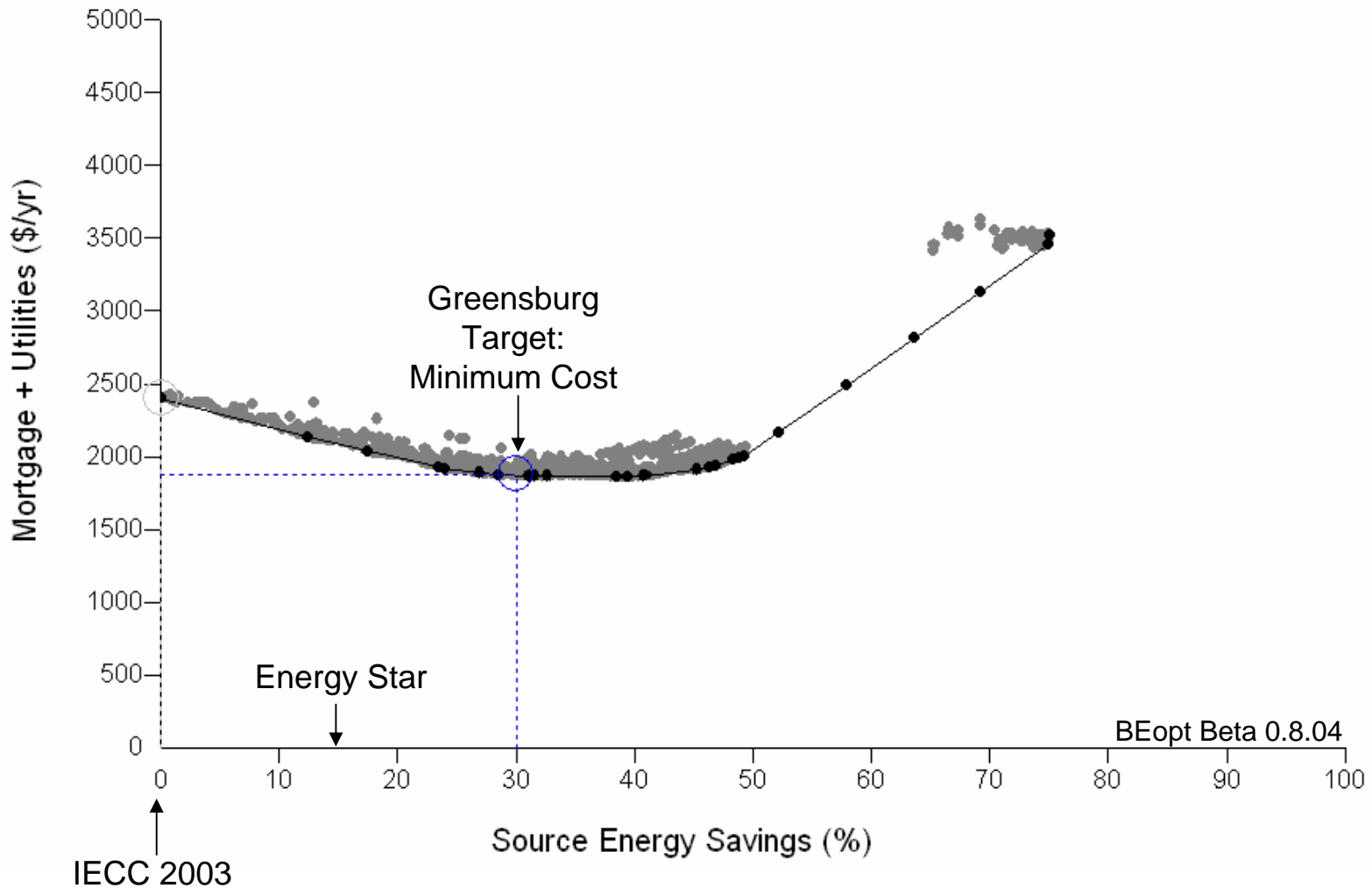


*Mixed Humid Climate Region*

# **Example Performance Targets and Efficiency Packages Greensburg, Kansas**

Dr. Ren Anderson, NREL

# 30% Savings Target: Greensburg



(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio), unconditioned basement

# Example: Greensburg 30% Efficiency Package<sup>1</sup>

- 2x6 + R-19 batts (R14 wall assembly)
- R40 ceiling assembly
- R10 basement
- .0002 SLA (4 ACH<sub>50</sub>)
- Low e/low SHGC glazing (0.3 U-value, 0.37 SHGC)
- 50% CFL Lighting
- SEER 14 AC
- AFUE 90+ furnace
- Premium gas hot water, EF 0.61
- Tight ducts (Mastic, 5% Leakage), R-8
- BA QA (moisture control, ...)

Estimated cost increase relative to standard home<sup>2,3</sup>: +\$1.25-\$2.00/ft<sup>2</sup>

## Notes:

1. Equivalent packages may be substituted, based on specific builder preferences
2. Does not include costs associated with builder/contractor training and changes in business practices.
3. Incremental costs evaluated relative to minimum IECC 2003

