



Impacts of AEP Modeling Assumptions: An Initial Study

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July 2007
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Supported by U.S. Department of Energy

Summary/Conclusions

- Current version of proposed AEP process produces lots of interesting data; but little “useable” information for selecting windows based on heating/cooling energy use
- Wide performance range for any one window often exceeds the range across all window types
- Results are not useful as a simple metric of relative window energy performance
- Other approaches possible that capture variability but more useful

Initial Study Results



Categories of comments:

1. RESFEN (modified) results for High/Low Operating parameters (From Table 2 of AEP Ballot)
(Note: Table 1 changes not implemented except for exterior shading, results give conceptual range)
2. Alternatives to High and Low Input Ranges
3. Comments on Fixed Parameters for Reference and Specific House (from Table 1 of AEP Ballot)

Project Objectives



Examined impact of some High/Low operating assumptions

- Will the use of this approach lead to a rating that will help consumers understand the relative performance of alternative products?
- Or will the variation be so large as to mask useful guidance ?

RESFEN Modeling



Modeled the following in RESFEN:

- **5 windows**
 - 1 = Dbl Clr, WV, (U=0.49, SHGC=0.56)
 - 2 = Hi Gain LowE Dbl, WV (U=0.37, SHGC=0.53)
 - 3 = Lo Gain Low-E Dbl, WV (U=0.34, SHGC=0.30)
 - 4 = Triple WV (U=0.18, SHGC=0.40)
 - 5 = Triple Low-E WV (U=0.18, SHGC=0.26)
- **5 climate zones**
 - Minneapolis, MN
 - Salt Lake City, UT
 - Riverside, CA
 - Charleston, SC
 - Washington, DC

AEP Procedures



Modeled the following in RESFEN:

- Reference Current House:
Used current RESFEN modeling assumptions with exterior shading, dir/screen effects, etc.
- Modeled High / Low assumptions for
(Note: Table 1 changes not implemented except for exterior shading, results give conceptual range)
 - Thermostat setpoints
 - Interior Shading operation

AEP Modeling: Thermostat



Thermostat Setpoint Assumptions

- RESFEN Current
 - HEATSET=70 SETBACK=65
 - COOLSET=78 SETUP=78
- AEP Proposed
 - Low Energy
 - HEATSET=68 SETBACK=65
 - COOLSET=78 SETUP=80
- AEP Proposed
 - High Energy
 - HEATSET=75 SETBACK=75
 - COOLSET=72 SETUP=72

AEP Modeling: Shading



Interior Shading Assumptions

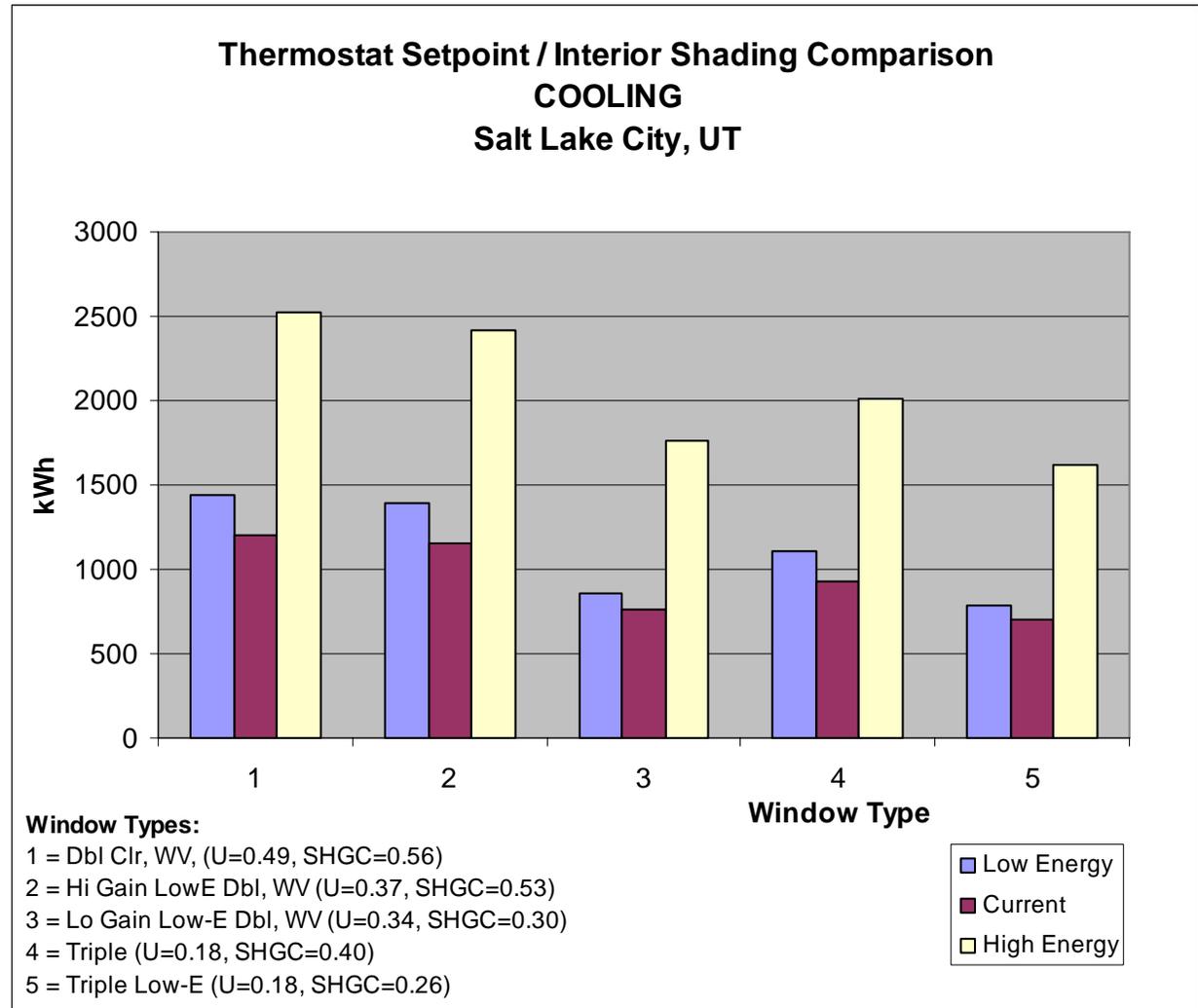
- RESFEN Current
 - Summer -- SHGC Multiplier = 0.7 (with ovh, obst, screens/dirt)
 - Winter -- SHGC Multiplier = 0.8 (with ovh, obst, screens/dirt)
- AEP Proposed Low Energy
 - Summer -- SHGC Multiplier = 0.8 (no ovh, obst, screens/dirt)
 - Winter -- SHGC Multiplier = 0.9 (no ovh, obst, screens/dirt)
- AEP Proposed High Energy
 - Summer -- SHGC Multiplier = 0.9 (no ovh, obst, screens/dirt)
 - Winter -- SHGC Multiplier = 0.8 (no ovh, obst, screens/dirt)

