

TECHNOLOGY BRIEF ▶▶▶

R-5 WINDOWS*



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The U.S. Department of Energy estimates that heat gained and lost through windows is responsible for 25-30% of residential energy use nationally. By upgrading windows in existing buildings or using high efficiency windows in new construction, customers can greatly reduce energy usage and increase comfort. Utilities in 33 states currently offer some kind of incentive to customers for installing energy efficient windows.¹ Incentives are usually based on ENERGY STAR certification, which can be met with double pane windows. However, very few programs incentivize customers to install the most efficient windows available on the market.



TECHNOLOGY OVERVIEW Triple pane windows use three panes of glass, usually with argon gas between panes to provide maximum energy efficiency and comfort. Window energy efficiency is measured using R

and U values. Triple pane windows have an R-value of 5 and a U-value of less than 0.22. The average double pane ENERGY STAR certified window has an R-value of 3 and a U-value of 0.3. Increasing the R-value from 3 to 5 reduces the average heat loss through the window by over 30%, and can reduce heating and cooling energy usage by 15-40% compared with ENERGY STAR windows depending on climate.²

MARKET PENETRATION In 2016, ENERGY STAR certified windows comprised 85% of all window sales, showing that ENERGY STAR windows are often the baseline choice.³ The Energy Trust of Oregon estimated a R-5 window market share of less than 3% of sales in Oregon in 2018.⁴ This is the only data available on adoption rates for R-5 windows.



INCREMENTAL COST Incremental cost estimates of R-5 windows compared with an R-3 baseline vary widely. One survey of cost estimates in 2018 found an average incremental cost of \$11.17/sq. ft. for R-5 compared with R-3 windows.⁵ Dominion Energy in Utah found an incremental cost of \$2.48/sq. ft. before any rebate for the same window types using a survey of participating vendors in its service territory. Dominion's survey also found a large decrease in incremental costs for R-5 windows in 2018 compared with previous years.

¹ Incentives and Rebates for Energy-Efficiency Windows Offered through Utility and State Program. Updated January, 2019. Available at: <https://www.efficientwindows.org/downloads/UtilityIncentivesWindows.pdf>

² Carmody and Haglund. Measure Guideline: Energy-Efficiency Window Performance and Selection. November 2012. Available at: <https://www.nrel.gov/docs/fy13osti/55444.pdf>

³ ENERGY STAR Unit Shipment and Market Penetration Report. Calendar Year 2016 Summary. Available at: https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2016_USD_Summary_Report.pdf?7f4f-f90d

⁴ Energy Trust of Oregon 2018 Windows Market Research Report. Available at: <https://www.energytrust.org/wp-content/uploads/2019/02/Energy-Trust-of-Oregon-Windows-2018-Market-Research-final.pdf>

⁵ Ibid.

MARKET BARRIERS The key market barriers for R-5 windows are product availability, incremental cost, and customer education. There are limited triple pane window options on the market, with most manufacturers offering only one or two products. These limited product offerings often carry a significant incremental cost compared to ENERGY STAR certified windows and may have relatively long pay-back periods. In addition, energy efficiency is generally not the key driver for window purchase decisions. Instead, customers are primarily concerned about aesthetics and cost, and are not willing to make a significant additional investment in high efficiency windows.

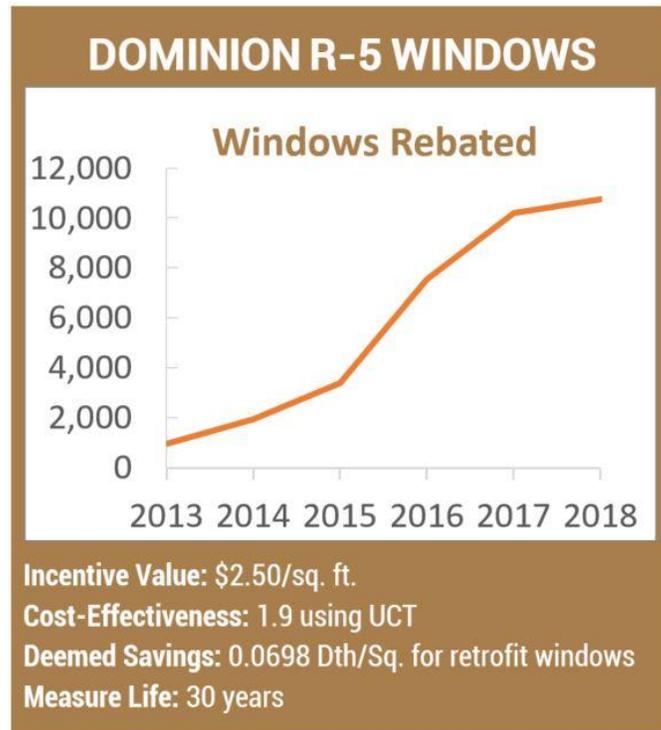
DOMINION ENERGY UTAH SUCCESS STORY

Since 2013 Dominion Energy Utah (previously Questar Gas Company), a natural gas utility, has provided an incentive of \$2.50/sq. ft. for installation of windows with a U-value of less than 0.22. The incentive is available to both single-family and multifamily residential customers in both the retrofit and new construction markets. It is one of the few window rebate programs nationally that only incentivizes R-5 windows. With R-5 windows well established in the Utah market, the incentive now covers nearly the full incremental cost of the windows (relative to a typical R-3 ENERGY STAR certified window).

As shown in the accompanying chart, the number of windows rebated by Dominion Energy grew steadily from 2013 to 2017, with incentives now provided to over 10,000 windows per year. The vast majority of rebates have been provided to retrofits of single-family homes, with lower participation in the multifamily retrofit market and new construction markets. However, multifamily retrofit participation has increased in recent years.

Dominion Energy supports R-5 windows as part of other more comprehensive energy efficiency programs, rather than as a stand-alone program. But the utility reports that R-5 windows measures have a benefit-cost ratio of 1.9 using the Utility Cost Test (UCT). The measures are also cost-effective using the Total Resource Cost Test and the Participant Cost Test.⁶

Dominion Energy credits its success to having trade partners in the region with qualifying windows readily available in the market. The largest trade partner is a local window manufacturer that sells directly to



customers. In addition, Dominion's service territory also has local distributors that specialize in R-5 window sales using smaller national manufacturers. The prevalence of these local companies means that Utah has relatively low incremental costs for R-5 windows compared with other regions where R-5 windows are not as readily available.

ADDITIONAL RESOURCES

U.S. Department of Energy. Measure Guideline: Energy Efficiency Window Performance and Selection. November, 2012.

Apex Analytics, LLC. Energy Trust of Oregon 2018 Windows Market Research Report. September 28, 2018. Available at: <https://www.energytrust.org/wp-content/uploads/2019/02/Energy-Trust-of-Oregon-Windows-2018-Market-Research-final.pdf>

ENERGY STAR Windows Information: https://www.energystar.gov/products/building_products/residential_windows_doors_and_skylights

Efficient Windows Collaborative: www.efficientwindows.org

Evaluation of Low-E Storm and R-5 Windows for Inclusion in Pennsylvania's Weatherization Priority List – Report by Energetics in Collaboration with LBNL. May 11, 2010. Available at: https://www.quantapanel.com/wp-content/uploads/2016/08/09_PA-Window-Evaluation-11May10-Final.pdf

Dominion Energy, 2019 ThermWise Weatherization Rebates Program Description. Utah PSC Docket No. 18-057-20. Available at: <https://psc.utah.gov/2018/10/17/docket-no-18-057-20/>

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