings
- Dynamic solar control
  - Passive heating and dramatic peak cooling reduction, SHGC 0.53 – 0.09
  - Now market ready, prices will drop with more investment in production
  - Many new projects underway in 2012 - 2014

Prototype – Concept Window
Highly Insulating and Dynamic
U-factor 0.18
SHGC 0.04 – 0.34
Low cost unsealed center lite

Highly Insulating R5 Production Engineering Solicitation & Award

- DOE Selected GED Integrated Solutions in partnership with PPG, and other major window companies.
- Goal – Affordable R5 (U-factor of 0.22 or less for operable window and 0.20 or less for fixed window) with price premium less than $4/ft^2 compared to conventional double pane low-e.
- Multiple paths to market, window companies and IGU sales.
- Product availability 12 – 24 months
- Traco recently selected for high performance commercial product development.

Dynamic Windows Field Trials

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Project Results

-Cooling energy savings up to 20%
-Peak demand savings up to 26%
-Human factors evaluation underway

Commercial

Residential

Key Policy and Utility Incentive Program Support

- Energy Policy only needs to address critical technology development problem (low U-factors for mixed and$_{CO}$ ld climates); could be extended to dynamic glass for significant impact in hot and mixed climates, SHGC < 0.10.
  - Or…..to keep policy easy, require low U-factors (0.20 – 0.24) with any SHGC requirement.
- DOE provides support to the development of utility incentive programs through the Efficient Windows Collaborative:
  - Technical advice on window technologies:
    - Savings estimates and a savings calculator
    - Market characterization information
    - Incremental cost estimates
  - Participation in the Consortium for Energy Efficiency (CEE) promotion of window programs to membership.
  - Maintain a database of current incentive programs for consumers.

ENERGY STAR: DOE Criteria Now Led by EPA

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ENERGY STAR for Windows – Effective January 2010

ENERGY STAR® Qualification Criteria for Residential Windows, Doors, and Skylights

Windows

Climate Zone	U-Factor[1]	SHGC[2]	
Northern	≤ 0.30	Any	Prescriptive
	=0.31	≥ 0.35	Equivalent Energy Performance
	=0.32	≥ 0.40	
North-Central	≤ 0.32	≤ 0.40	
South-Central	≤ 0.35	≤ 0.30	
Southern	≤ 0.60	≤ 0.27	

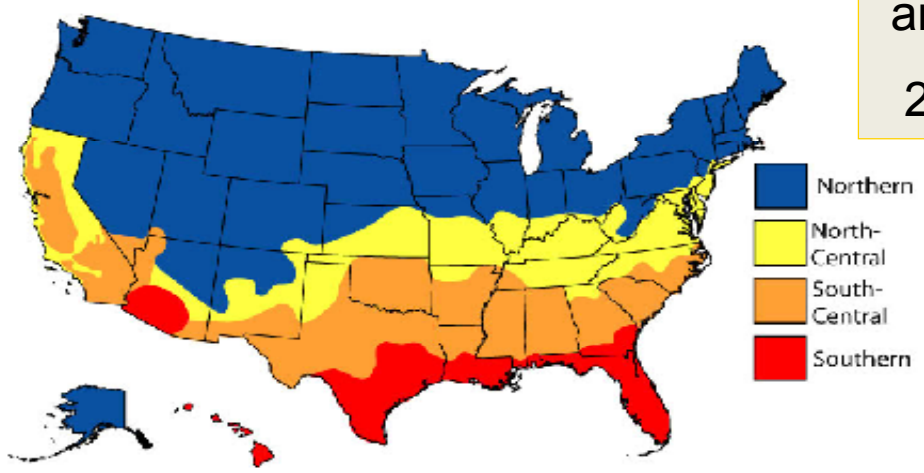
Doors

Glazing Level	U-Factor[1]	SHGC[2]
Opaque	≤ 0.21	No Rating
≤ ½-Lite	≤ 0.27	≤ 0.30
> ½-Lite	≤ 0.32	≤ 0.30