AEP Modeling Results



Salt Lake City

Cooling

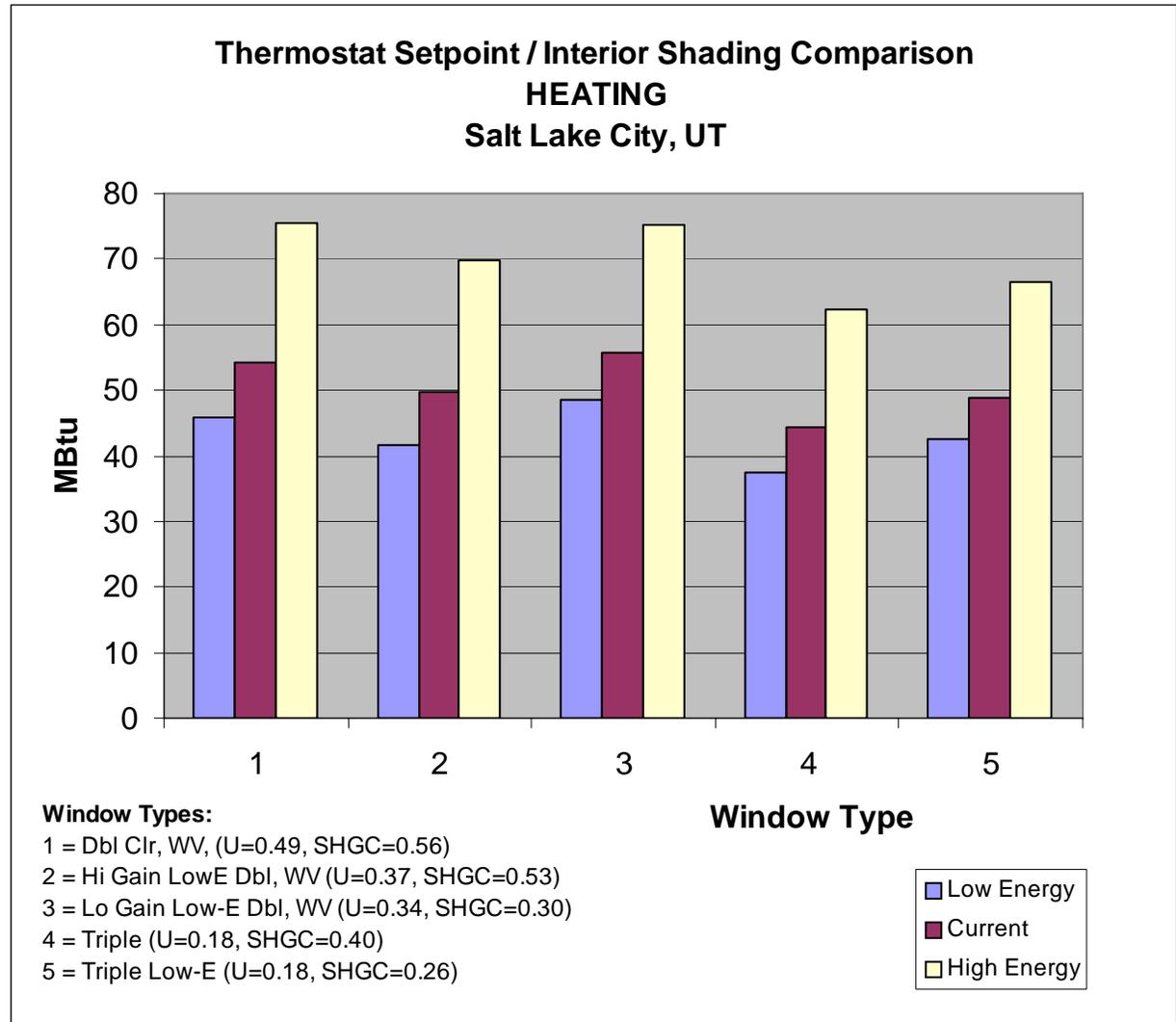


AEP Modeling Results



Salt Lake City

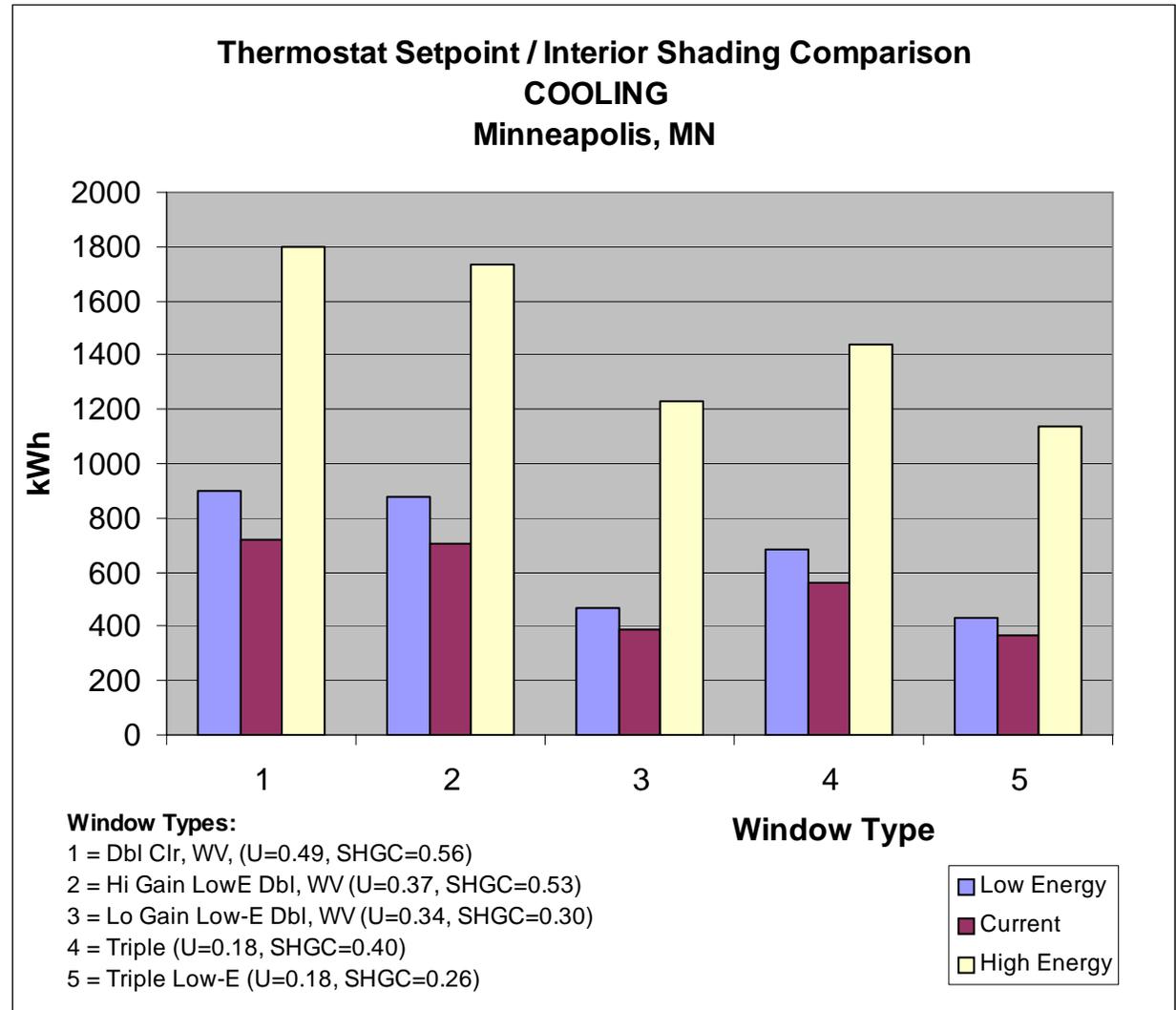
Heating



AEP Modeling Results



Minneapolis
Cooling

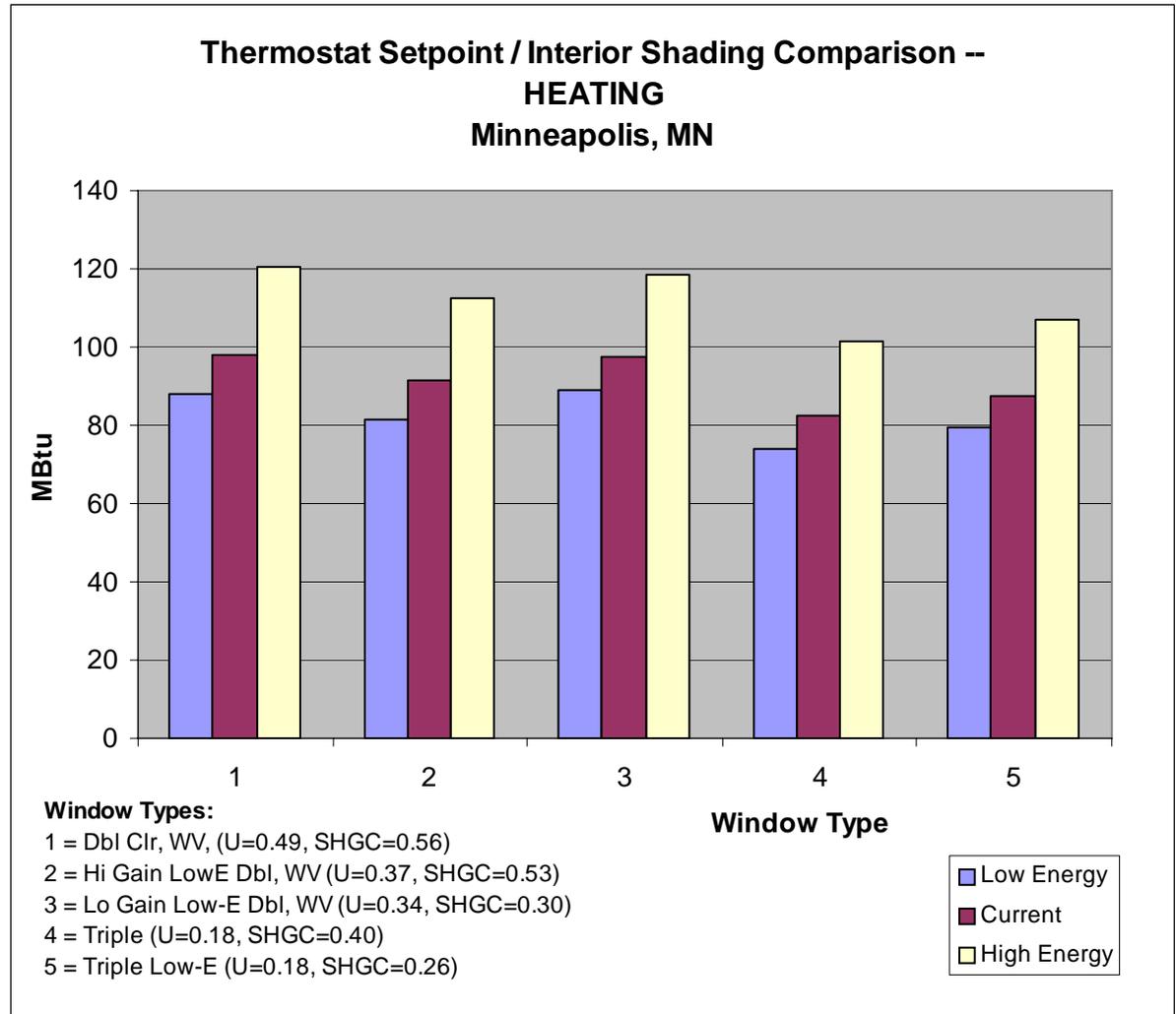


AEP Modeling Results



Minneapolis

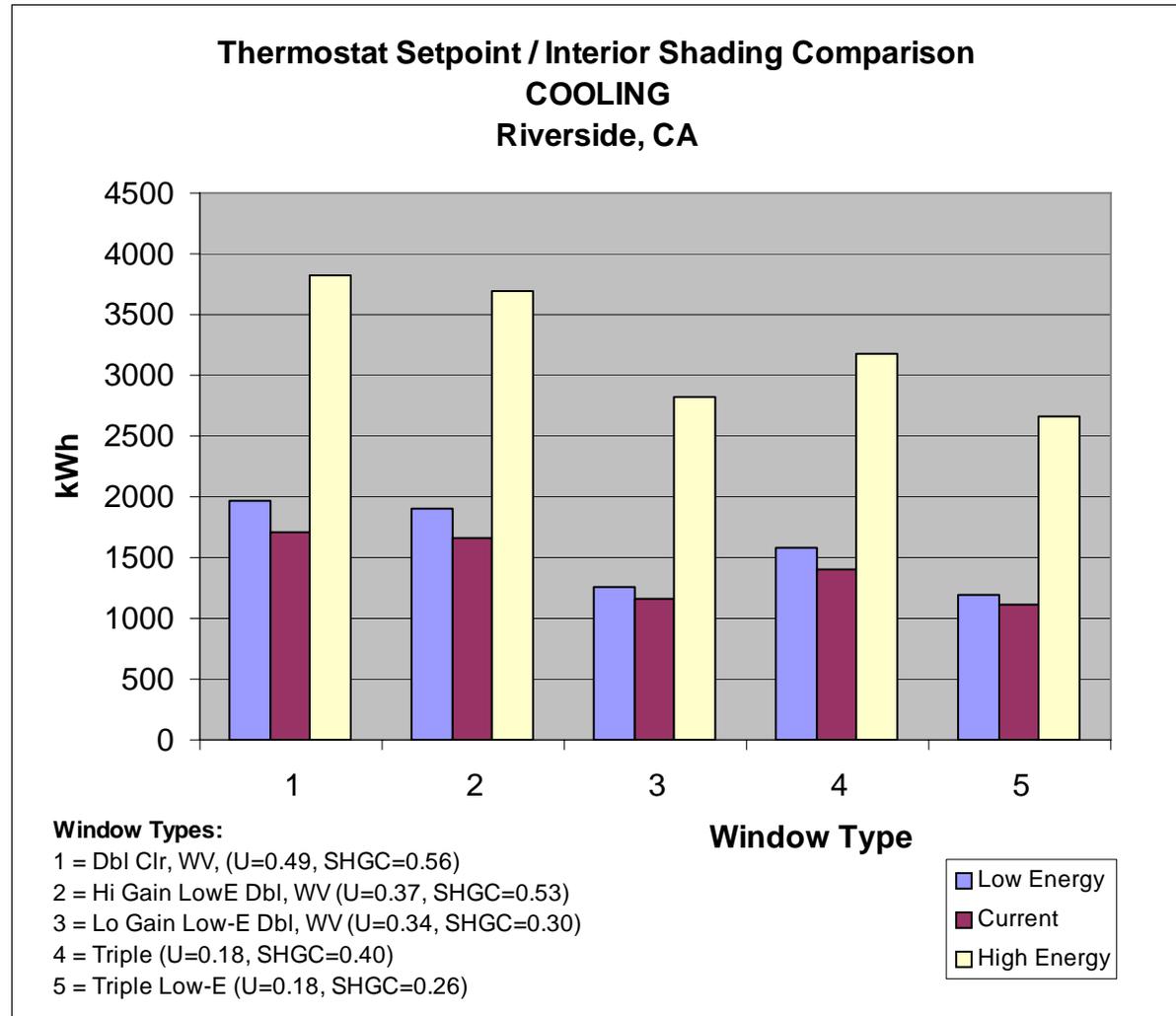
Heating



AEP Modeling Results



Riverside
Cooling

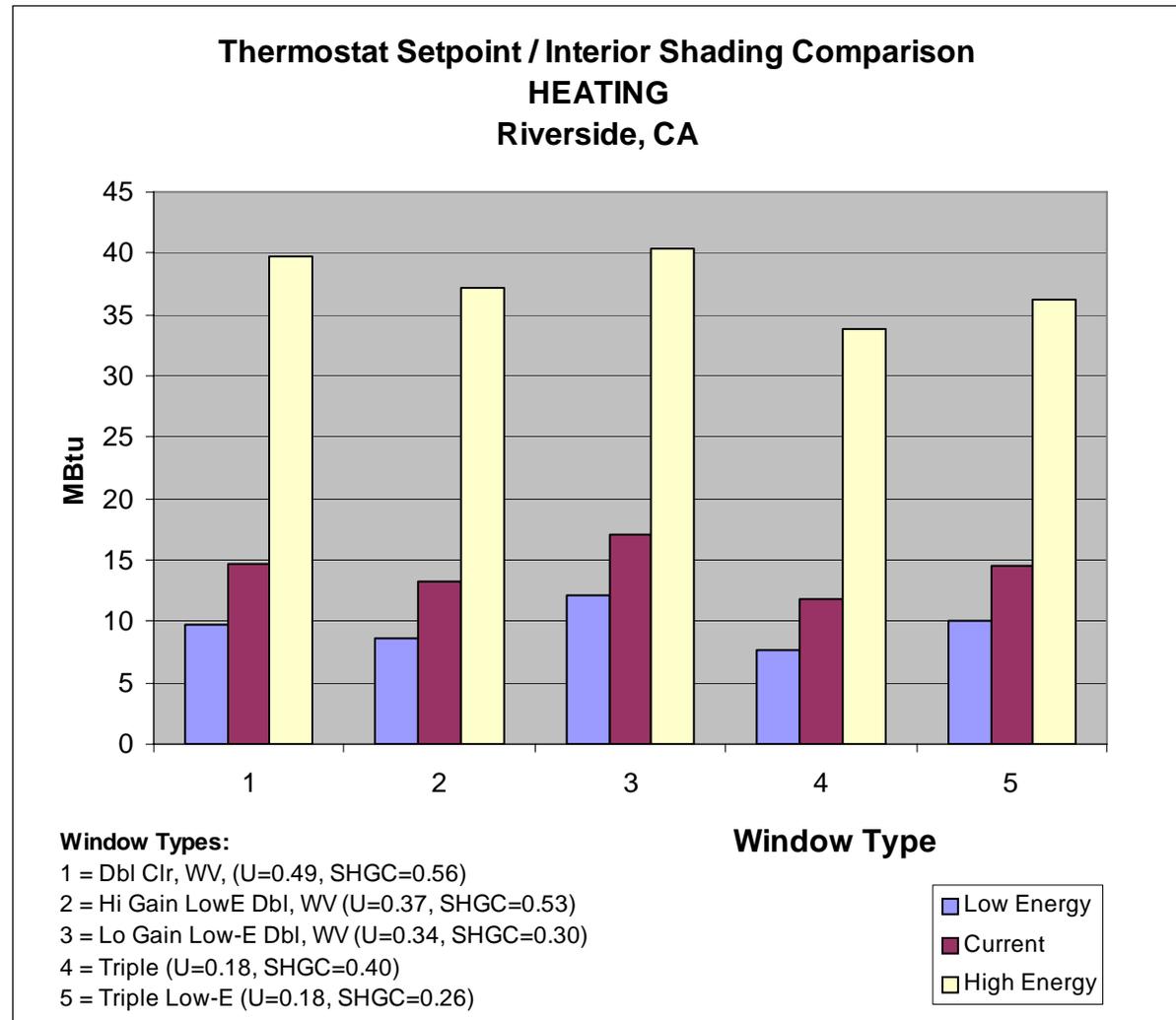


AEP Modeling Results



Riverside

Heating

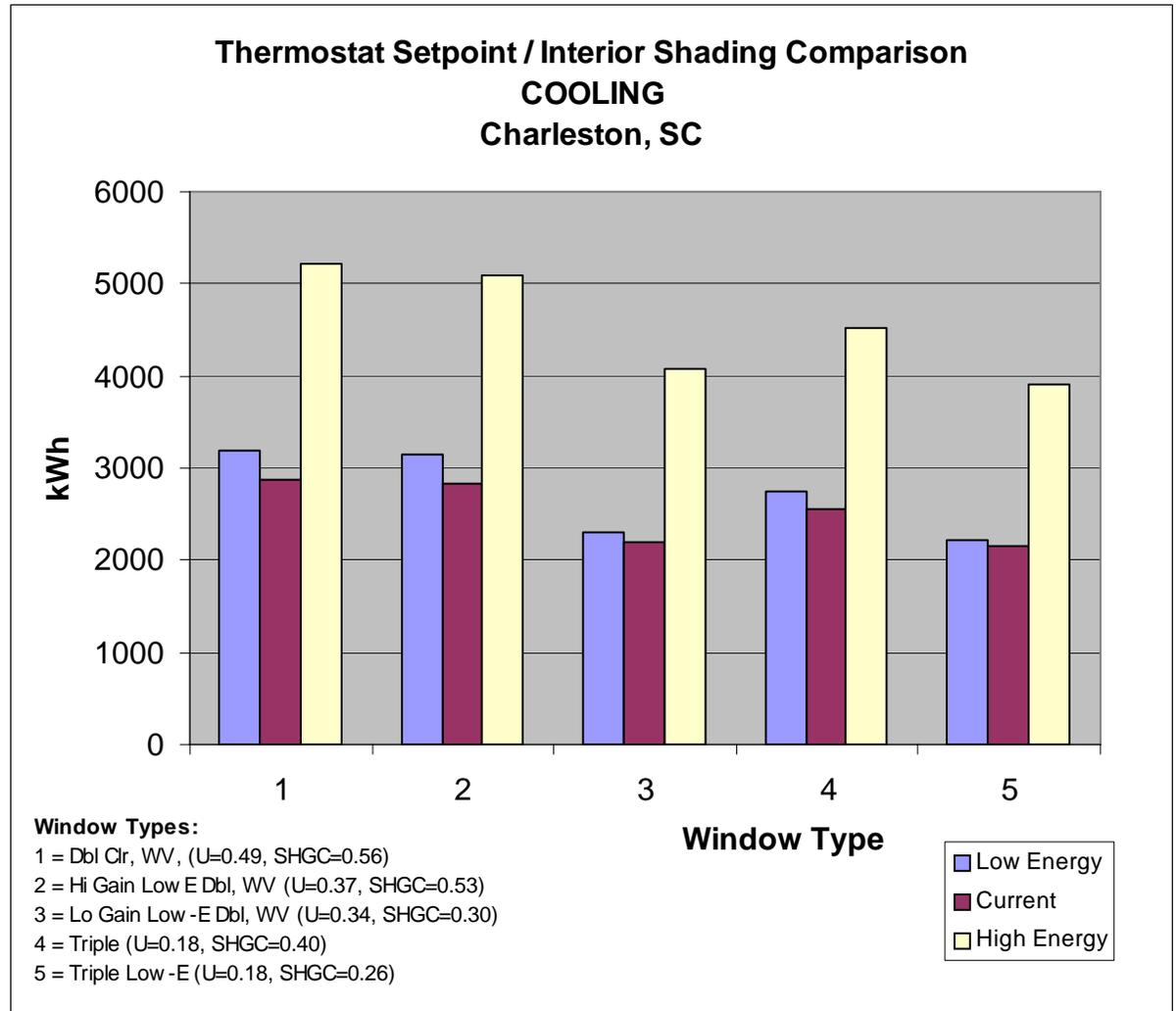


AEP Modeling Results



Charleston

Cooling

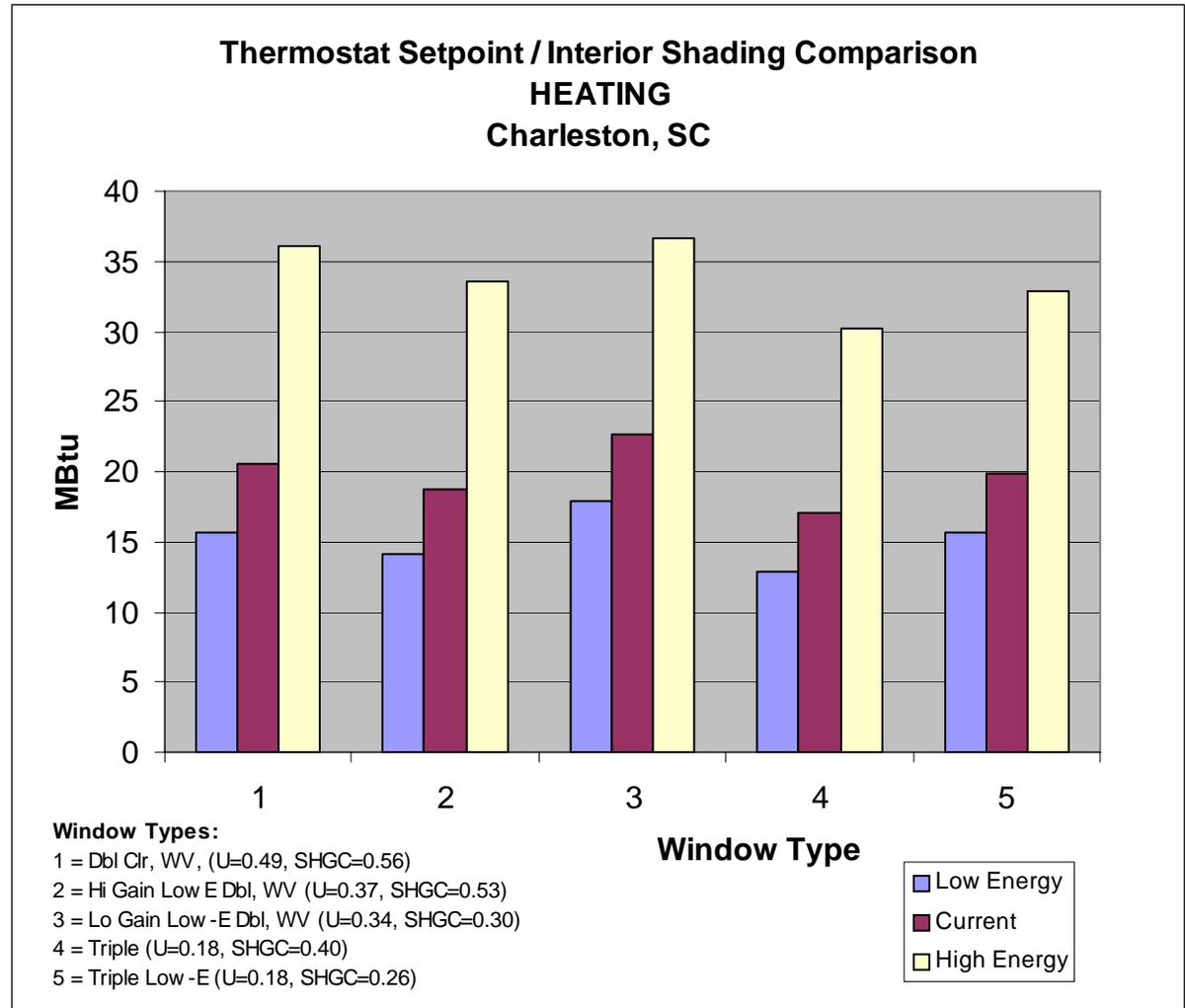


AEP Modeling Results



Charleston

Heating

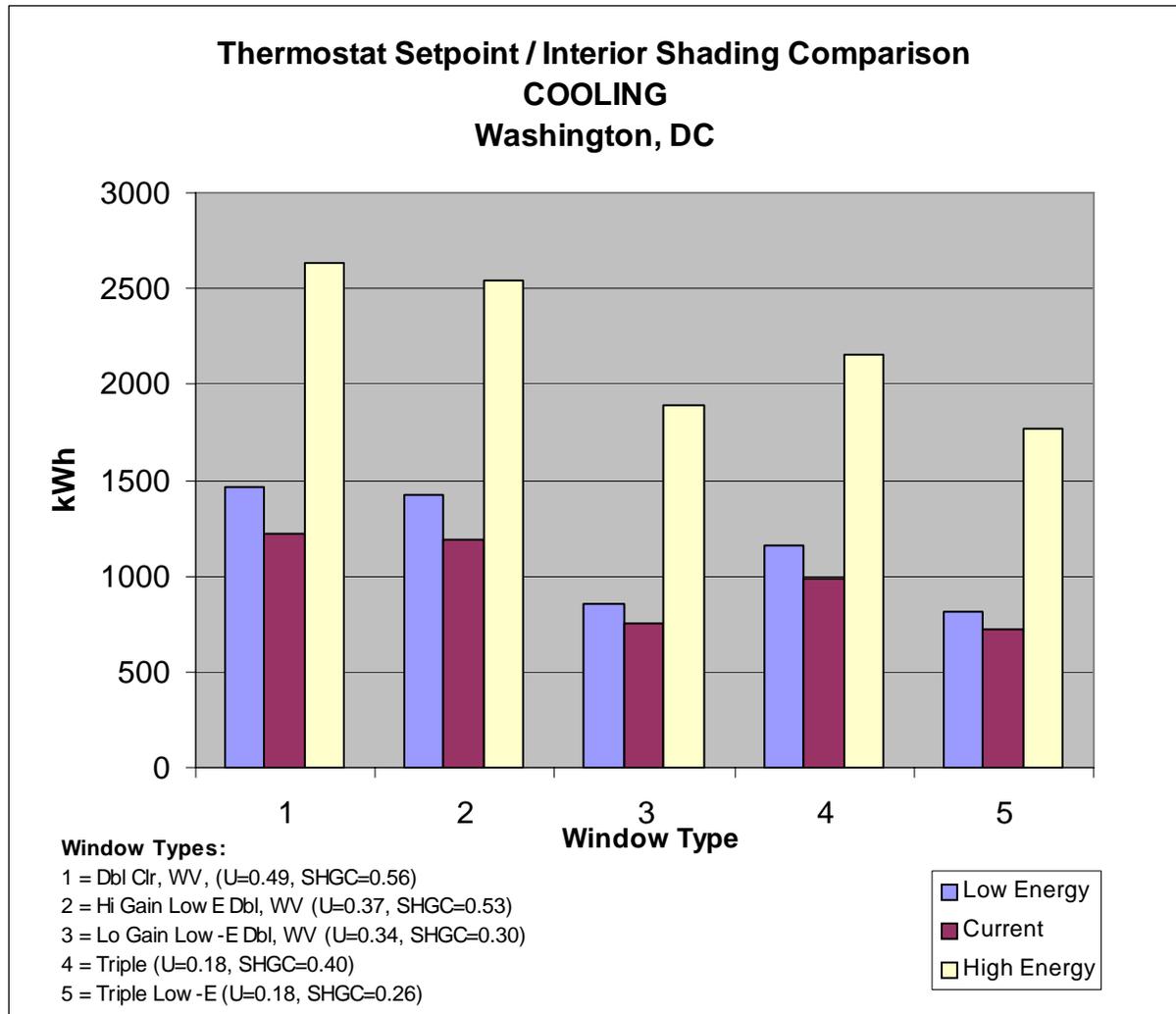


AEP Modeling Results



Washington
DC

Cooling

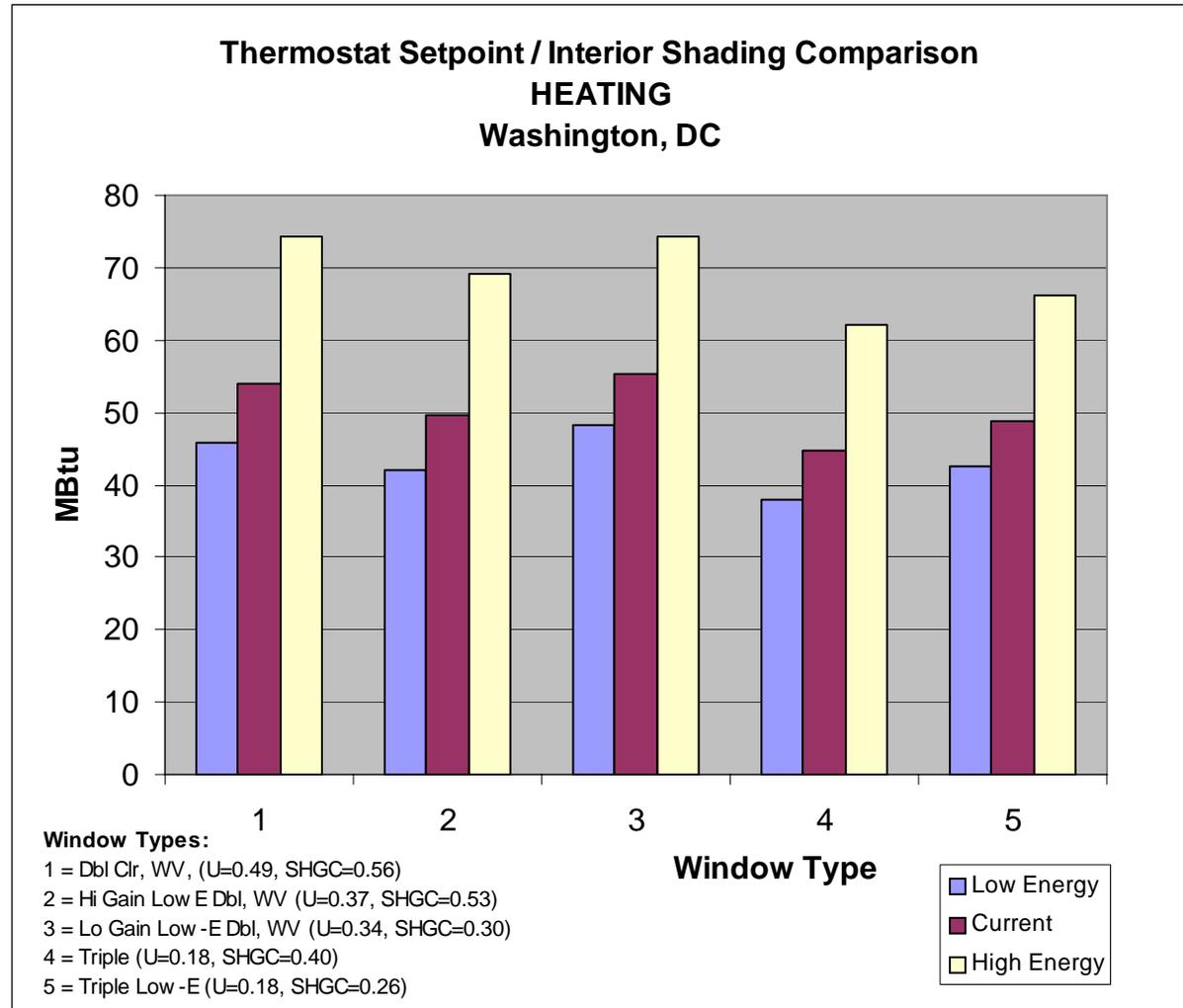


AEP Modeling Results



Washington
DC