# Estimated Annual Cost Savings: 30% Energy Savings Target

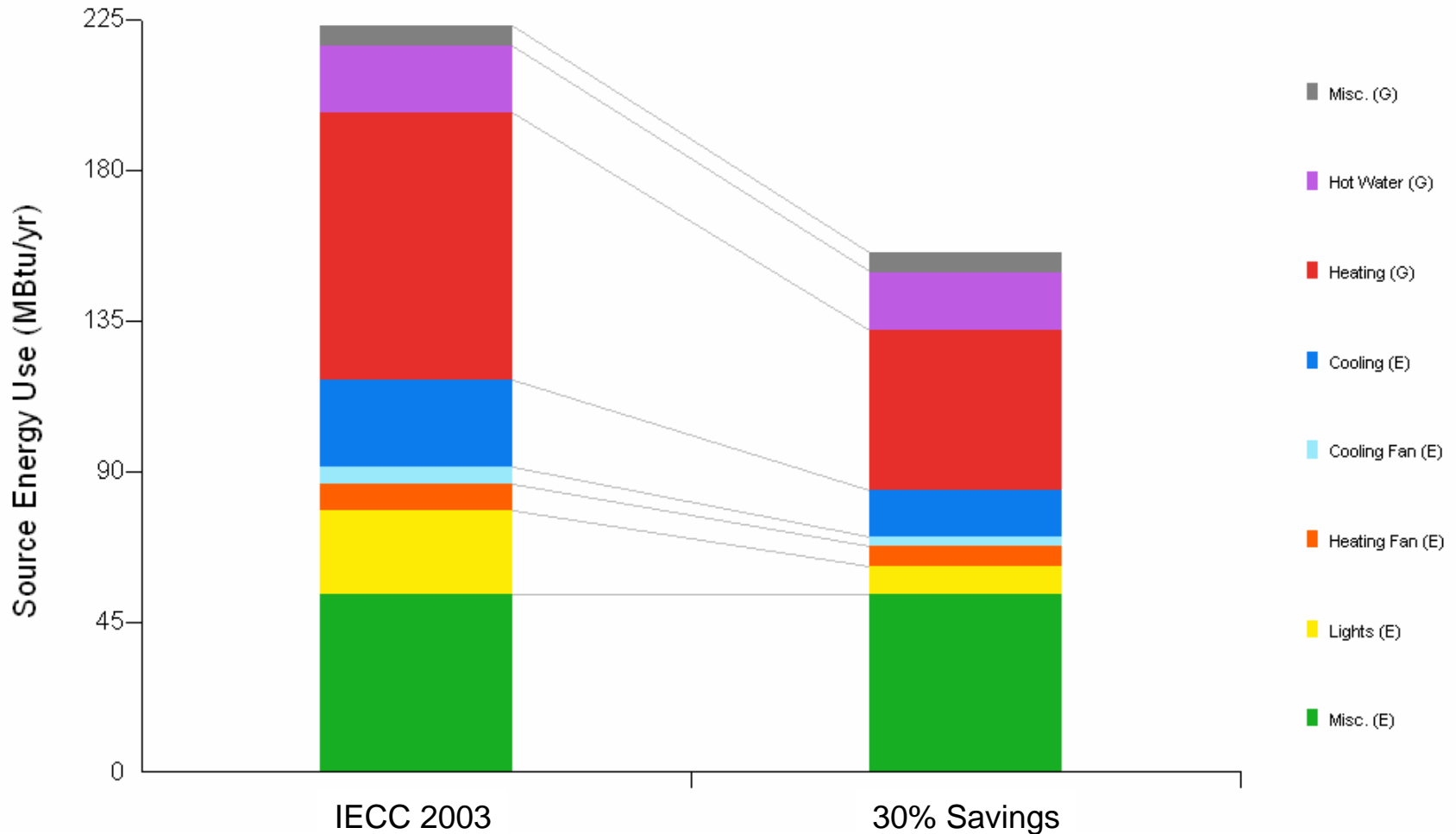
	Greensburg
Estimated Incremental First Cost Relative to Standard Practice <sup>1</sup>	\$4,000
Annual Amortized Cost 7%, 30Year mortgage <sup>2</sup>	\$211
Estimated Annual Utility Bill Savings	\$723
<b>Net Annual Savings</b>	<b>\$512</b>

(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio, unconditioned basement)

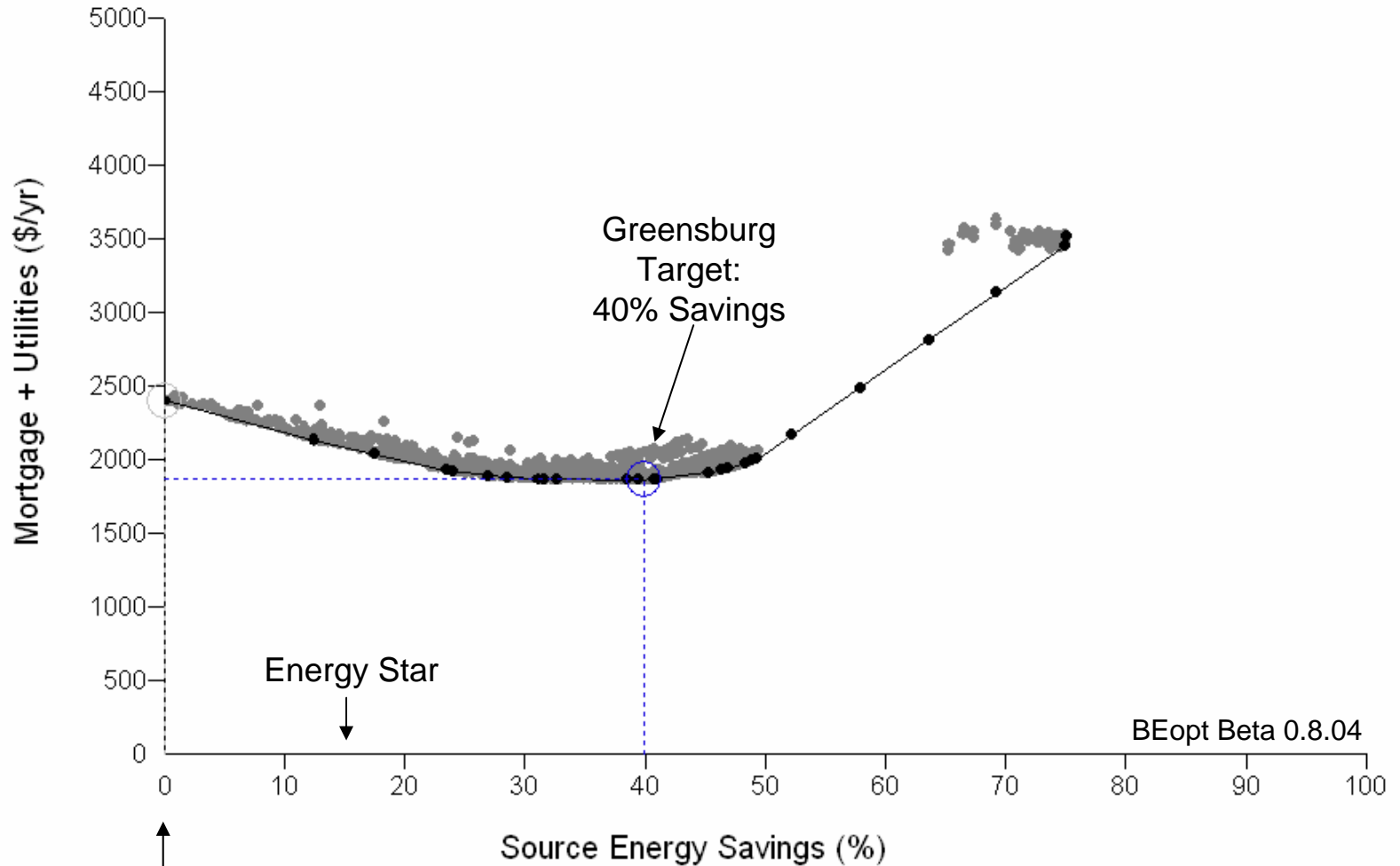
<sup>1</sup>Evaluated relative to minimum IECC 2003

<sup>2</sup> Assumes 28% marginal tax bracket and includes present value of future replacements of equipment over 30 year life of mortgage.