Skylights

Climate Zone	U-Factor[1]	SHGC[2]
Northern	≤ 0.55	Any
North-Central	≤ 0.55	≤ 0.40
South-Central	≤ 0.57	≤ 0.30
Southern	≤ 0.70	≤ 0.30

[1] Btu/h.ft².°F
[2] Fraction of incident solar radiation



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Proposed Future for ENERGY STAR from R&D Perspective

- DOE to support EPA in moving ahead with Phase II ENERGY STAR criteria.
- Consideration by EPA given to a “Super Star” approach, with advanced criteria sooner, combined with longer time in market for current ENERGY STAR.
- DOE originally proposed in 2008 a U-factor of 0.20-0.24 for Northern Climates with SHGC > 0.35 in the 2013 to 2014 timeframe.

R-value & U-factor Discussion

- DOE has used R-value for non technical audiences for many years (e.g. Congressional Budget Requests)
- Window energy performance should only be specified as NFRC whole window U-factors.
- For general reference R is the inverse of U-factor.
- We use R-5 as a general program name and to get the attention of consumers that understand R values better. We have R-10 to R-20 walls and R-30 to R-50 attics for insulation code in some locations but window performance is generally around R-2 to R-3.
- We also know some window companies have advertised very high R- values such as R-15 but they are referring to center of glass performance, thus if DOE promotes R-5 as a big step forward there needs to be more examination of center of glass claims.
- Most of the vendors in the volume purchase program use R-value on their website and printed material.

R-5 (U=0.2-0.22) and Low-E Storm Windows Volume Purchase Phase I

Develop Buyer Groups

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Develop Draft Solicitation Specifications with Buyers and Possible Manufacturer Bidders July – November 2009

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Issue Solicitation – Dec 2009

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Responses Due – Feb 2010

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Finalize Agreements with Qualified Vendors - April 2010

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Promote Qualified Products June 2010 and continuing

Final Windows and Low-E Storm Windows Specifications and Certifications

<u>High Performance Windows</u>

- U-factor: 0.20-0.22
- Air leakage: ≤ 0.30 cfm/ft^2
- Certifications: NFRC/NAFS
- Warranty (yr): 20 glass/10 non-glass
- NFRC label required
- NAFS 05: Performance Grade R25

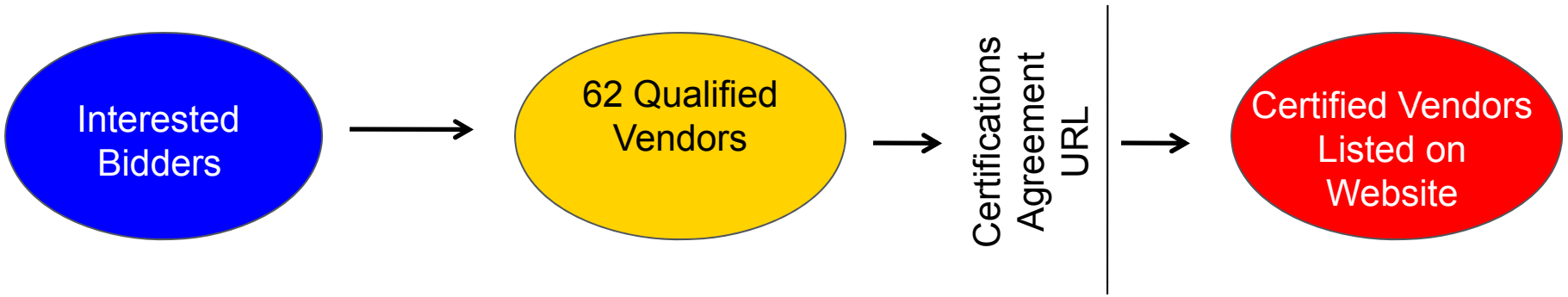
<u>Low-e Storm Windows</u>

- Emissivity: <0.22
- Glass thickness: 3 mm minimum
- Structural test: ANSI/AAMA 1002.10-93
- Registry: IGDB (LBNL database)
- Warranty (yr): 10 glass/non-glass
- Registration in International Glazing Database (LBNL)

Response to Solicitation

62 vendors submitted qualified bids

- 37 identified themselves as regionally based.
- 25 identified themselves as nationally based.
- 20 capable of delivering products to Canada.
- 11 entered bids for low-e storm windows.
- 9 of the top 16 window manufacturers by sales.