Heating



Modeling Dynamic Systems



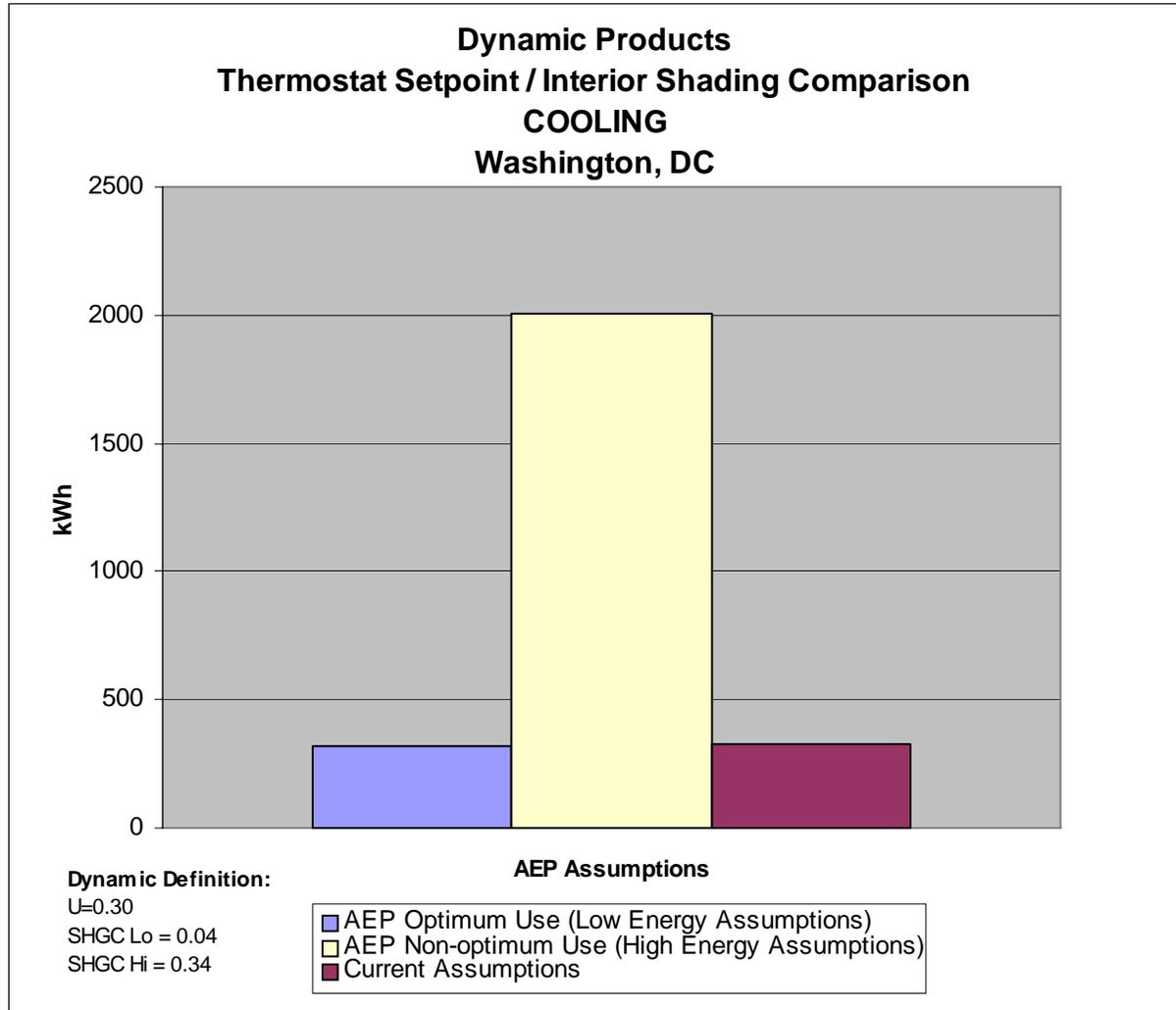
- What happens when dynamic products are modeled using the proposed AEP guidelines?

AEP Modeling Results

Dynamic Products

Washington DC

Cooling

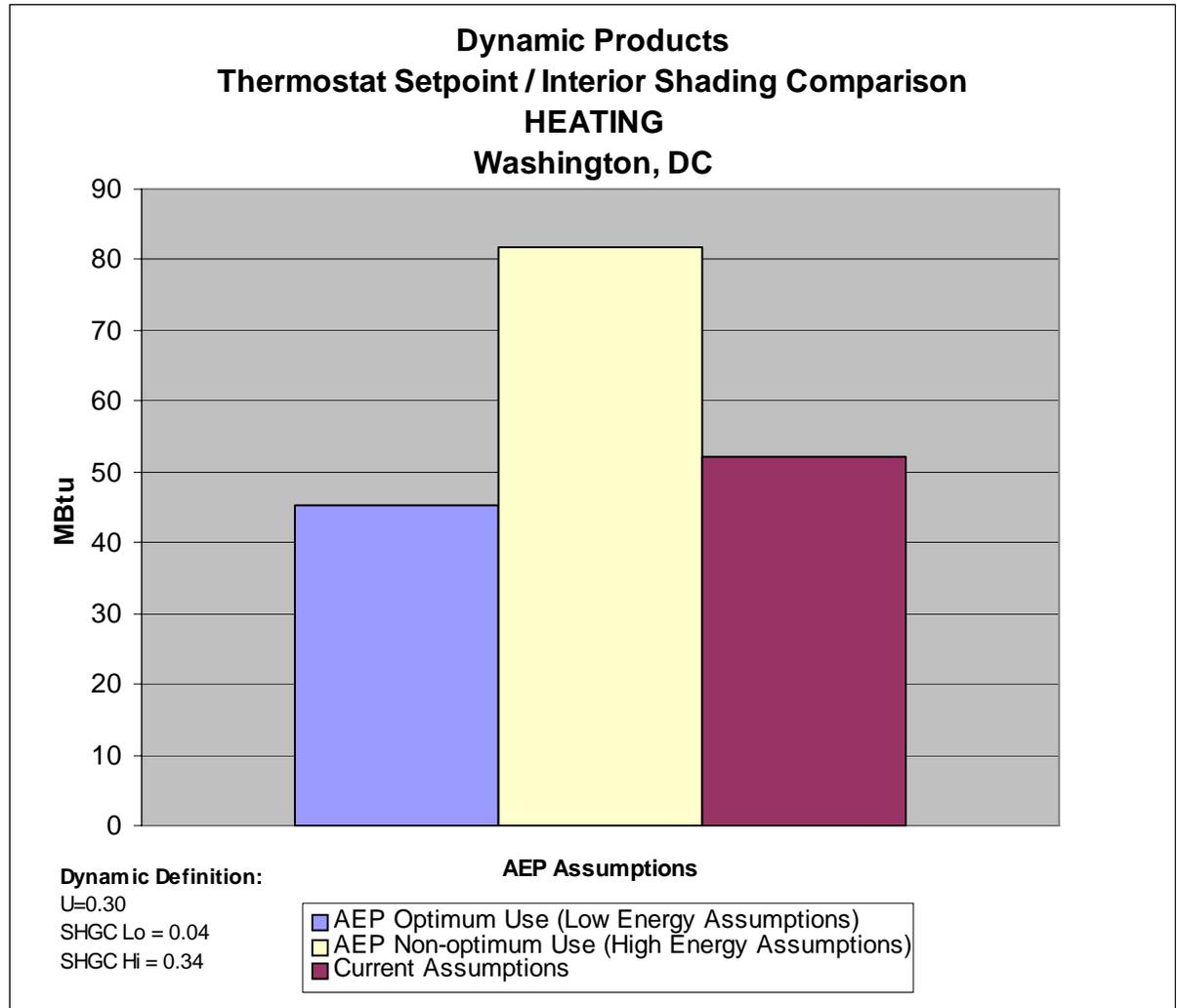


AEP Modeling Results

Dynamic Products

Washington DC

Heating



Conclusions

- Differences between "High" and "Low" performance values overwhelms the differences between products; e.g., clear double vs. best superwindow
- If the goal is to develop a useful procedure to determine relative energy performance for non-expert user, this approach fails:
 - “Too much data, not enough useful information”
- Need to develop an alternate process

Alternatives to “High/Low” Range



Goal: capture some of “variability” while providing useful information for decision-making