# Estimated Annual Energy Savings by End Use: 30% Target



# 40% Savings Target: Greensburg



IECC 2003  
(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio, unconditioned basement)

# Example: Greensburg 40% Efficiency Package<sup>1</sup>

- 2x6 + R-21 batts (R15 wall assembly)
- R50 ceiling assembly
- R10 basement
- .0002 SLA (4 ACH<sub>50</sub>)
- Low e/low SHGC glazing, Argon Fill (0.28 U-value, 0.37 SHGC)
- 80% CFL Lighting
- SEER 18 AC
- AFUE 90+ furnace
- Premium gas hot water, EF 0.61
- Tight ducts (Mastic, 5% Leakage), R-8
- BA QA (moisture control, ...)

Estimated cost increase relative to standard home<sup>2,3</sup>: +\$3.00-\$4.00/ft<sup>2</sup>

## Notes:

1. Equivalent packages may be substituted, based on specific builder preferences
2. Does not include costs associated with builder/contractor training and changes in business practices.
3. Incremental costs evaluated relative to minimum IECC 2003

# Estimated Annual Costs: 40% Efficiency Target

	Greensburg
Estimated Incremental First Cost Relative to Standard Practice <sup>1,2</sup>	\$7,000
Annual Amortized Cost 7%, 30 Year mortgage <sup>3</sup>	\$411
Annual Utility Bill Savings	\$919
<b>Net Annual Savings</b>	<b>\$508</b>

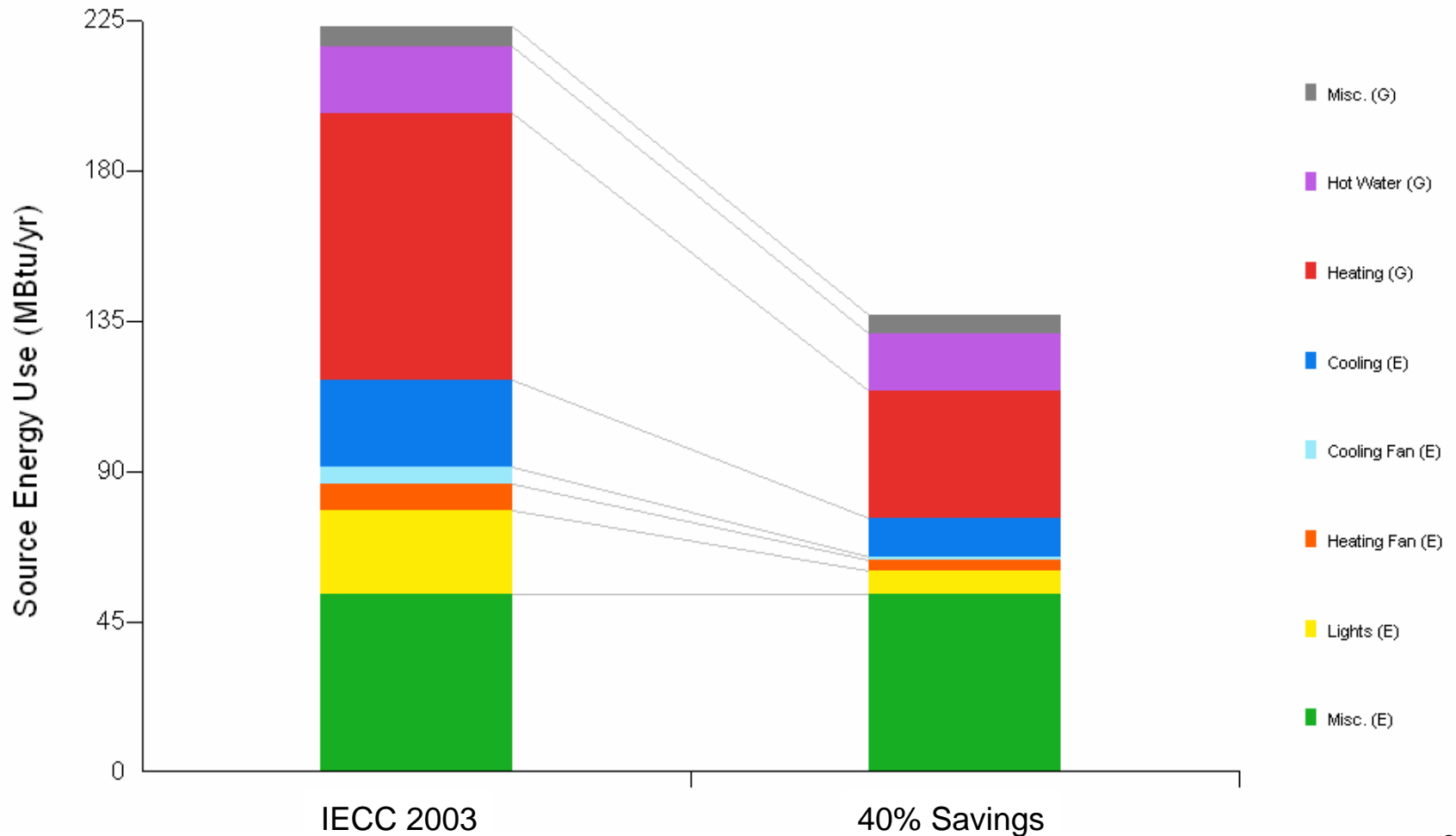
(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio), unconditioned basement

<sup>1</sup>Evaluated relative to minimum IECC 2003. Cost does not include impact of \$2000 tax credit.

