Model Conservation Standards

Comparative Consumer Economics for Electric and Gas Heated Homes

April 6, 2004

Northwest Power and Conservation Council

Review of Previous Findings

- Current MCS performance requirements are regionally cost-effective for electrically heated homes
- Current Codes do not capture all regionally cost-effective energy savings
- Current Codes do not capture all "economically feasible energy savings" – even without consideration of utility/Bonneville financial assistance
- It appears that more measures are "economically feasible" for consumers than are cost-effective for the region's power system

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Today's Results

- Presents Comparative Consumer Economics for New Single Family Homes heated with Electricity and Natural Gas
- Why?
  - Where natural gas is available, it is the dominant (90% plus) choice for heating new single family homes
  - Natural gas retail prices are lower than most retail electric rates (e.g. regional average retail gas rates are less than ½ regional average retail electric rates)
  - Council draft plan recommendations for State Energy Code improvements has potential implications for homes heated with natural gas

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Consumer Economic Feasibility Analysis

Life Cycle Cost Input Assumptions

- Mortgage Rate and Term
- Consumer Discount Rate
- Downpayment
- Private Mortgage Insurance (for less than 20% down)
- Retail Electricity Price and Escalation Rate
- State and Federal Income Tax Rate
- Property Tax Rate
- Homeowner's Insurance Rate
- Measure Incremental Cost
- Measure Incremental Savings

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Life Cycle Cost – "Probability" Model

- Problem
  - All of the major input assumptions are known to vary over a range, yet each new homebuyer will face unique combination of financial conditions
  - "Point estimates" for each assumption result in "Yes/No" answers, when the real conclusion is "sometimes OK, sometimes not so OK"
- Solution
  - Use distributions of input assumptions that represent the "probability" that a specific value for each input will occur to compute the likelihood that a specific level of efficiency is economically feasible

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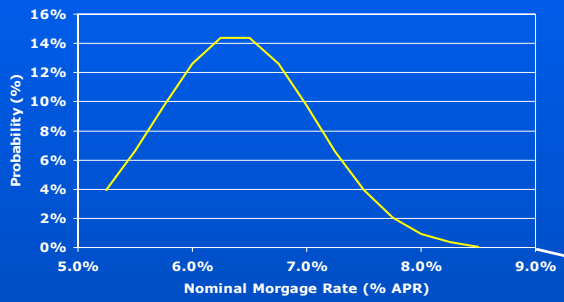
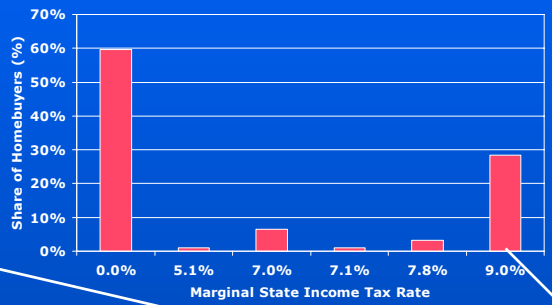
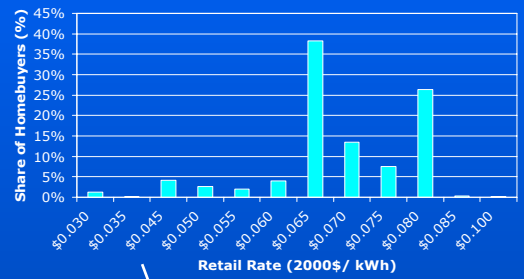
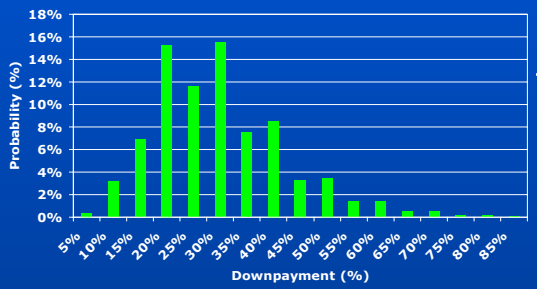
Consumer Life Cycle Cost Model