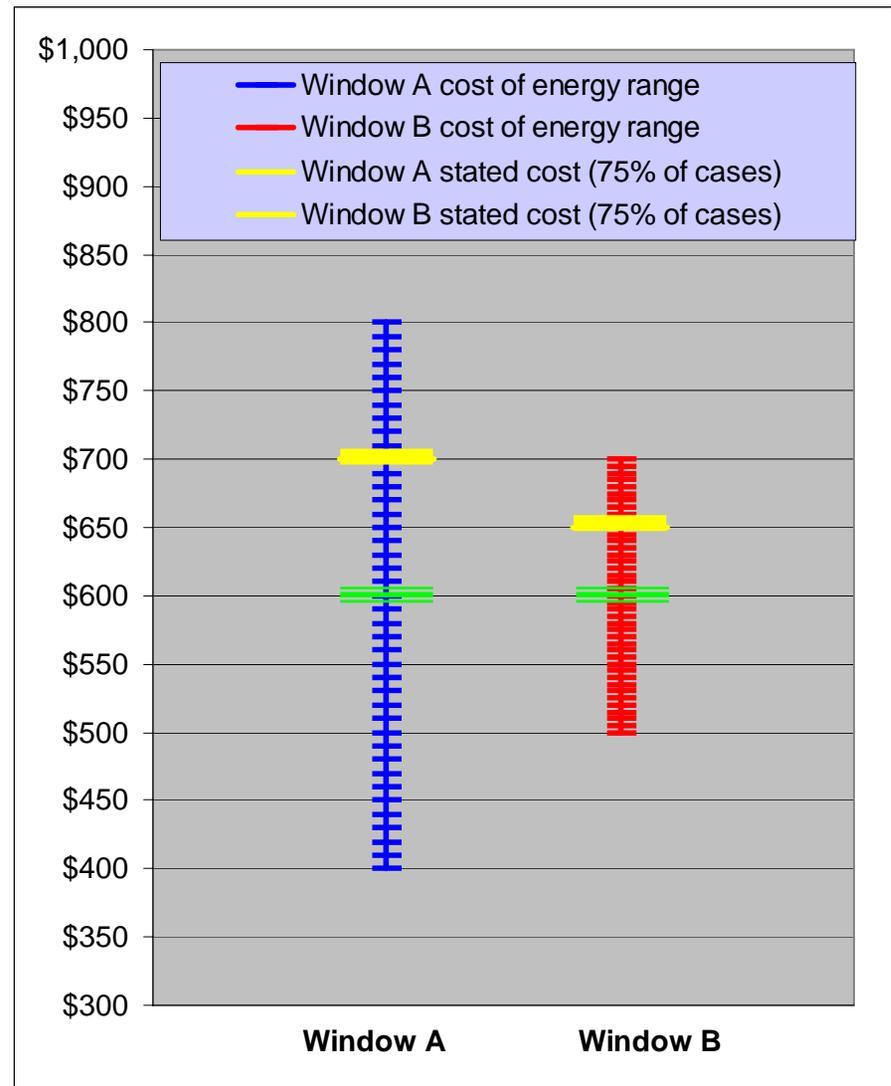
Approach: Do analysis of multitude of “realistic” conditions (hundreds or thousands of runs per location/window)

- Determine nominal value
- Develop Error Bars
User will understand the uncertainty of typical conditions
Example: \$600 +/- \$80 vs \$600 +/- \$50
- Develop one number threshold where large majority (75%?) of products meet or beat.
(This rewards products which perform consistently over a range of applications)

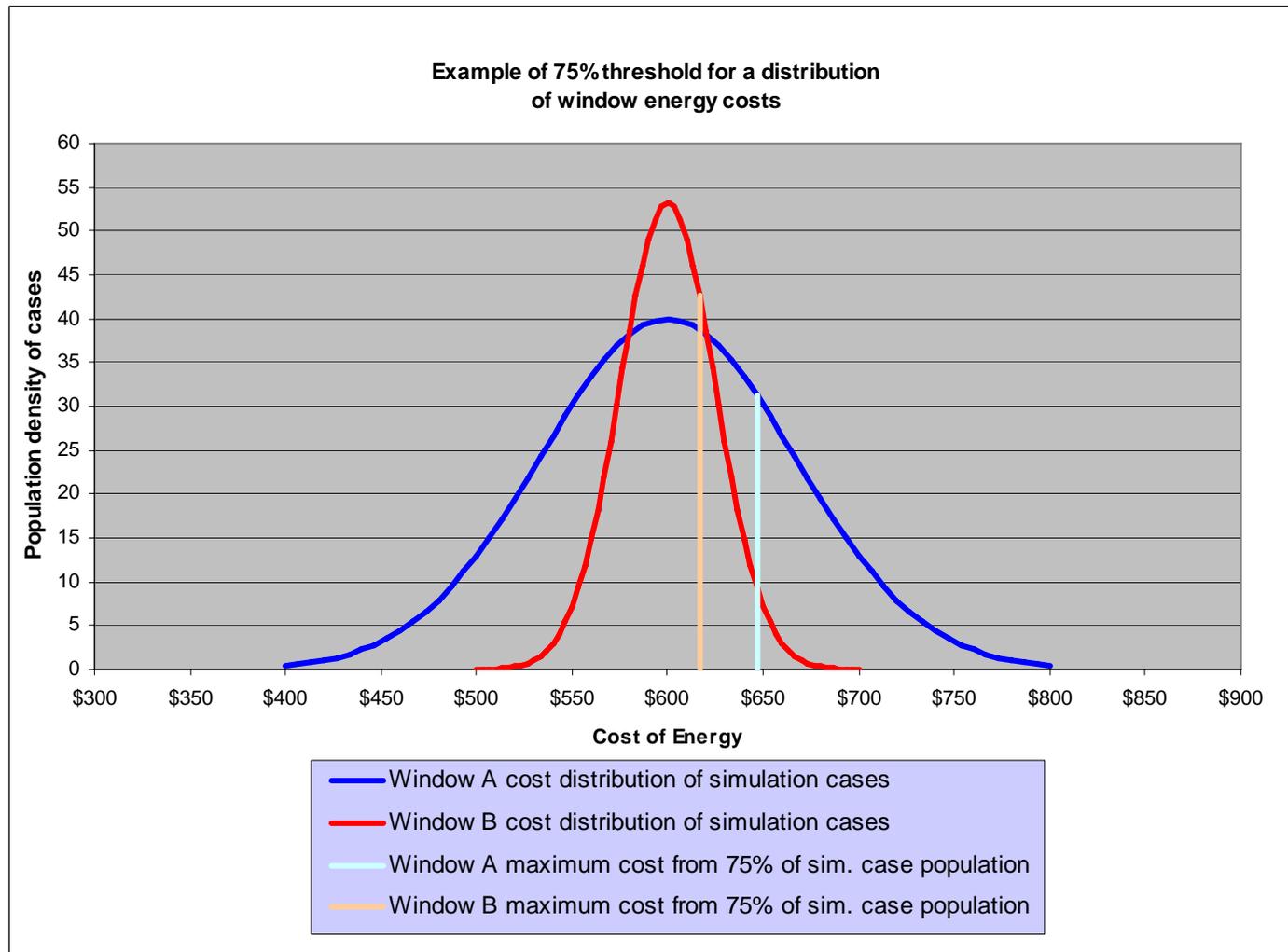
Alternative to High/Low

Example:

- Window A's cooling is \$600 at **typical conditions**, but all results fall between \$400 and \$800. To simplify, assume they fall linearly between that range. The **stated cost would be \$700** – the level at which 75% of all cases meet or beat
- WINDOW B's cooling is also at \$600 for typical conditions but all results fall between \$700 and \$500, again with a linear distribution for this example. So the stated cost would be \$650.



Alternative to High/Low



Comments on Table 1

(User-Defined , Fixed Parameters For Reference House and Specific House)

Assumptions that LBNL agrees with:

- Floor Area Change
- House Construction (although suggest averaging 1 and 2 storey instead of 1 ½ storey)
- Aspect Ratio
- Foundation
- Insulation
- Fenestration Type
- Structural Mass
- Internal Furniture Mass
- HVAC System
- Duct Loss

Comments on Table 1

(User-Defined , Fixed Parameters For Reference House and Specific House)

Assumptions that need further study:

- HVAC System Sizing
- Part Load Performance
- Internal Loads
- Natural Ventilation

Assumptions that LBNL does not agree with:

- Fenestration Area and Distribution (OK for Specific House)
- Exterior Shading (OK for Specific House)



Download Presentation

This presentation can be downloaded at:

<http://windows.lbl.gov/aep/aepassumptions.htm>

Appendices

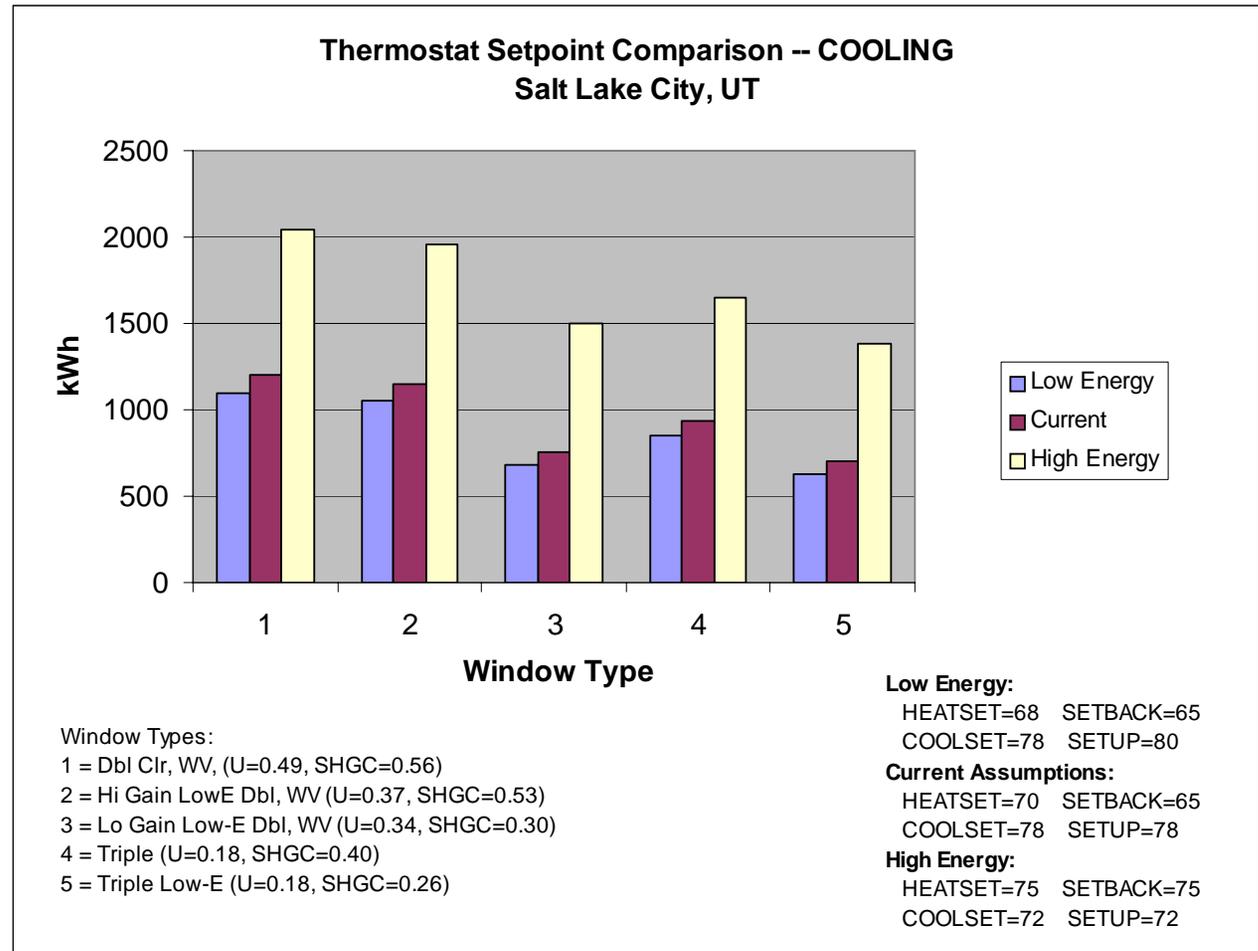


Separate Data on thermostat setpoints and shading controls, as well as an another way to represent the example in the Alternate to High/Low slide

AEP Modeling TSTATS only



Salt Lake City
Cooling



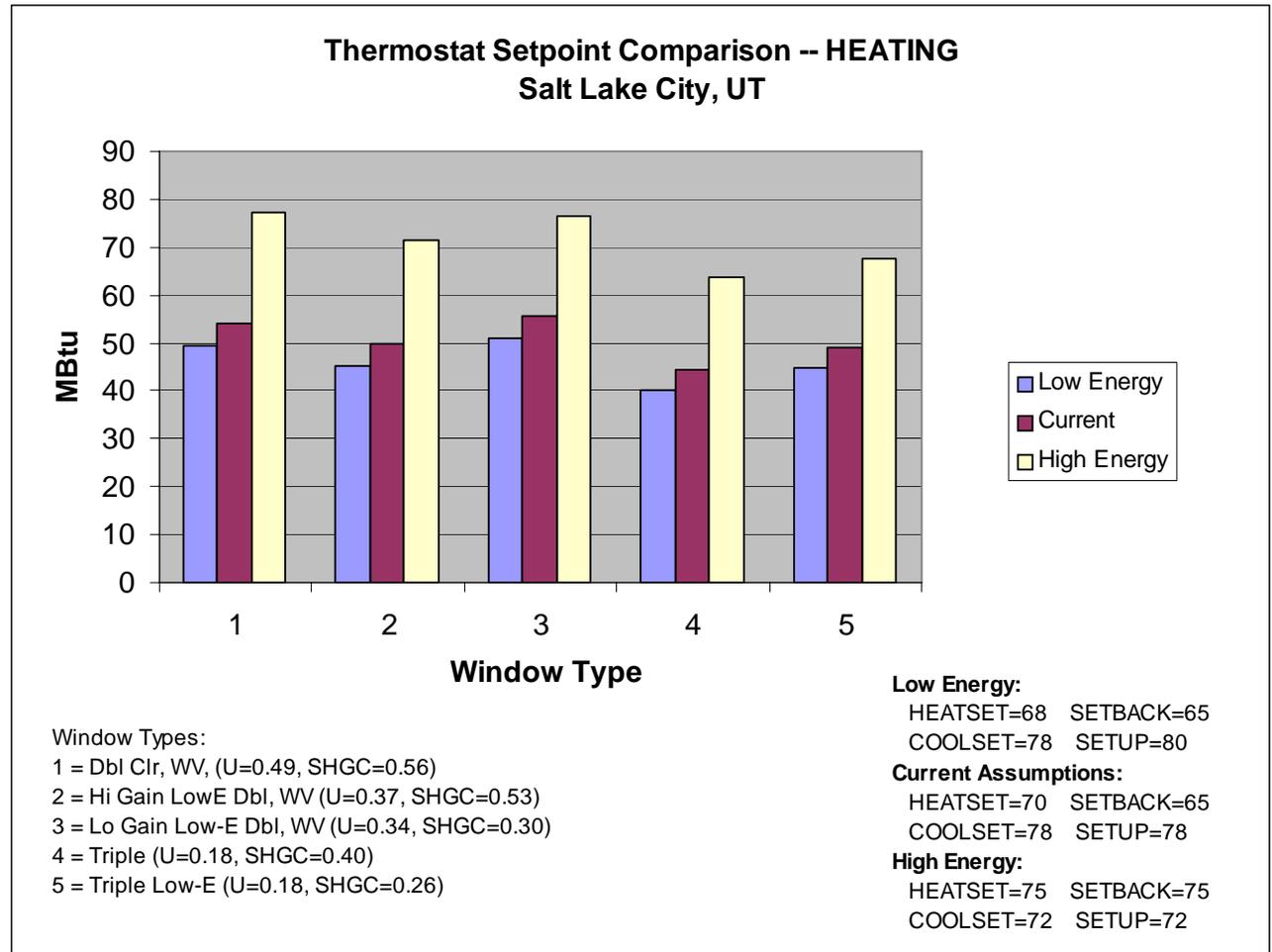
All other modeling assumptions kept to RESFEN current, including interior/exterior shading