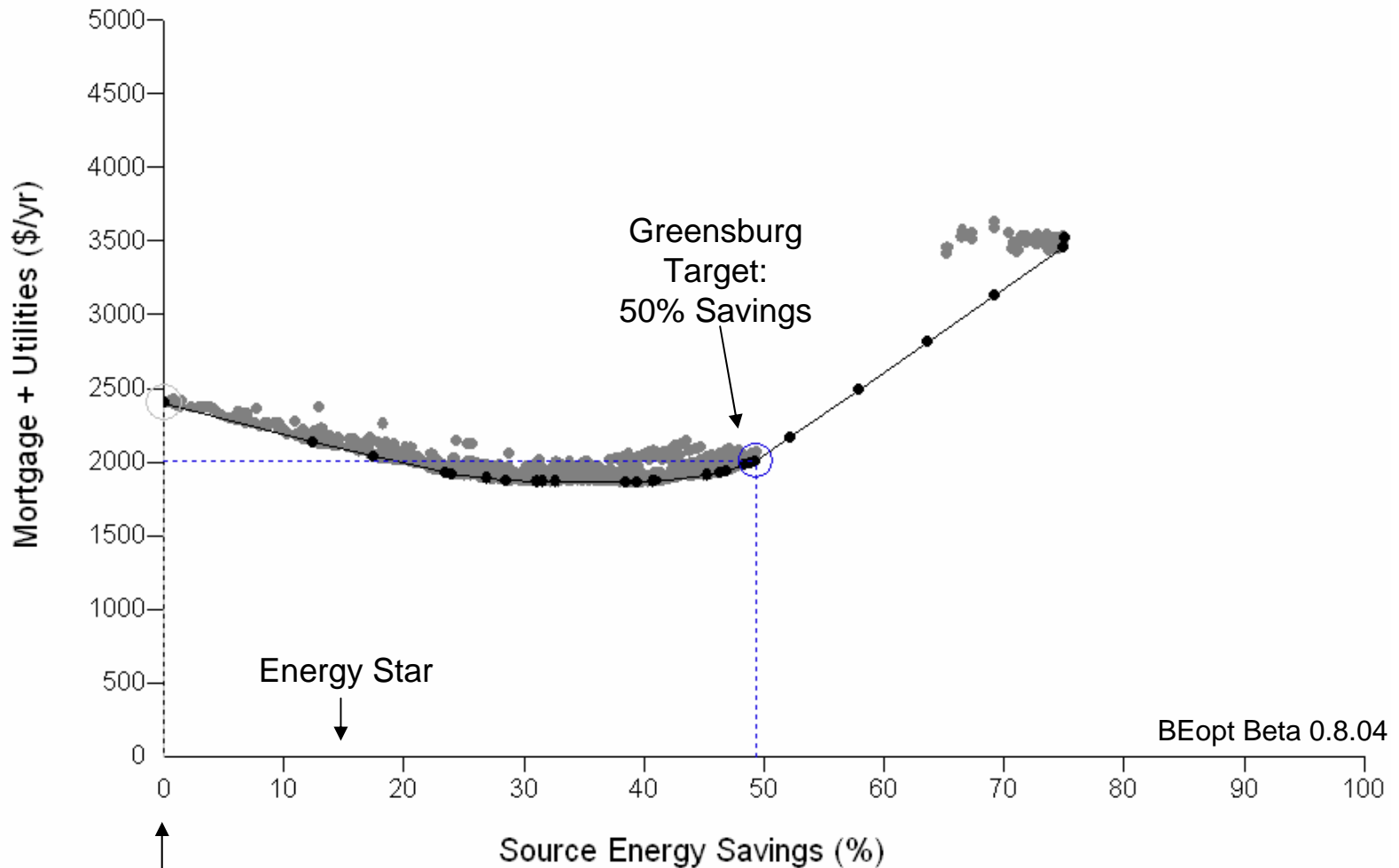
<sup>2</sup>Qualifies for federal new home tax credit

<sup>3</sup> Assumes 28% marginal tax bracket and includes present value of future replacements of equipment over 30 year life of mortgage.

# Estimated Annual Energy Savings by End Use: 40% Target



# 50% Savings Target: Greensburg



IECC 2003  
(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio, unconditioned basement)

# Example: Greensburg 50% Efficiency Package<sup>1</sup>

- 2x6 + R-19 batts+ foam sheathing (R22 wall assembly)
- R50 ceiling assembly
- R10 basement
- .0001 SLA (2 ACH<sub>50</sub>)
- Low e/low SHGC glazing, Argon Fill (0.28 U-value, 0.37 SHGC)
- 80% CFL Lighting
- SEER 18 AC
- AFUE 90+ furnace
- Gas tankless hot water, EF 0.8+
- Tight ducts (Mastic, 5% Leakage), in conditioned space
- Energy Star Appliances
- BA QA (moisture control, ...)

Estimated cost increase relative to standard home<sup>2,3</sup>: +\$6.00-\$8.00/ft<sup>2</sup>

## Notes:

1. Equivalent packages may be substituted, based on specific builder preferences
2. Does not include costs associated with builder/contractor training and changes in business practices.
3. Incremental costs evaluated relative to minimum IECC 2003

# Estimated Annual Costs: 50% Efficiency Target

	Greensburg
Estimated Incremental First Cost Relative to Standard Practice <sup>1,2</sup>	\$13,000
Annual Amortized Cost 7%, 30Year mortgage <sup>3</sup>	\$706
Annual Utility Bill Savings	\$1162
<b>Net Annual Savings</b>	<b>\$456</b>