Phase I Results

Requirements were intentionally kept simple

- Meet deadline of Feb 19, 2010 to submit bid.
- Submit a compliance letter.
- Submit at least one window product meeting specifications.
  - Additional window products can be added throughout the program period.
- New vendors can be added if they sell their products through already-qualified vendors.

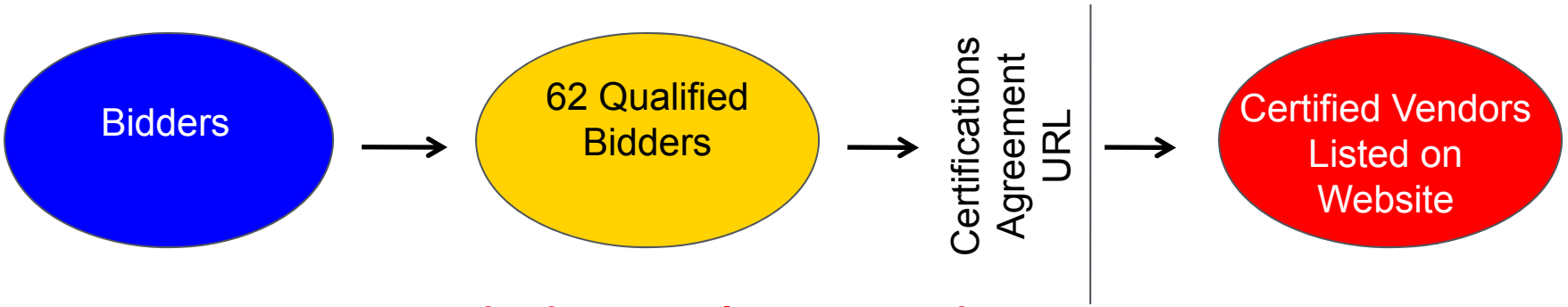
Phase I Vendors

After ”Qualification”

- Items required to become a “certified” vendor listed on the website
  - Windows: Thermal and structural certification reports
  - Low-E Storm Windows: IGDB and ANSI/AAMA test reports
  - Proof of warranty
  - Vendor URL address
  - Signed Agreement between PNNL and vendor

After "Certification"

- Vendor's products are listed on the website with the vendor's URL.
- There are currently 40 certified windows vendors including 4 low-e windows vendors listed on the website. More vendors and certified vendor's products are added each month.