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Salt Lake City

Heating

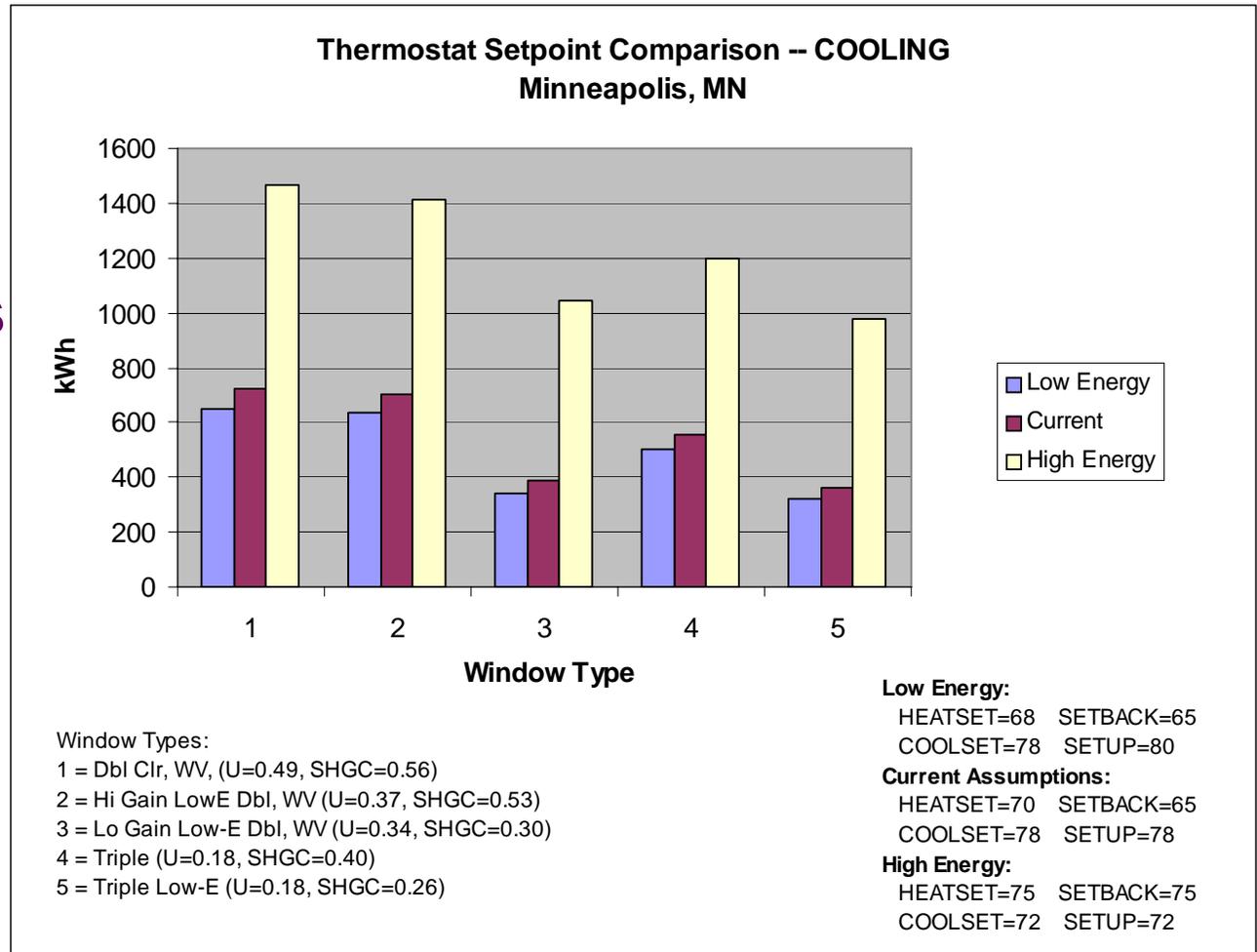


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Minneapolis
Cooling



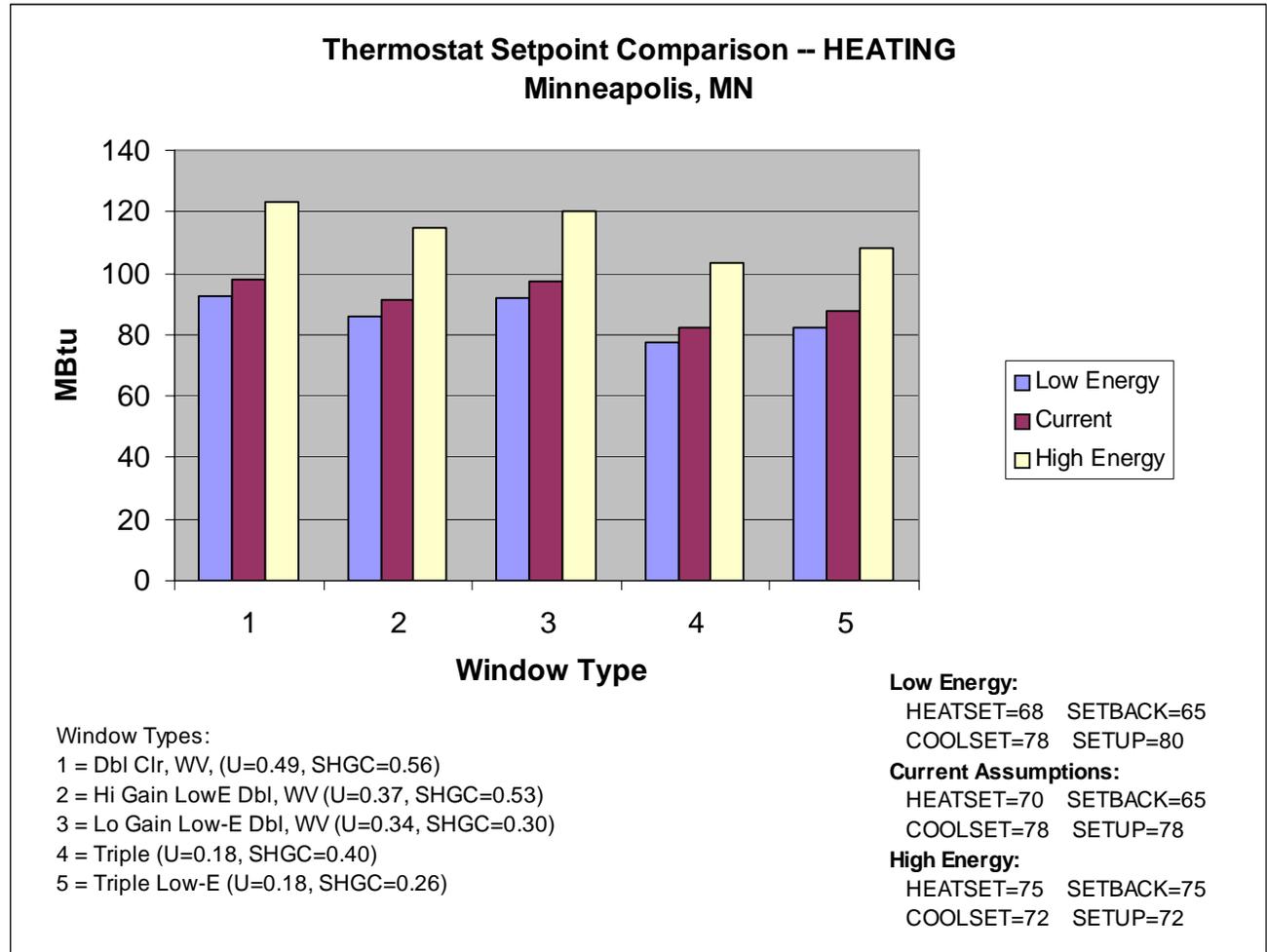
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Minneapolis