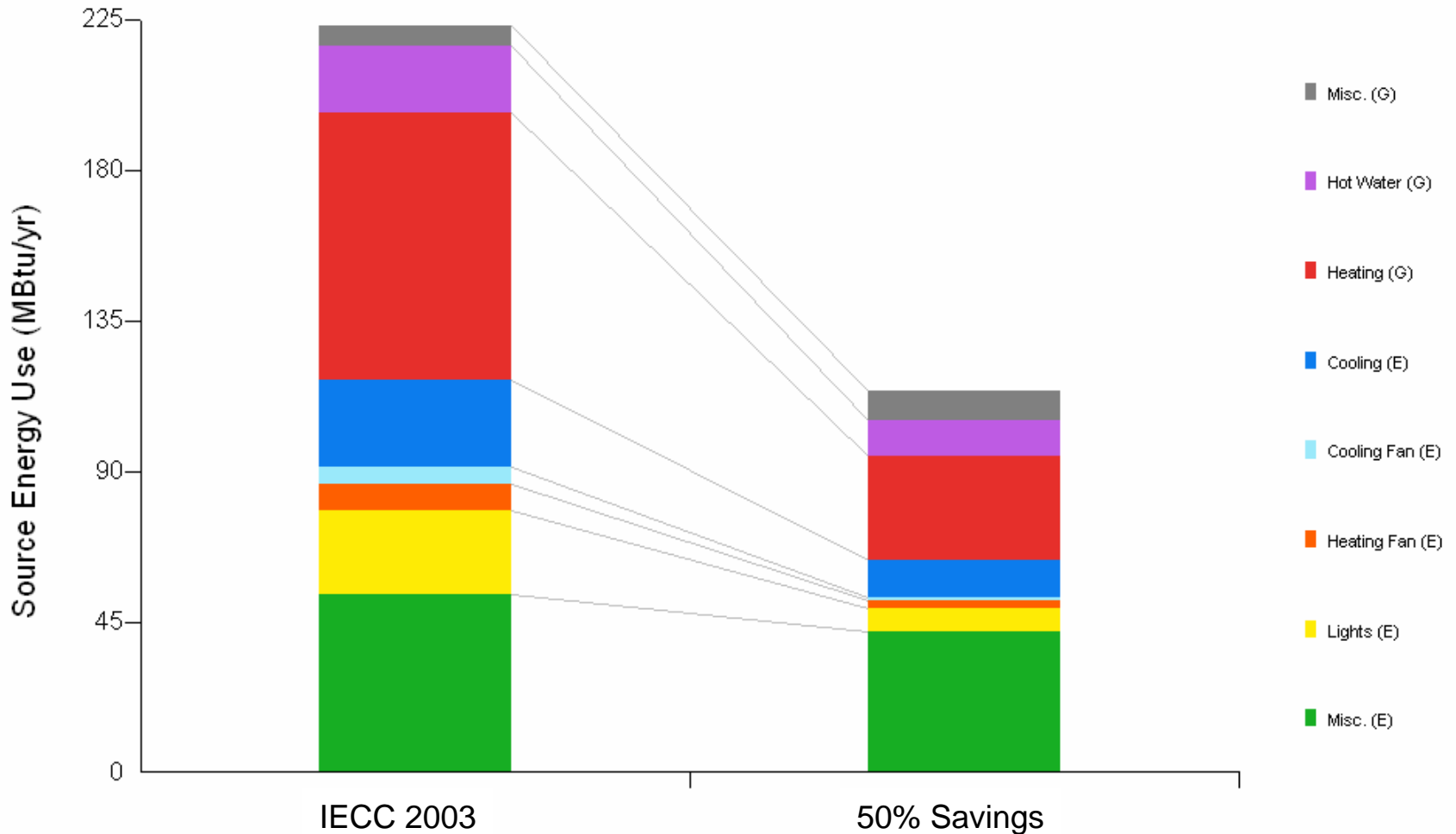
(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio), unconditioned basement

<sup>1</sup>Evaluated relative to minimum IECC 2003

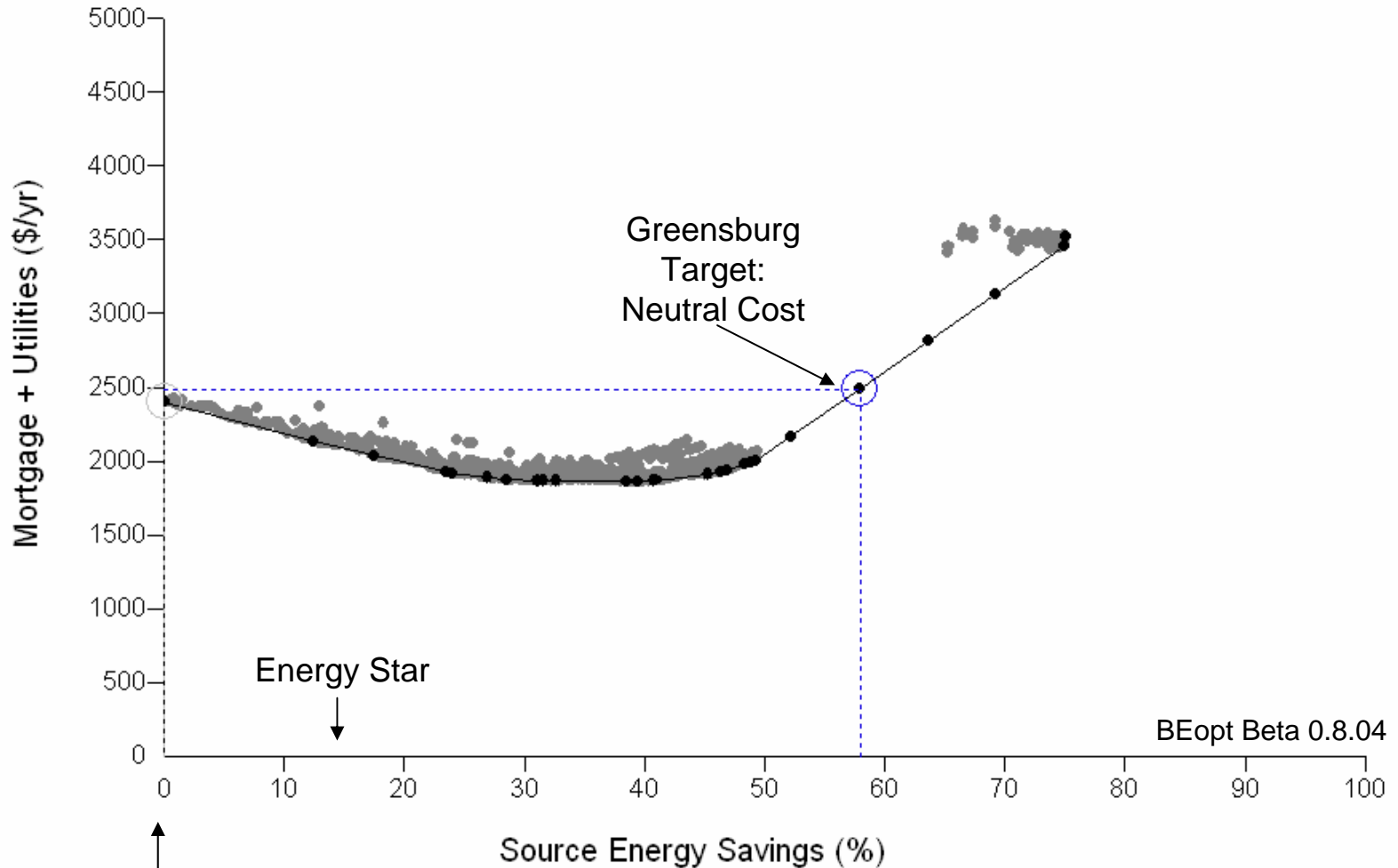
<sup>2</sup>Qualifies for federal new home tax credit

<sup>3</sup> Assumes 28% marginal tax bracket and includes present value of future replacements of equipment over 30 year life of mortgage. 12

# Estimated Annual Energy Savings by End Use: 50% Target



# Neutral Cost Point: Greensburg



IECC 2003  
(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio, unconditioned basement)

# Example: Greensburg Neutral Cost Package<sup>1</sup>

- R22 wall assembly (2x6 + R-19 batts+ foam sheathing)
- R50 ceiling assembly
- R10 basement
- .0001 SLA (2 ACH<sub>50</sub>)
- Low e/low SHGC glazing, Argon Fill (0.28 U-value, 0.37 SHGC)
- 80% CFL Lighting
- SEER 18 AC
- AFUE 90+ furnace
- Gas tankless hot water, EF 0.8+
- Tight ducts (Mastic, 5% Leakage), in conditioned space
- Energy Star Appliances
- 1.5 kW<sub>DC</sub> PV System
- BA QA (moisture control, ...)