www.windowsvolumepurchase.org

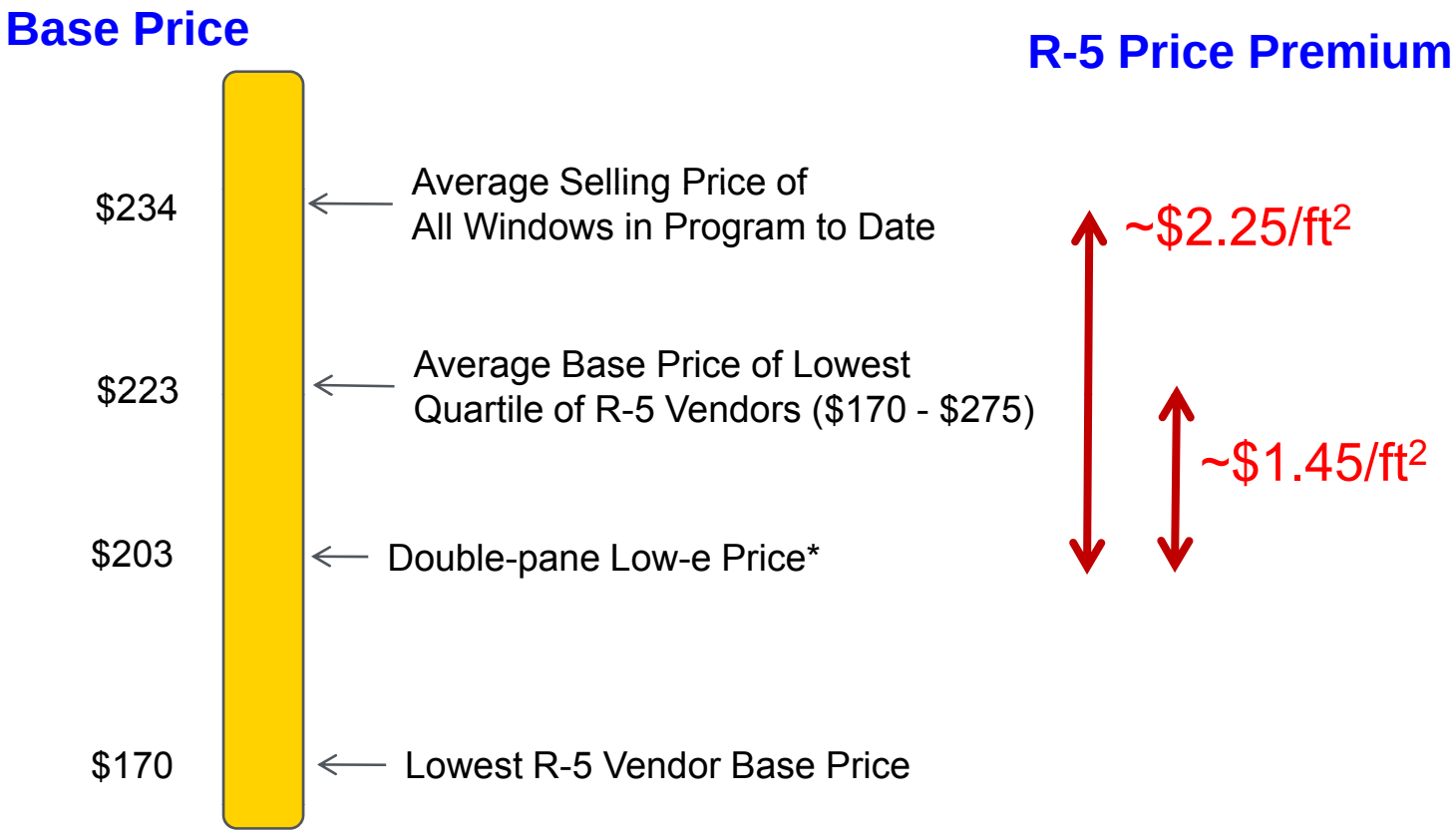
Products and Prices

www.windowsvolumepurchase.org

- Minimum order of 15/20 for retrofit/new construction windows.
- Minimum order of 1 for sliding glass doors.
- Minimum order of 20 for low-e storm windows.
  - Vendors are expected to honor all requests which meet the minimum order requirement.
- Prices are 'base' prices and a maximum bid by each vendor for each united inches (UI) category.
- Prices are given, but not by vendor and may not be increased over the period of the program—but may be decreased.
  - Price is for window frame type & color listed.
  - Price does not include shipping, installation or added features.
- List of vendors and window products they sell is posted on site.
- Delivery area in North America for each vendor is given.

Window Prices Comparison

30 in x 66 in Double-Hung Window



*Average retail price of vinyl frame, double-pane low-e window.