Heating

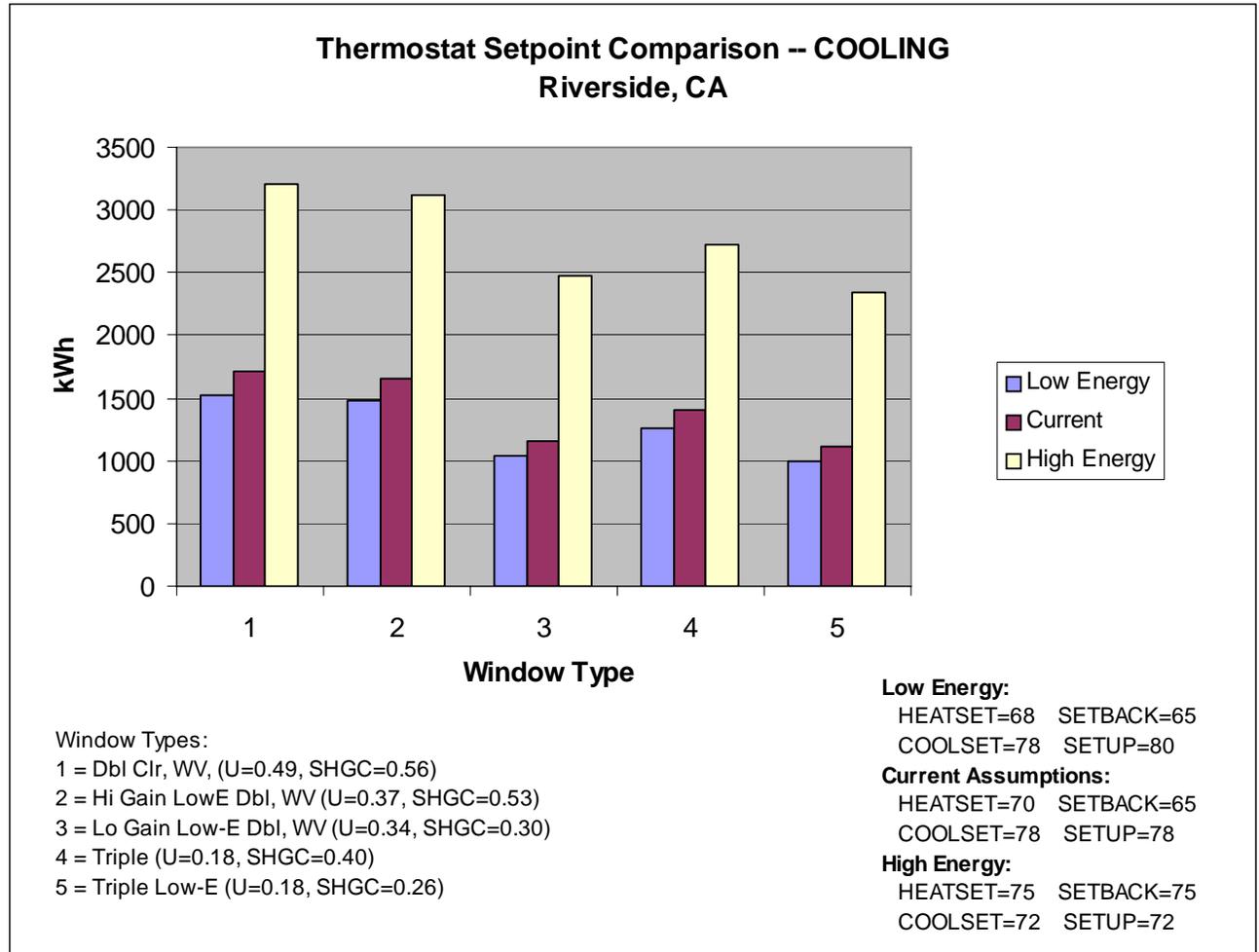


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Riverside
Cooling

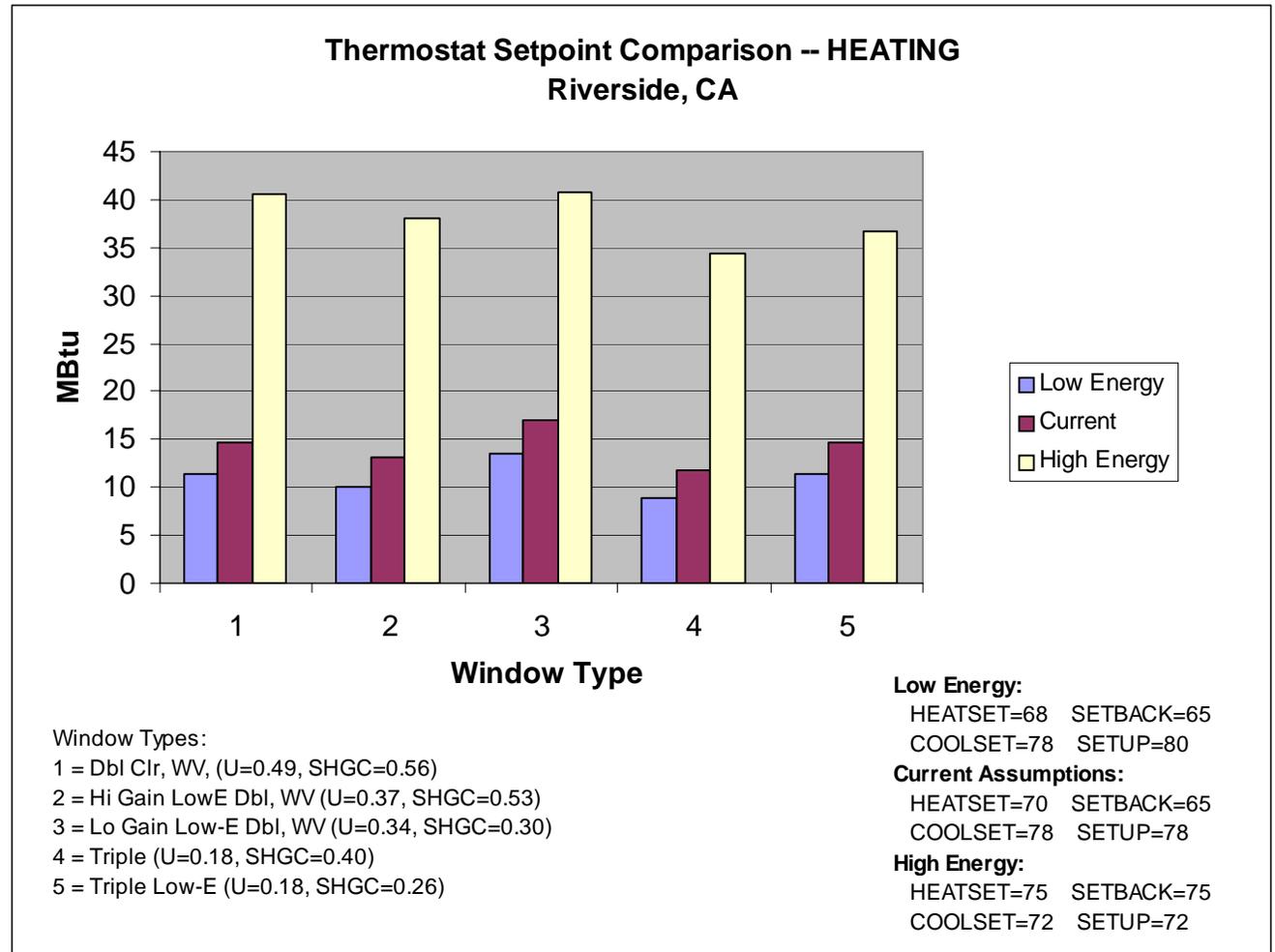


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Riverside
Heating

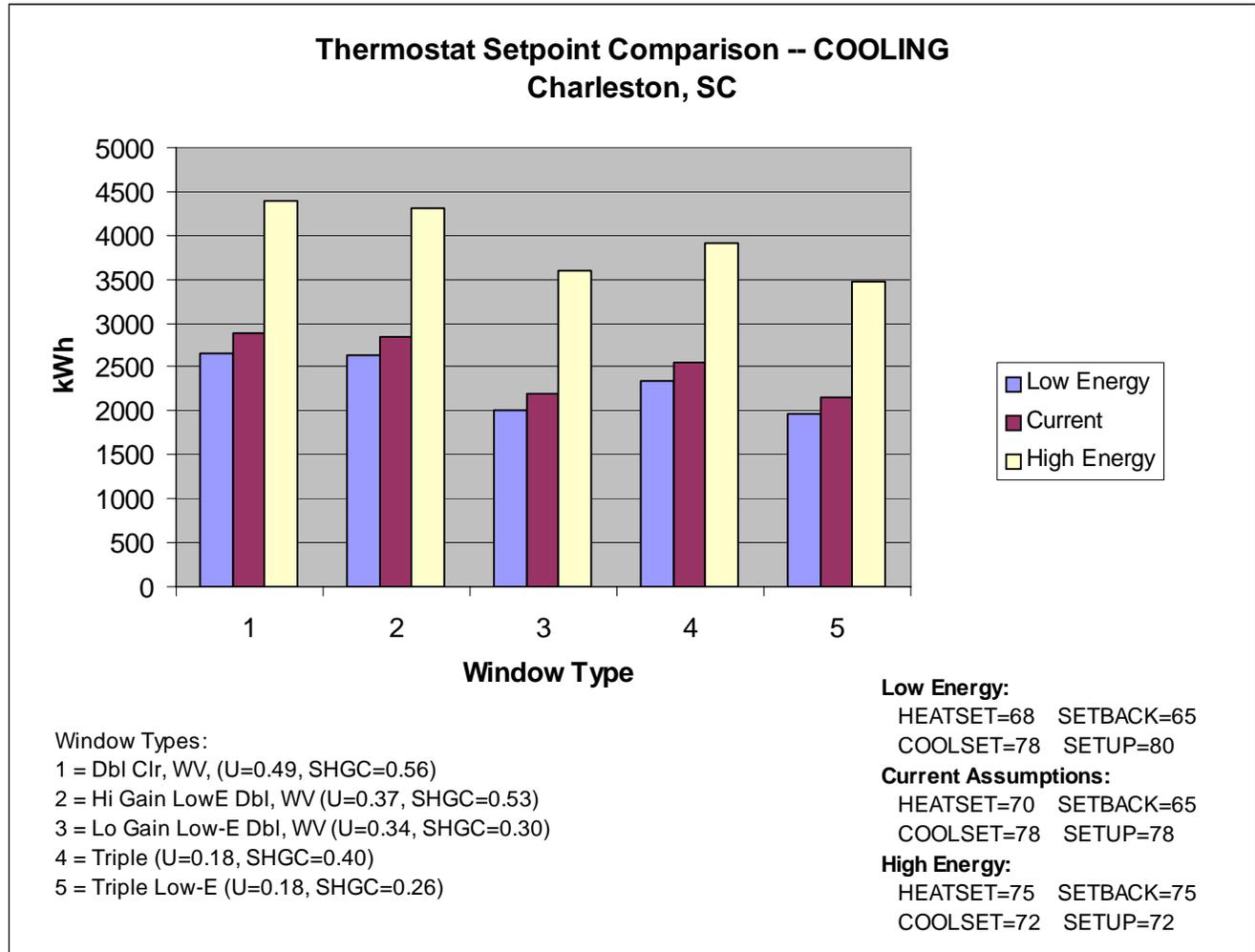


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Charleston Cooling

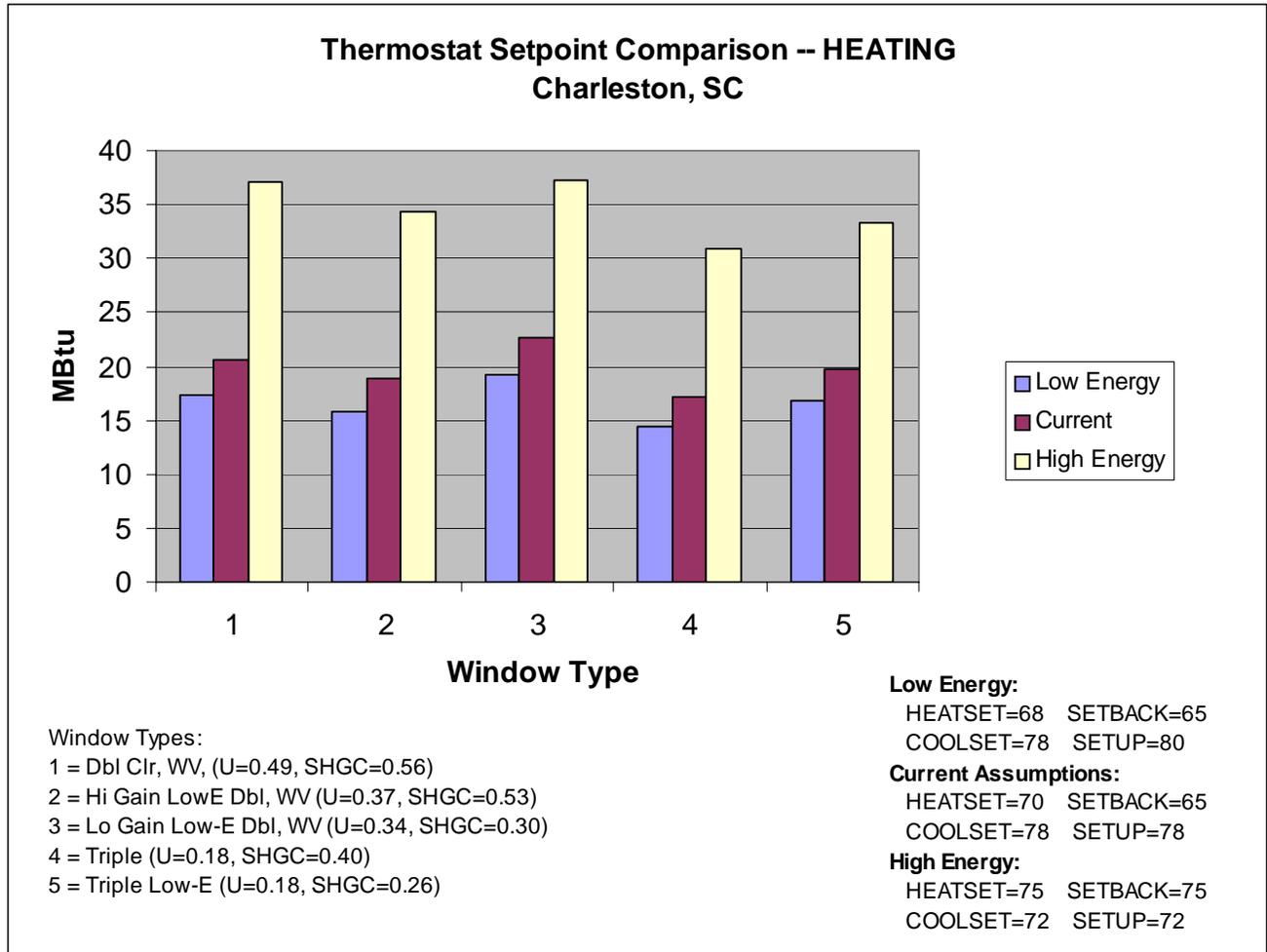


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Charleston
Heating



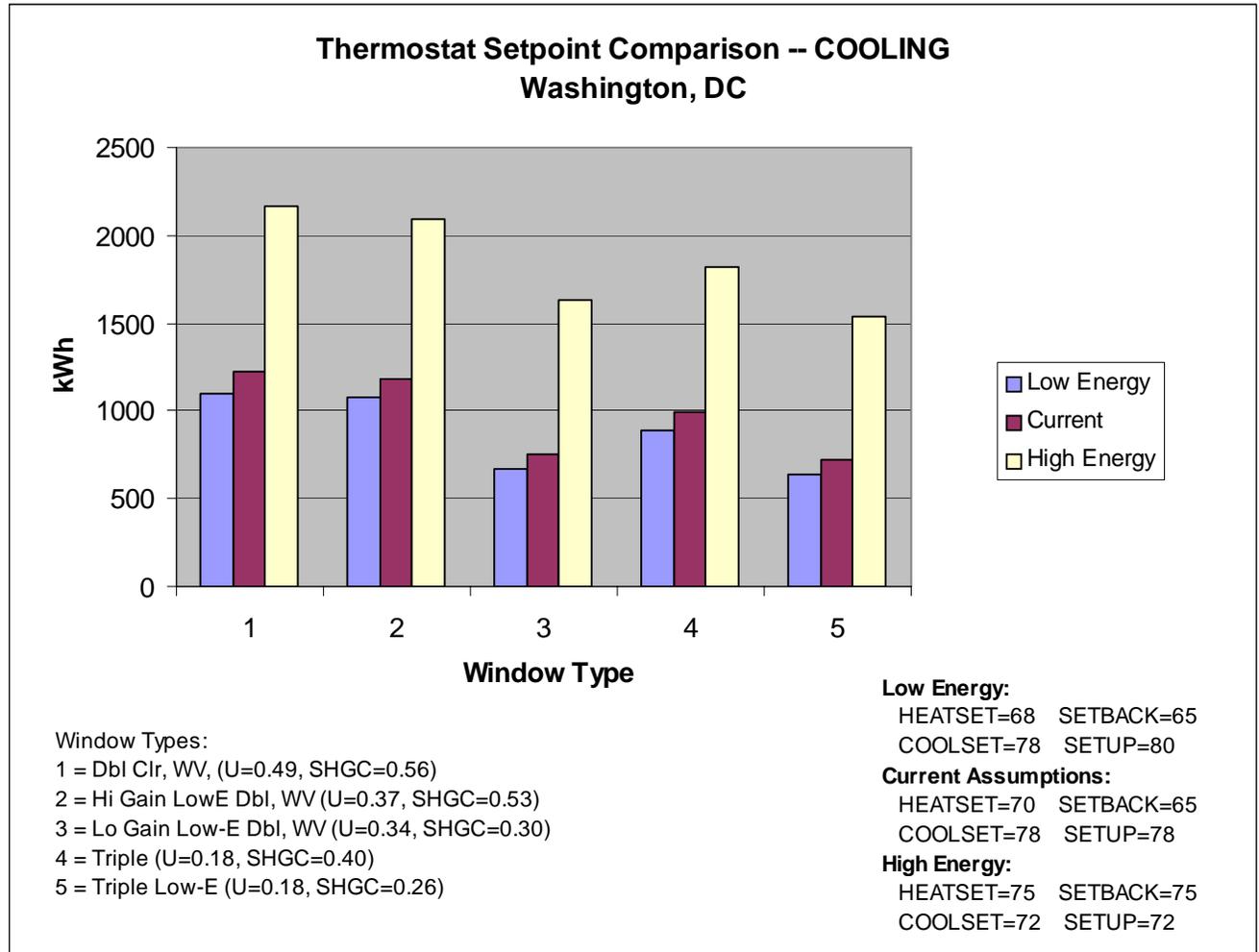
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Washington
DC

Cooling



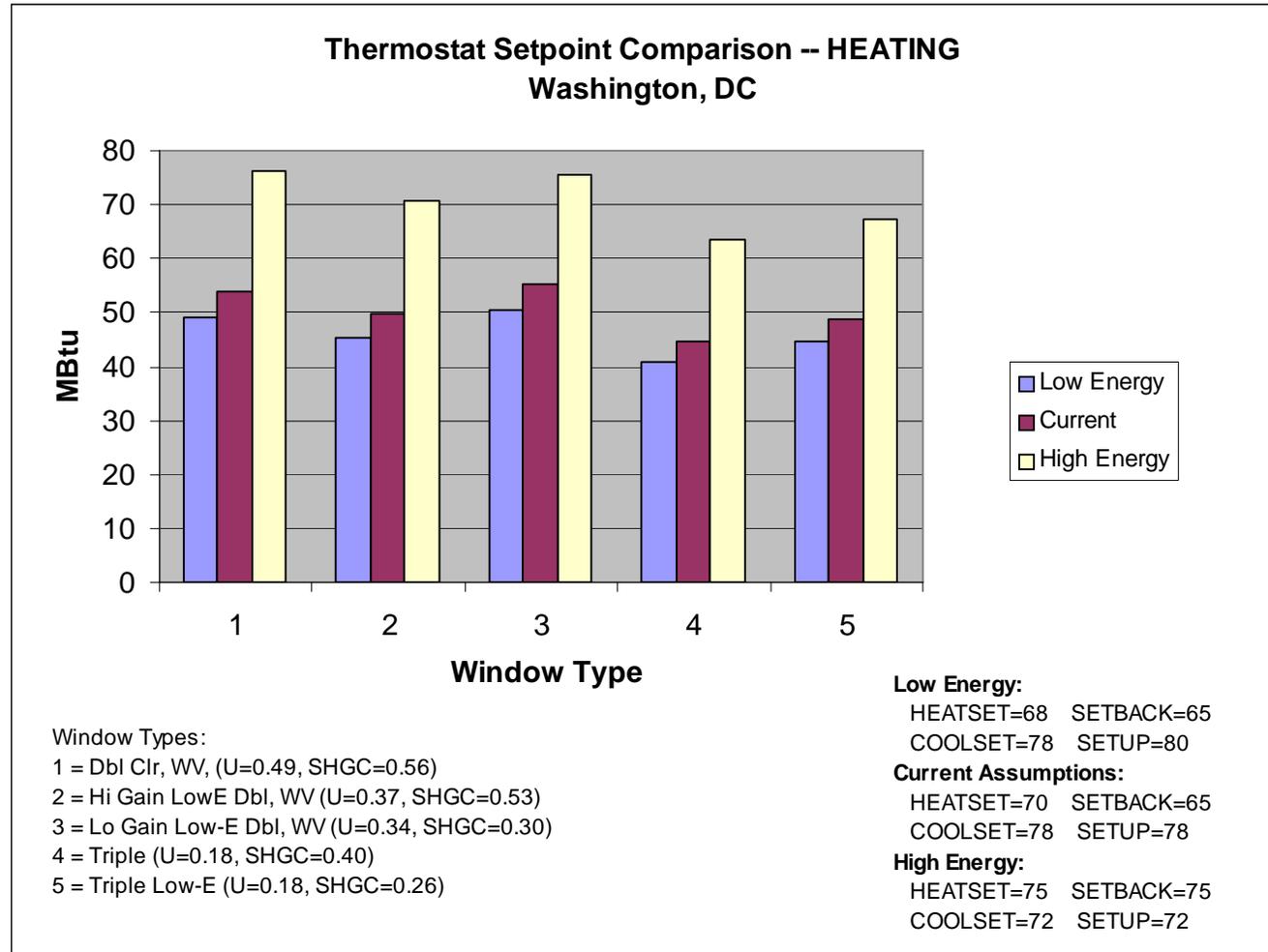
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Heating



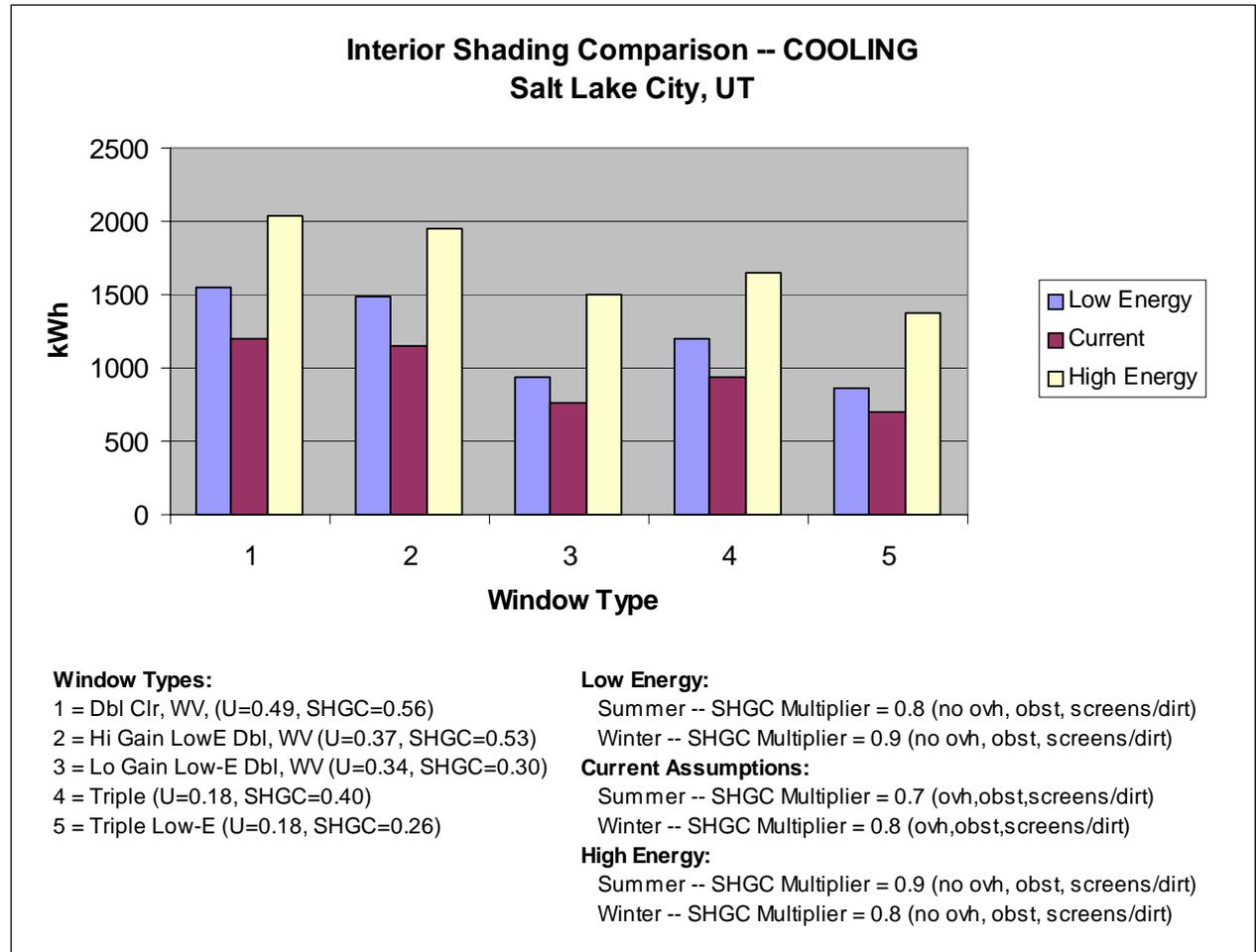
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AEP Modeling IntShade only