Estimated cost increase relative to standard home<sup>2,3</sup>: +\$10.00-\$13.00/ft<sup>2</sup>

Notes:

1. Equivalent packages may be substituted, based on specific builder preferences
2. Does not include costs associated with builder/contractor training and changes in business practices.
3. Incremental costs evaluated relative to minimum IECC 2003

# Estimated Annual Costs: Neutral Cost Target

	Greensburg
Estimated Incremental First Cost Relative to Standard Practice <sup>1,2</sup>	\$25,000
Annual Amortized Cost 7%, 30Year mortgage <sup>3</sup>	\$1386
Annual Utility Bill Savings	\$1386
<b>Net Annual Savings</b>	<b>\$0</b>

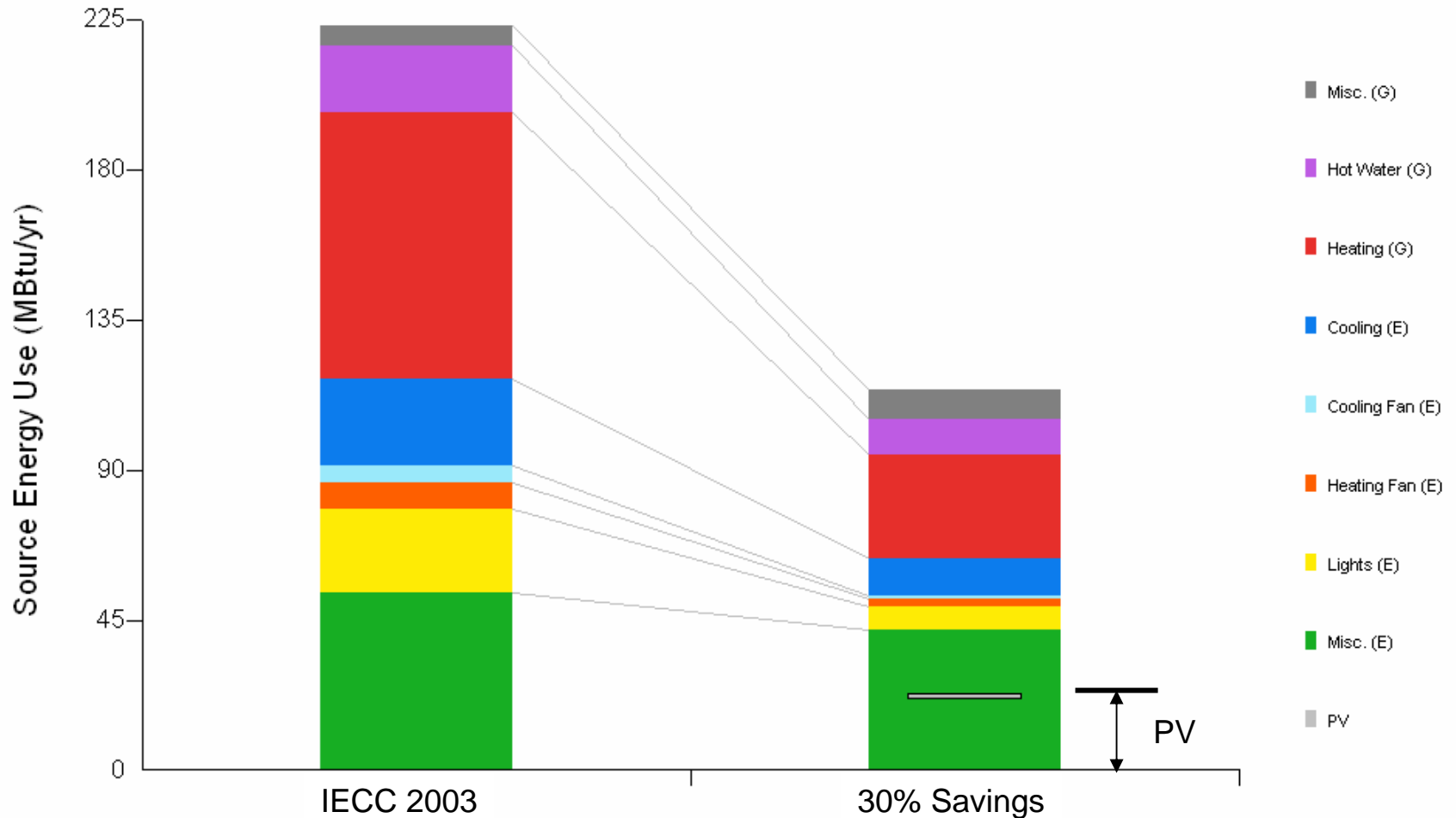
(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio), unconditioned basement