Value of High Performance Windows

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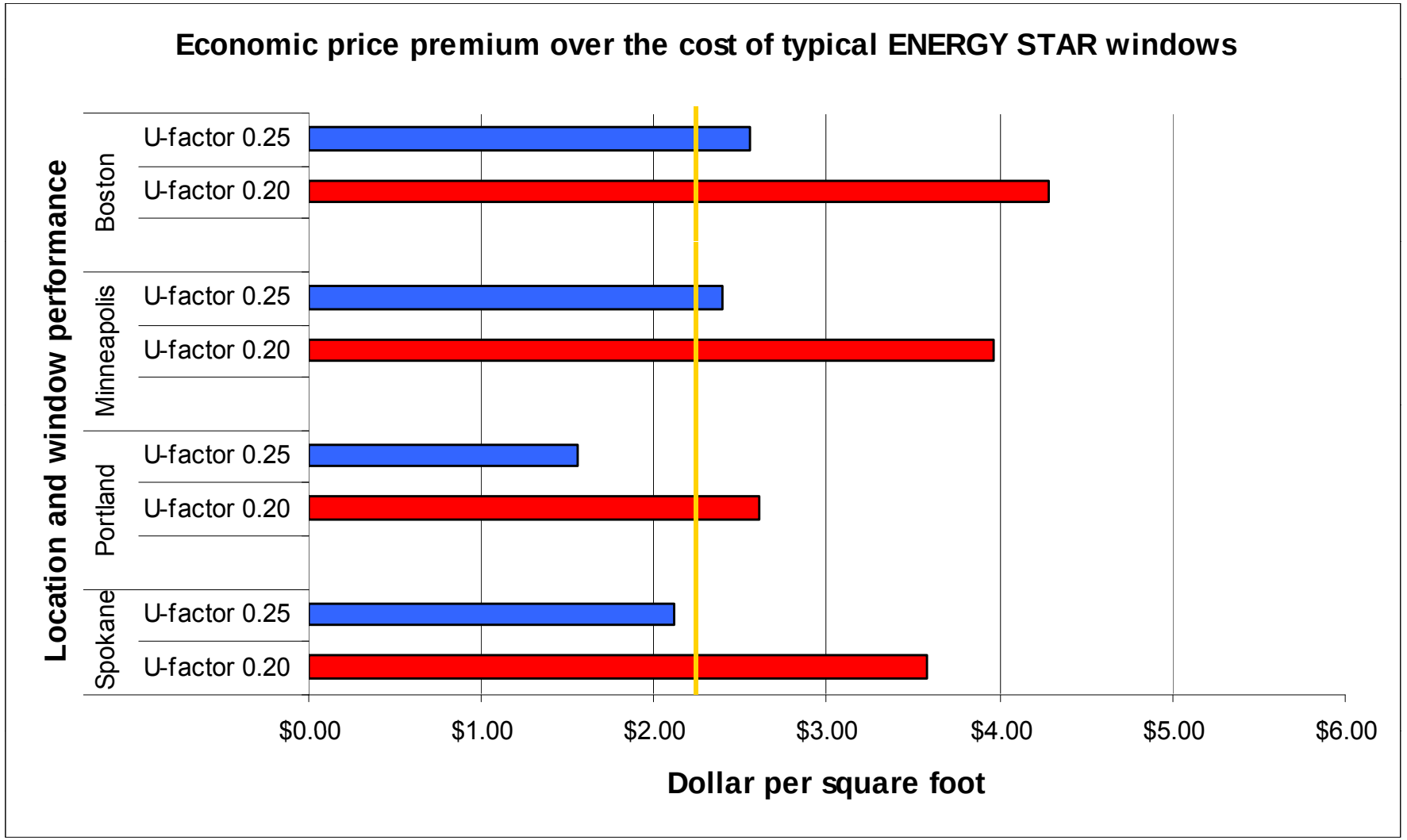
8% annual discount rate, 25 years time horizon



Phase II Volume Purchase Program

- Engage industry to discuss results of Phase I and scope and products for Phase II.
- Consider adding additional residential window types.
- Consider windows for “punch out” commercial applications. Analysis currently underway to help set performance metrics.

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