Salt Lake City

Cooling



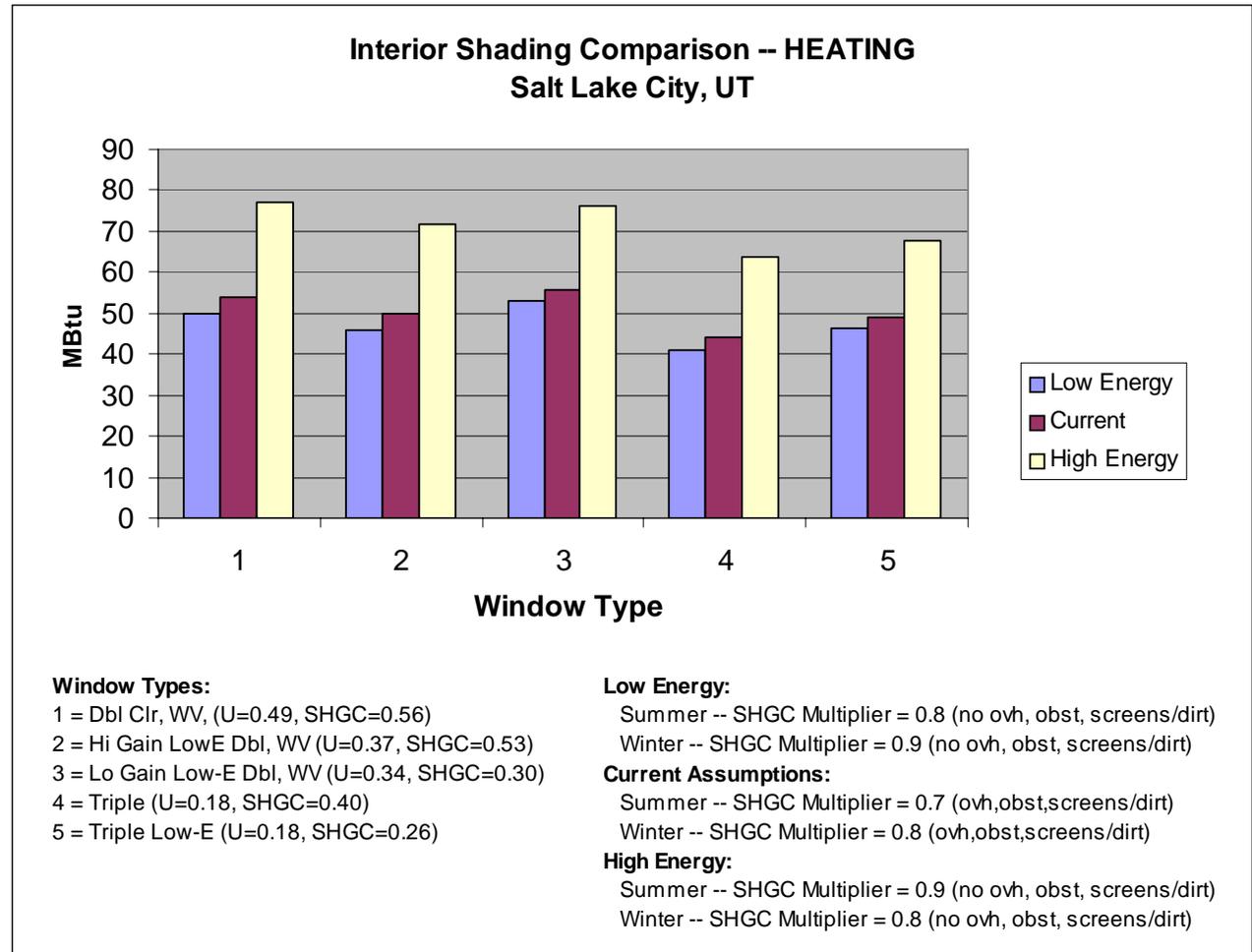
No exterior shading/dirt/screens, etc -- All other modeling assumptions kept to RESFEN current

AEP Modeling IntShade only



Salt Lake City

Heating

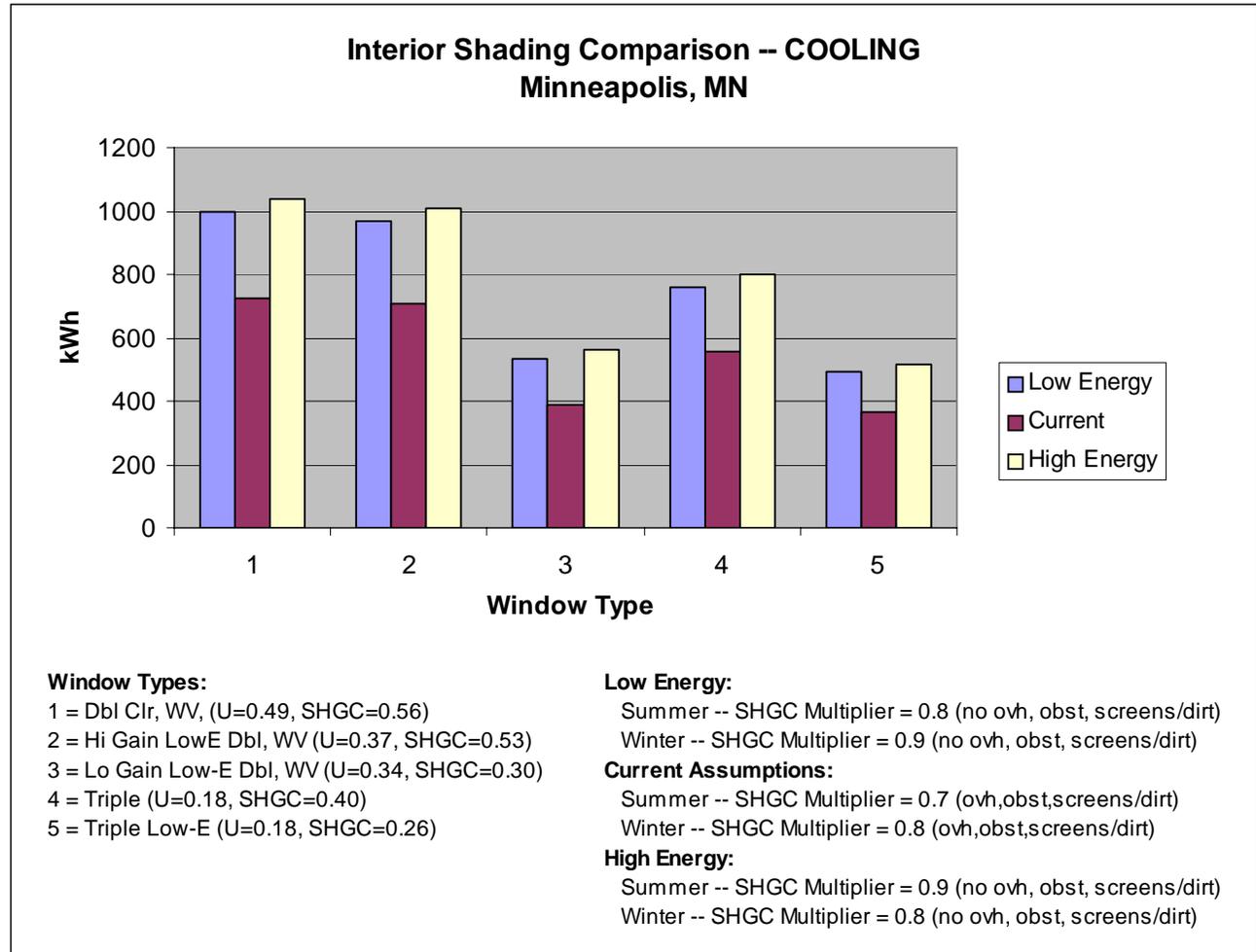


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AEP Modeling IntShade only



Minneapolis
Cooling



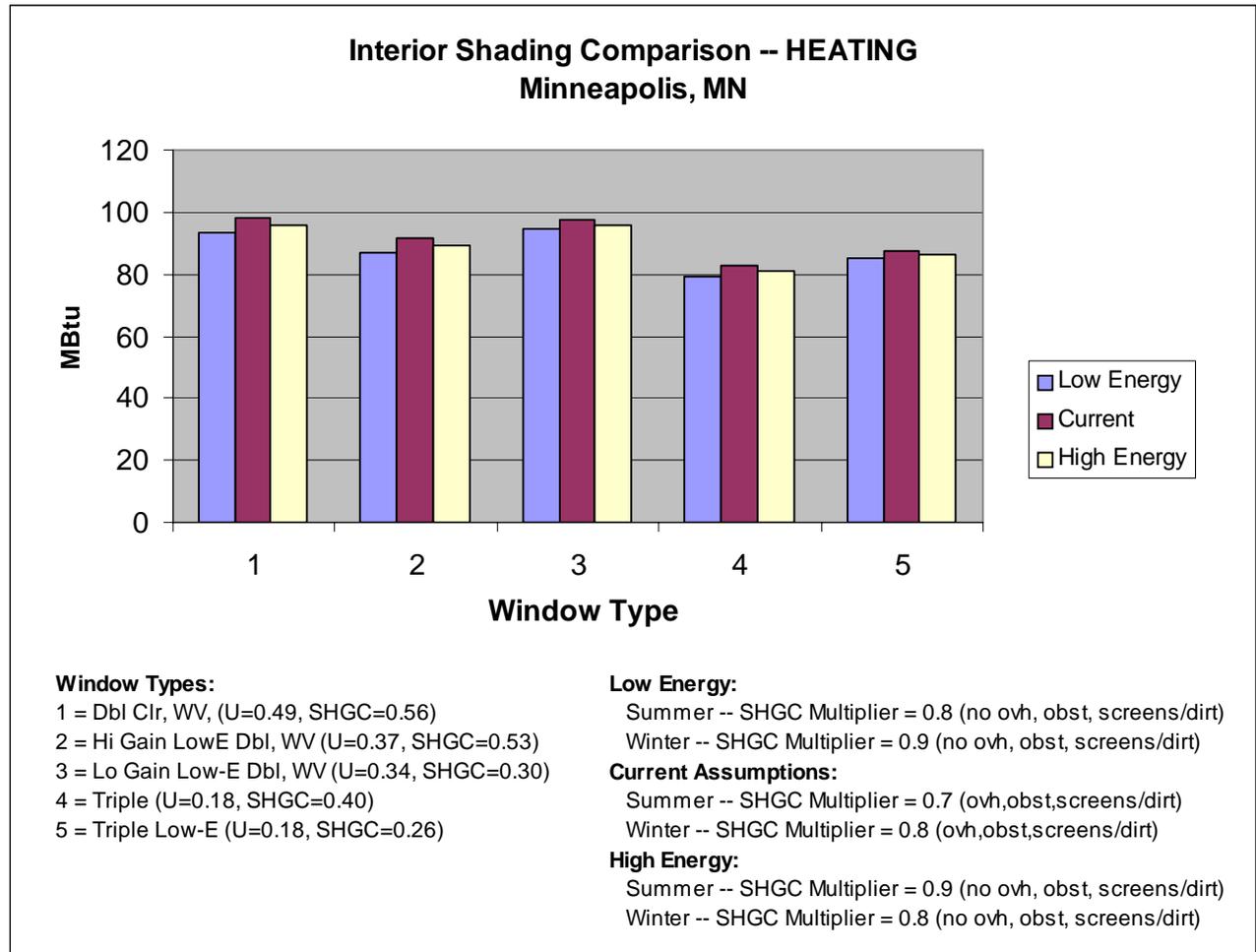
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Minneapolis