<sup>1</sup>Evaluated relative to minimum IECC 2003

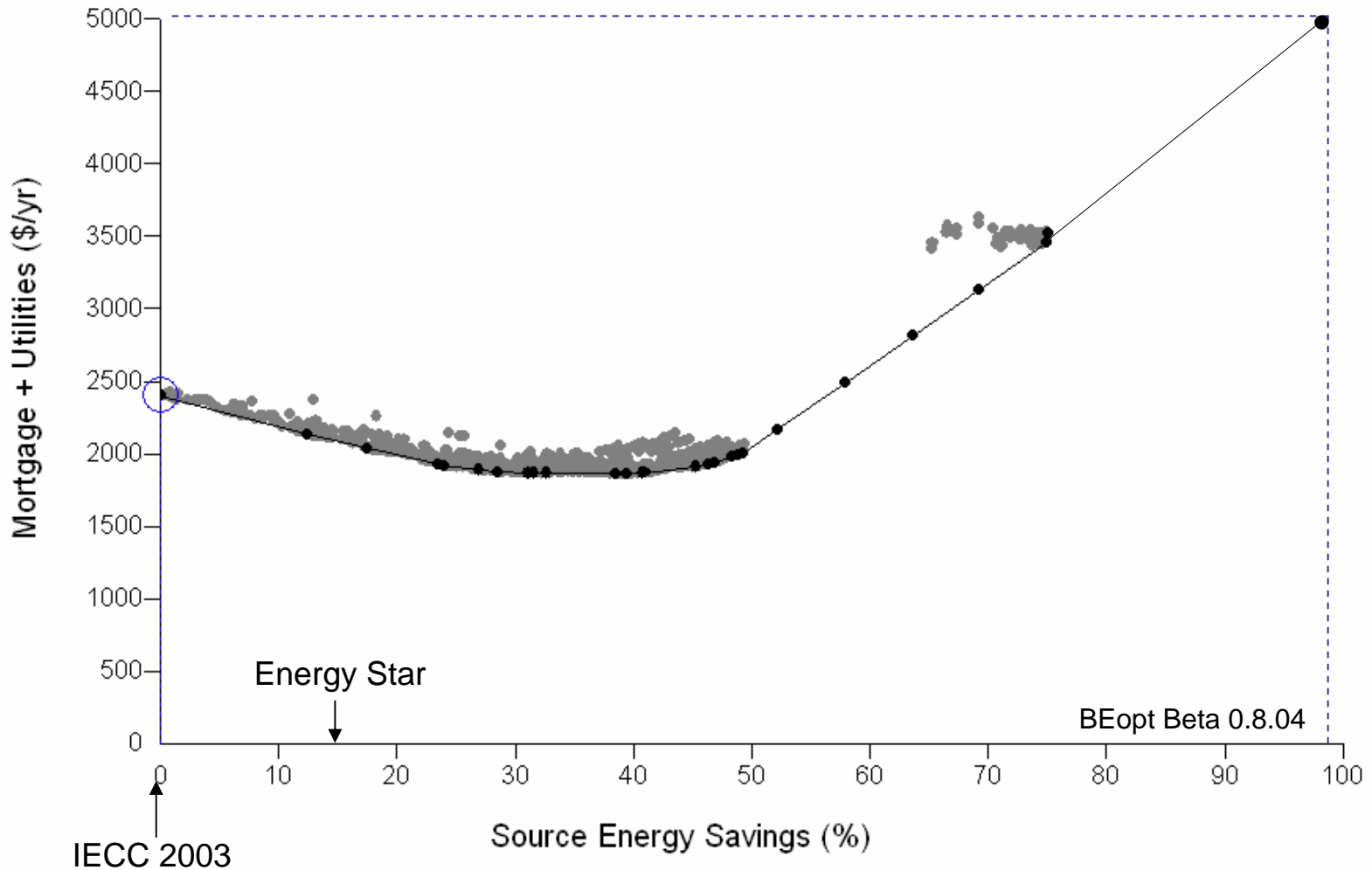
<sup>2</sup>Qualifies for federal new home tax credit

<sup>3</sup> Assumes 28% marginal tax bracket and includes present value of future replacements of equipment over 30 year life of mortgage. <sup>16</sup>

# Estimated Annual Energy Savings by End Use: Neutral Cost Target



# Net Zero Energy Target: Greensburg



(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio, unconditioned basement)

# Example: Greensburg NZEH Package<sup>1</sup>

- R22 wall assembly (2x6 + R-19 batts+ foam sheathing)
- R50 ceiling assembly
- R10 basement
- .0001 SLA (2 ACH<sub>50</sub>)
- Low e/low SHGC glazing, Argon Fill (0.28 U-value, 0.37 SHGC)
- 80% CFL Lighting
- SEER 18 AC
- AFUE 90+ furnace
- Gas tankless hot water, EF 0.8+
- Tight ducts (Mastic, 5% Leakage), in conditioned space
- Energy Star Appliances
- 7 kW<sub>DC</sub> PV System and solar hot water system
- BA QA (moisture control, ...)

Estimated cost increase relative to standard home<sup>2,3</sup>: +\$35.00-\$40.00/ft<sup>2</sup>

Notes:

1. Equivalent packages may be substituted, based on specific builder preferences
2. Does not include costs associated with builder/contractor training and changes in business practices.
3. Incremental costs evaluated relative to minimum IECC 2003

# Estimated Annual Costs: Net Zero Energy Target

	Greensburg
Estimated Incremental First Cost Relative to Standard Practice <sup>1,2</sup>	\$69,000
Annual Amortized Cost 7%, 30Year mortgage <sup>2</sup>	\$4102
Annual Utility Bill Savings	\$2306
<b>Net Annual Savings</b>	<b>-\$1796</b>