Heating

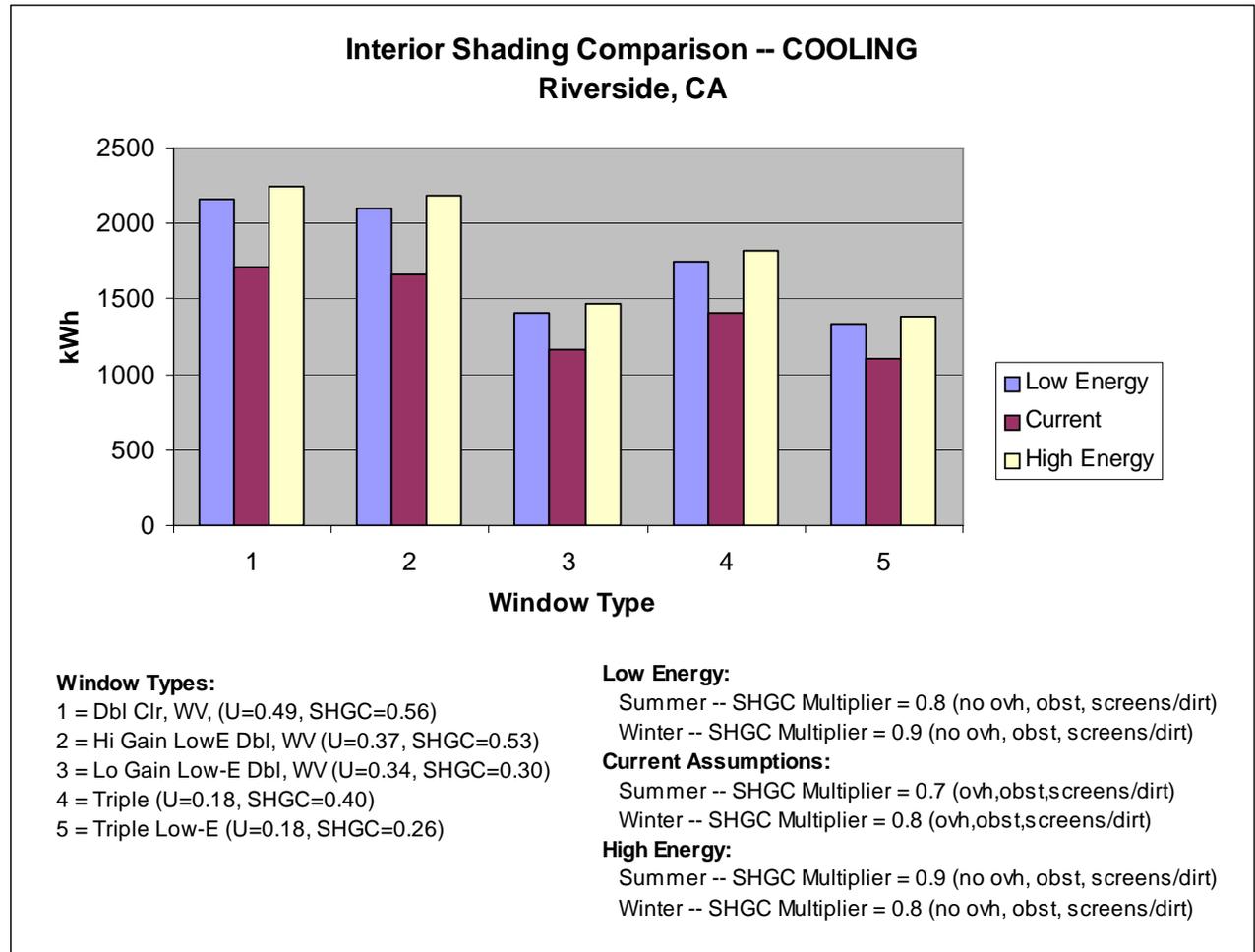


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Cooling

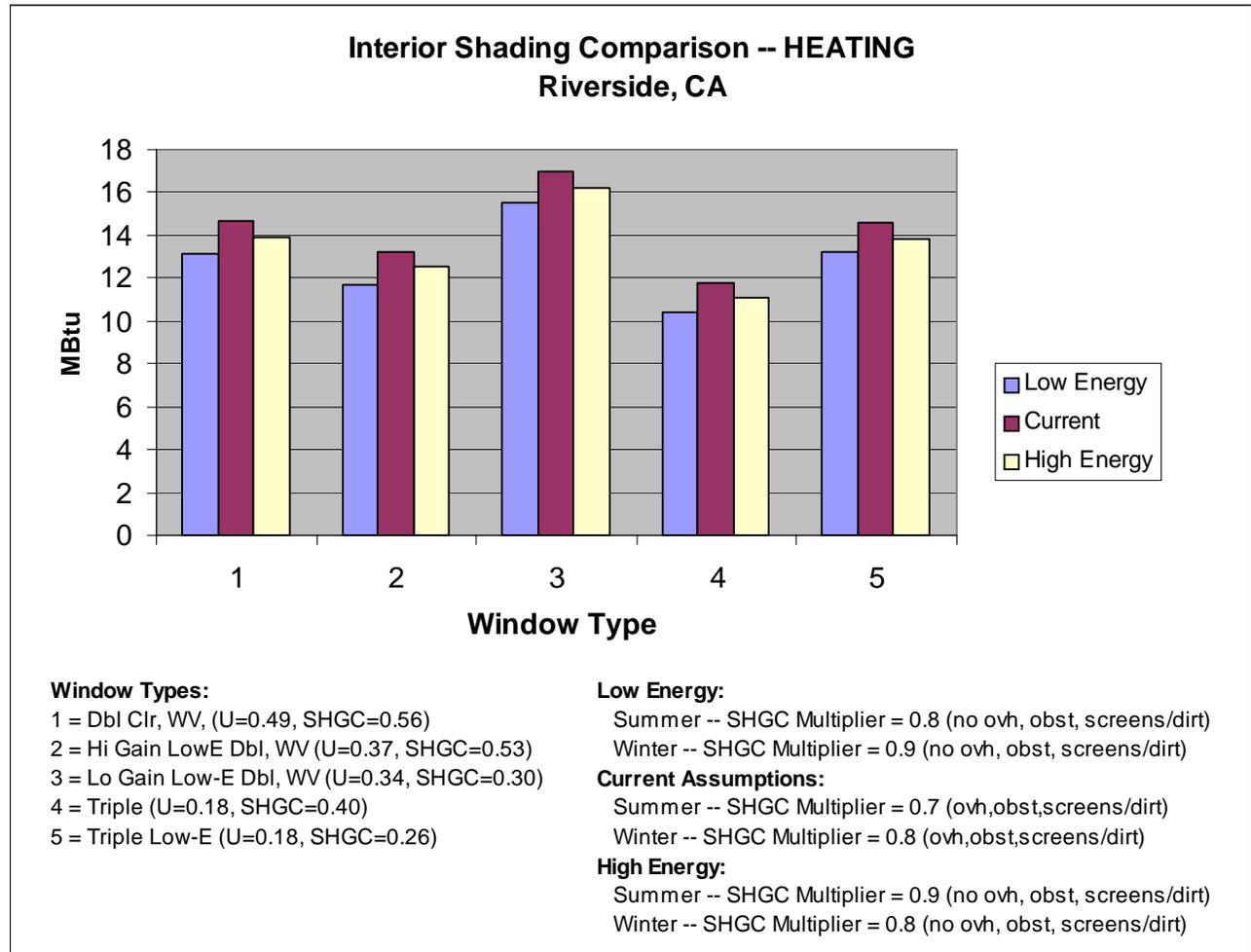


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Heating

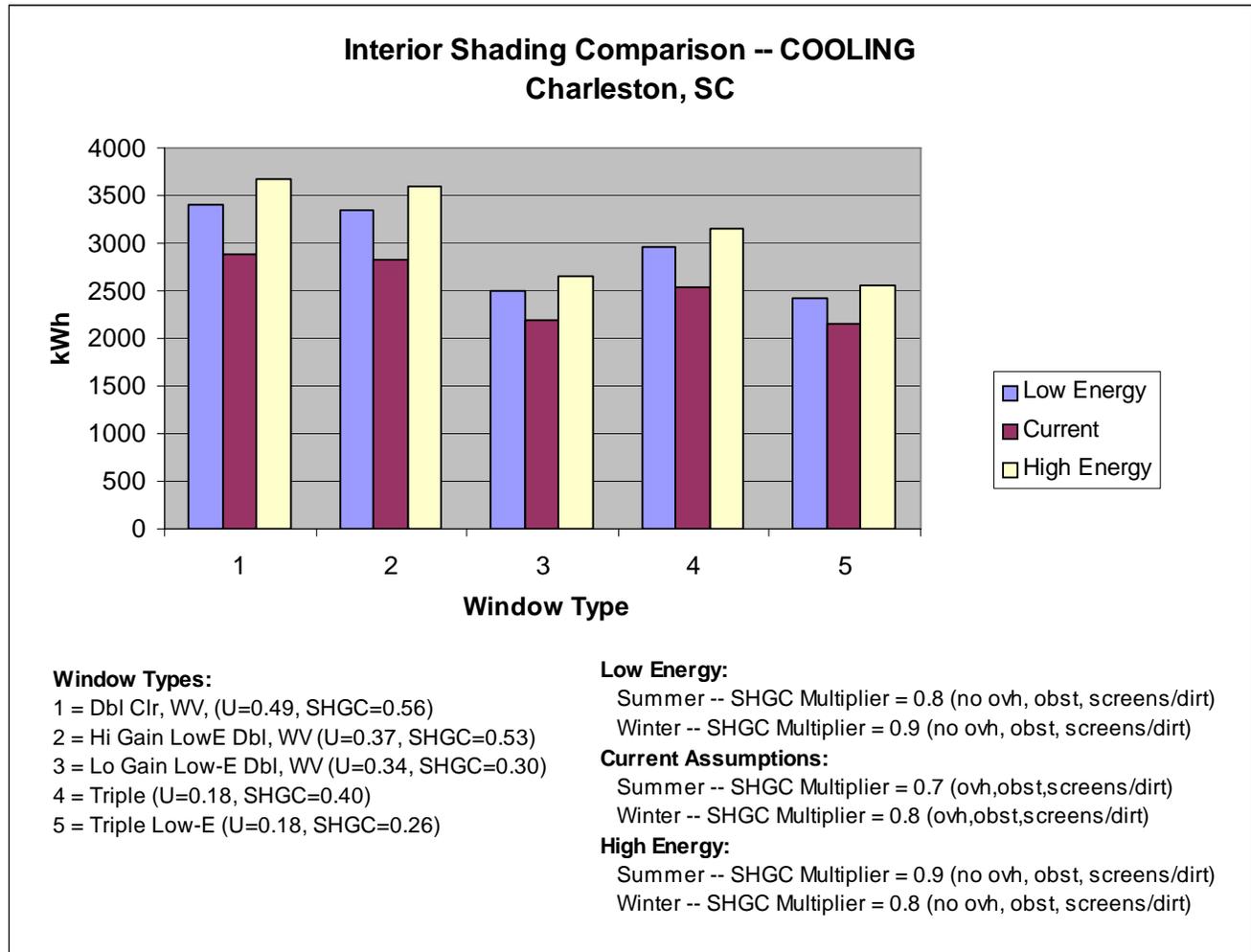


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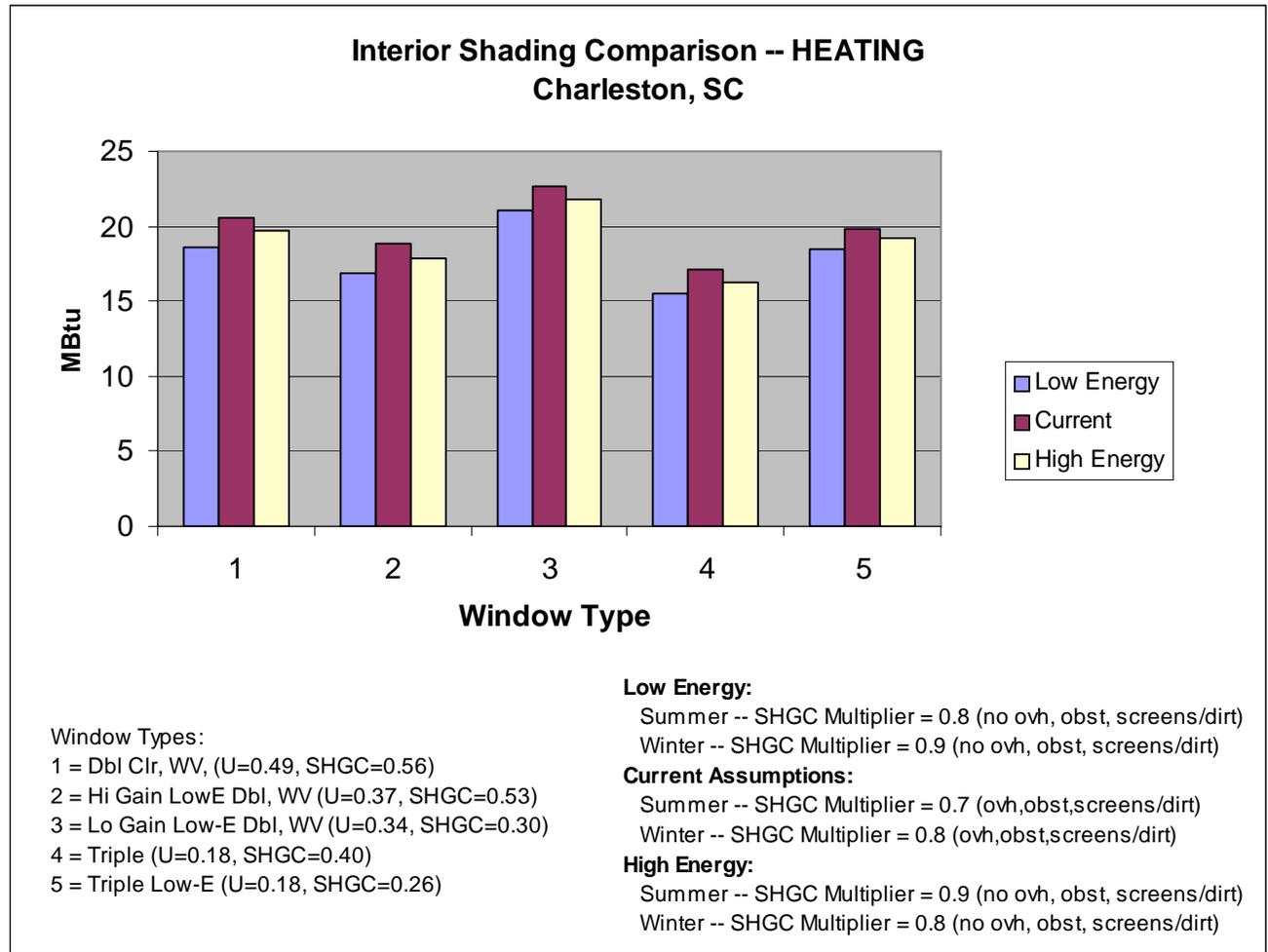


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Heating

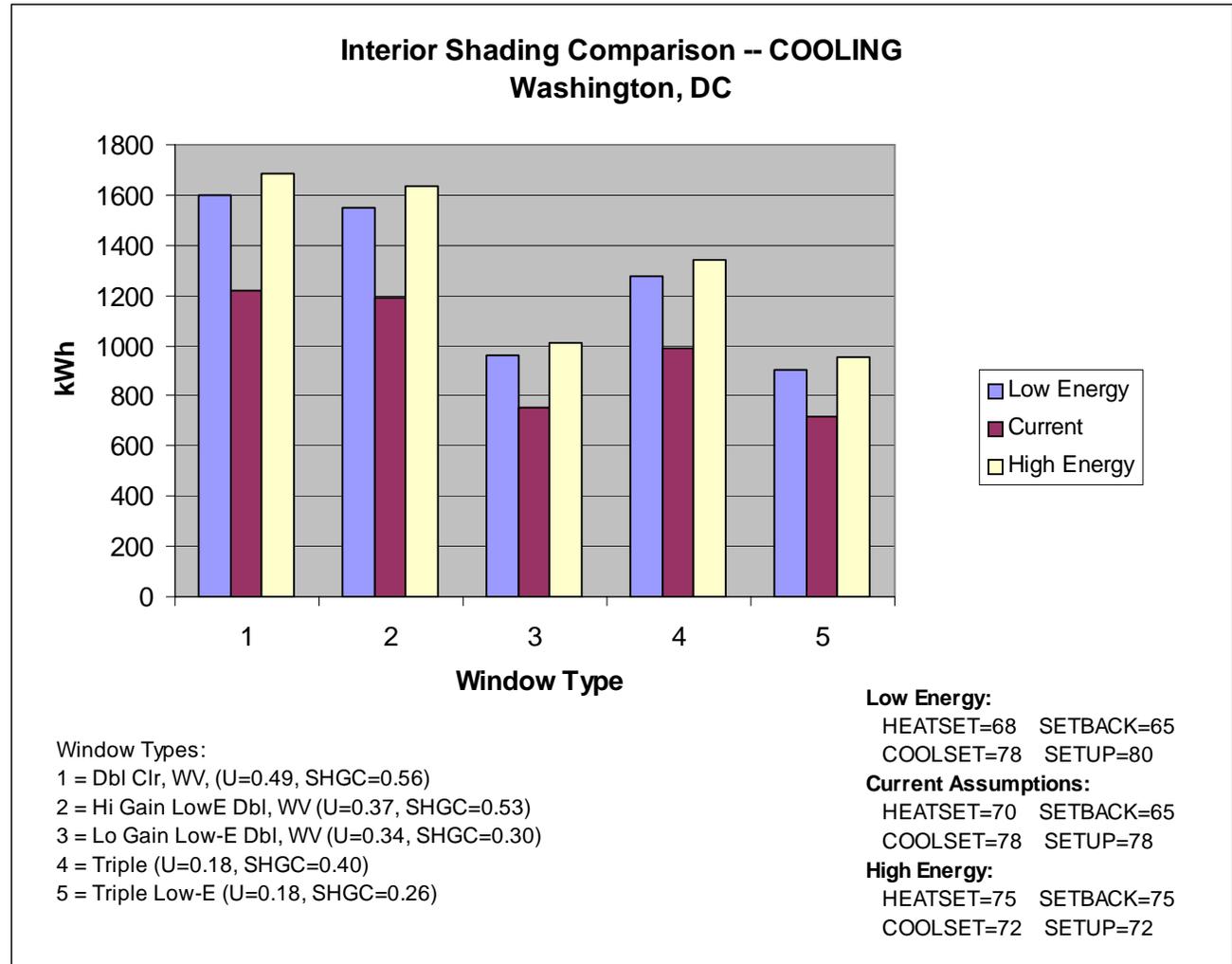


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Cooling



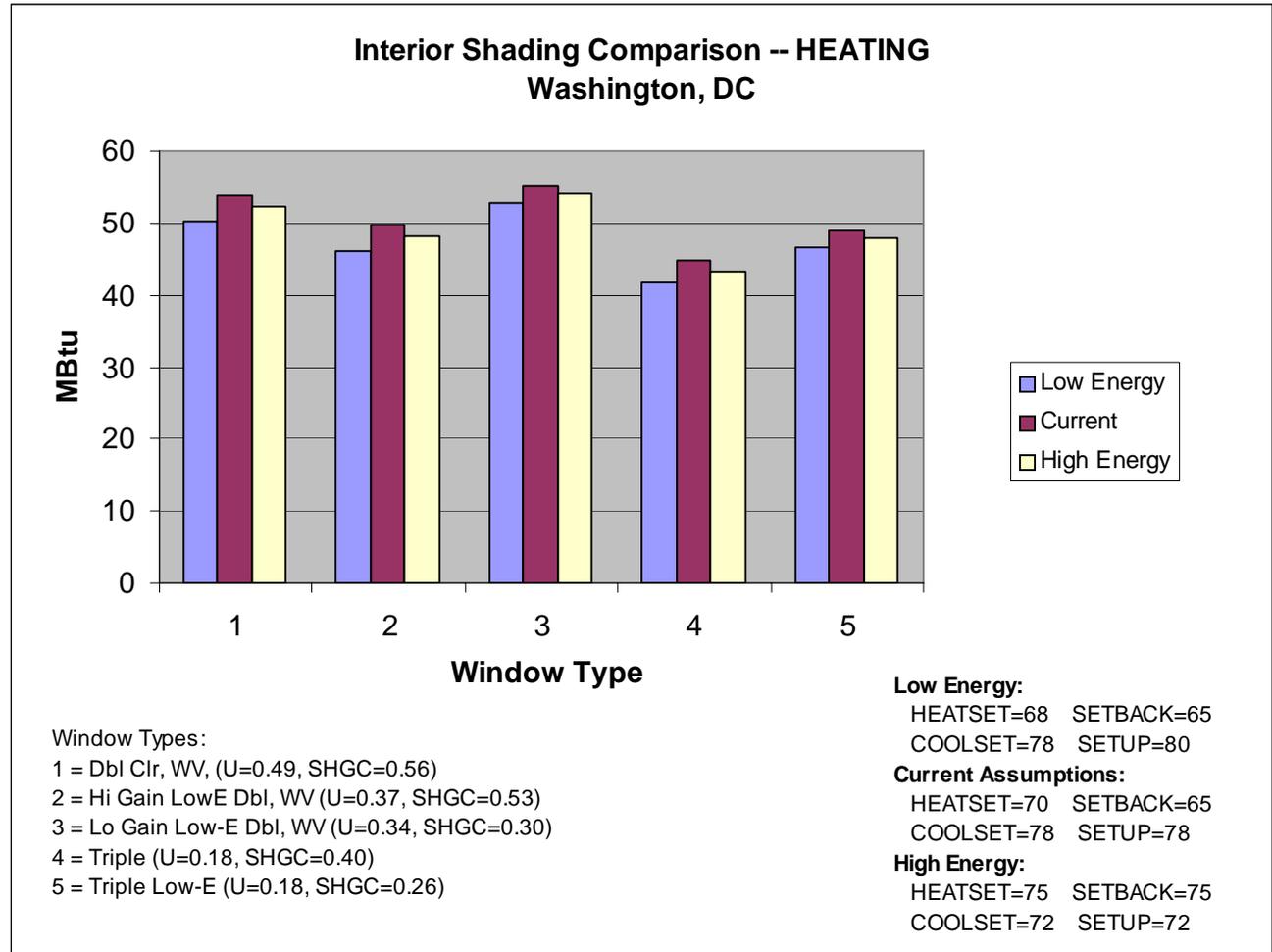
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