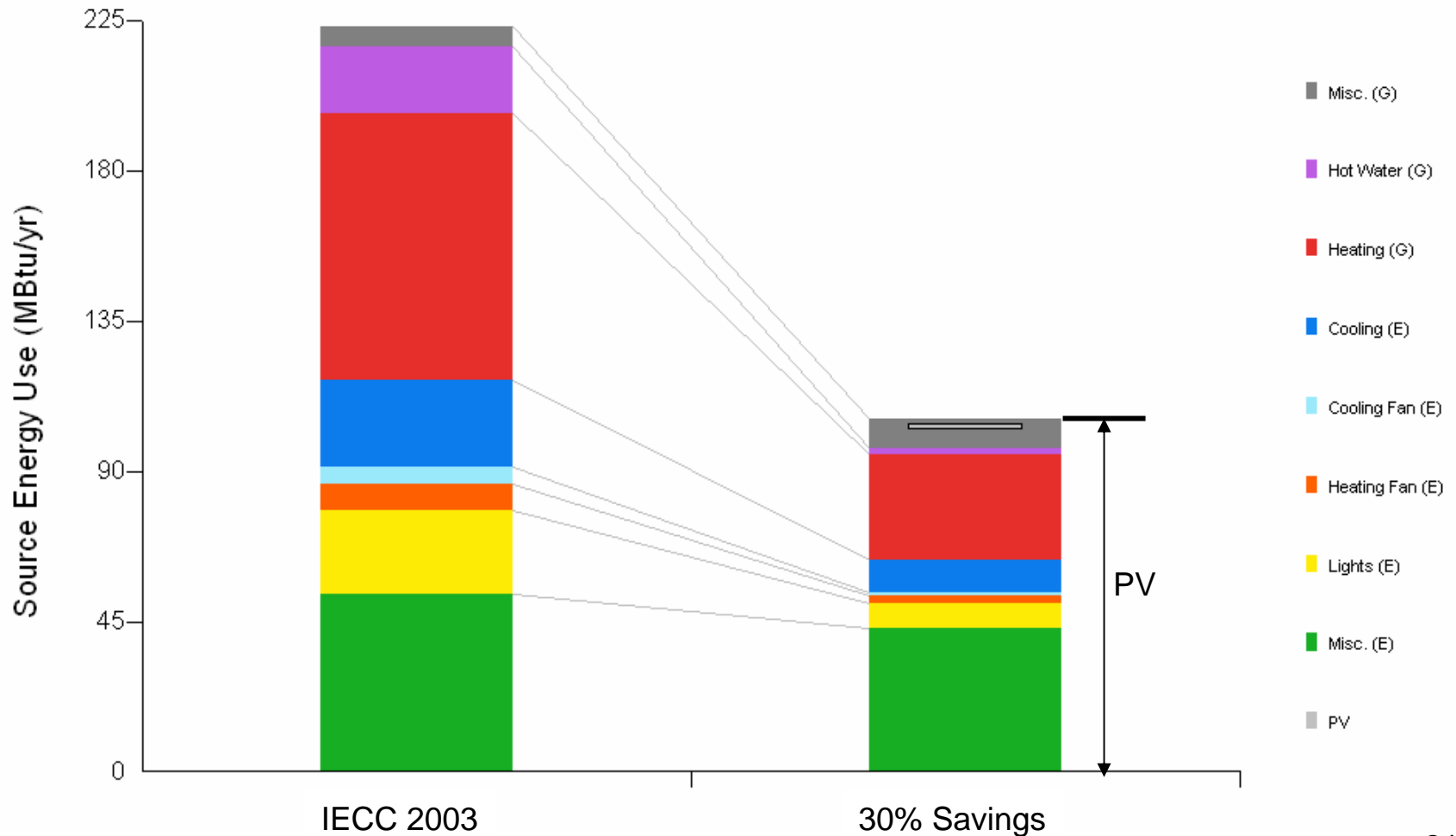
(2000 ft<sup>2</sup>, 2-story, 16% window to floor area ratio), unconditioned basement

<sup>1</sup>Evaluated relative to minimum IECC 2003

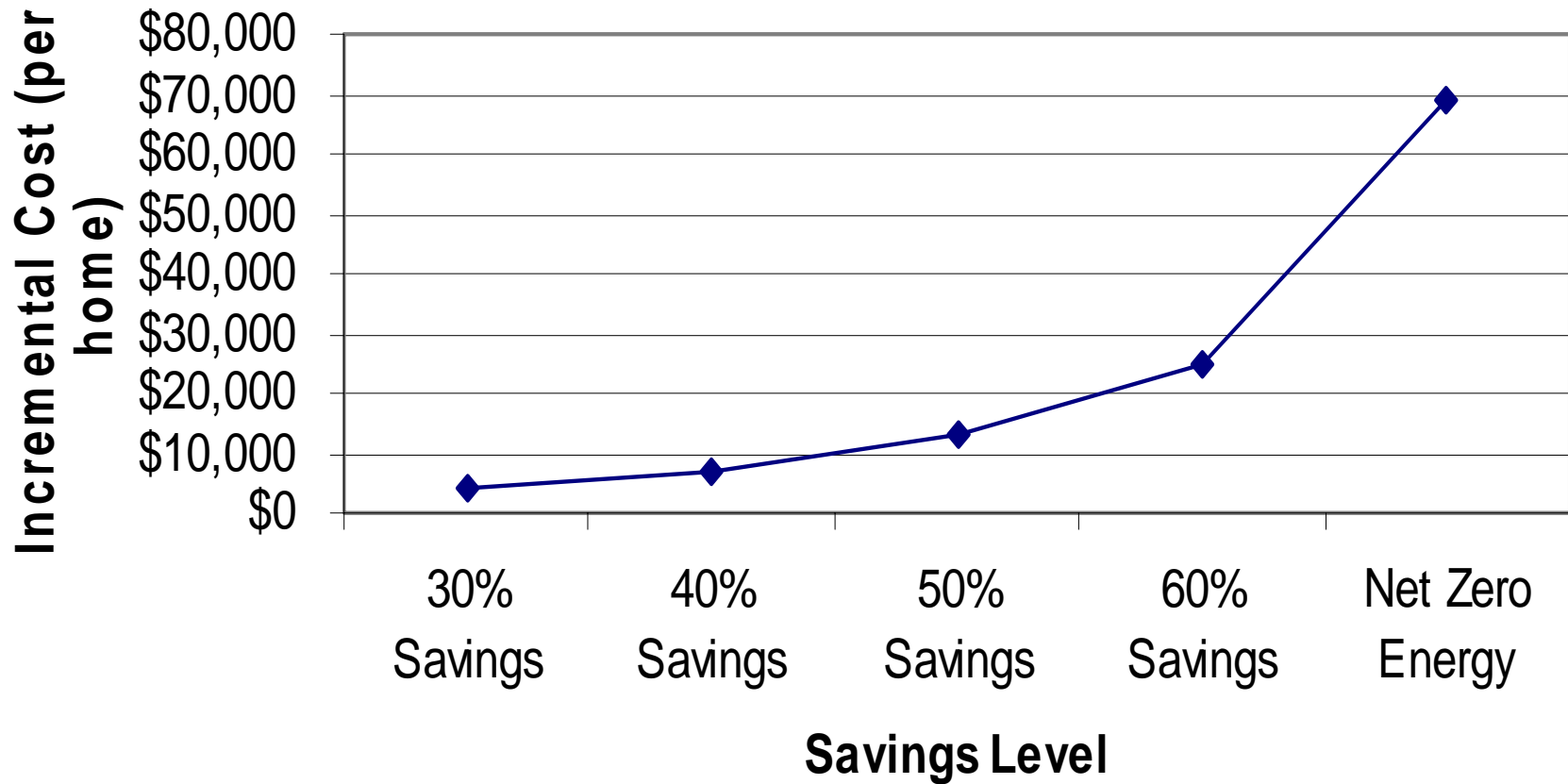
<sup>2</sup>Qualifies for federal new home tax credit

<sup>3</sup> Assumes 28% marginal tax bracket and includes present value of future replacements of equipment over 30 year life of mortgage.

# Estimated Annual Energy Savings by End Use: Net Zero Energy Target



## Cost of Energy Saving Upgrades



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