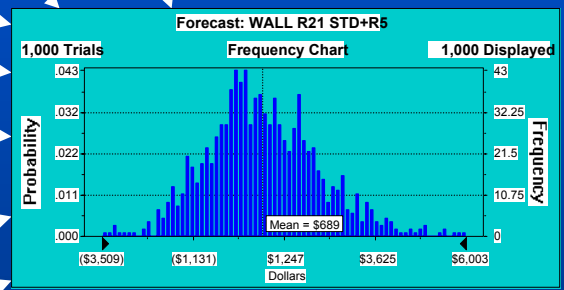


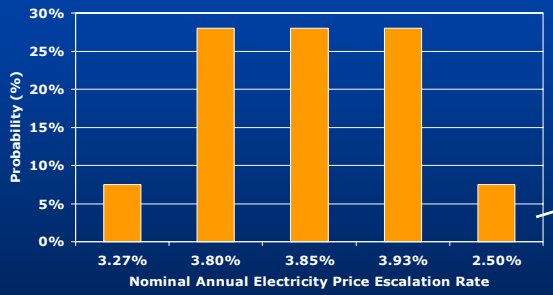


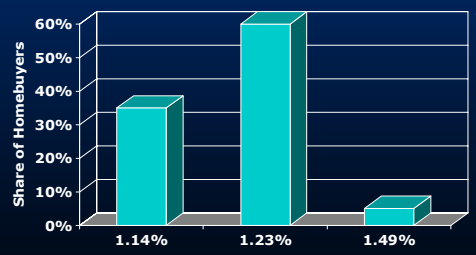


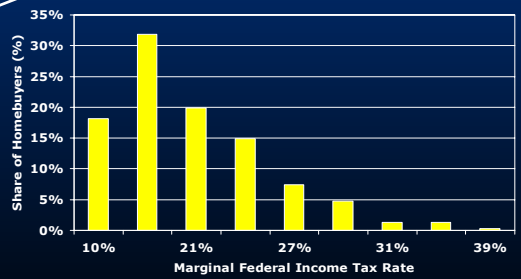


INPUT ASSUMPTIONS		
Measure Name	Savings (kwh/yr)	Capital Cost
WALL R21 ADV	995	$ 313
WINDOW CL35	729	$ 243
FLOOR R38 STD w/12"Trus	506	$ 686
ATTIC R49 ADVrh	369	$ 557
WINDOW CL30	720	$ 1,265
WINDOW CL25	714	$ 1,351
VAULT R38 HD	194	$ 414
WALL R21 STD+R5	681	$ 1,786
WALL 8" SSPANEL	751	$ 2,444
ATTIC R60 ADVrh	93	$ 320
WALL R33 DBL	82	$ 1,253
VAULT 10" SS Panel	26	$ 1,444









Economic Feasibility Results

- Computed ***net present value*** of principal, interest, taxes, insurance + energy (PITI+E) to home buyer of each measure, with measures added in "biggest bang for the buck" order
- Kept adding measures until there was a 50% probability that the home buyer's investment would result in a ***negative net present value***

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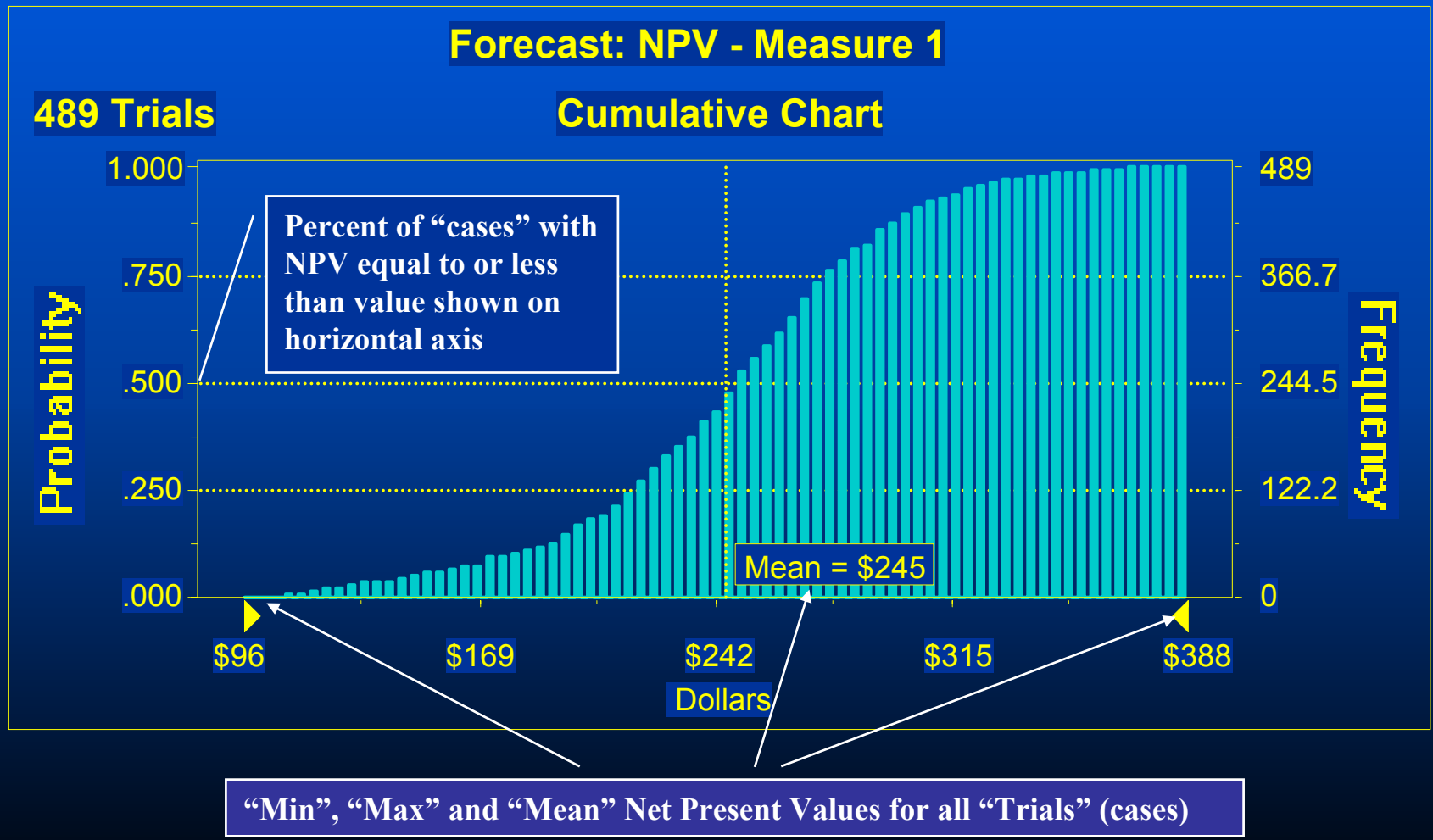
Interpreting Net Present Value Graphs

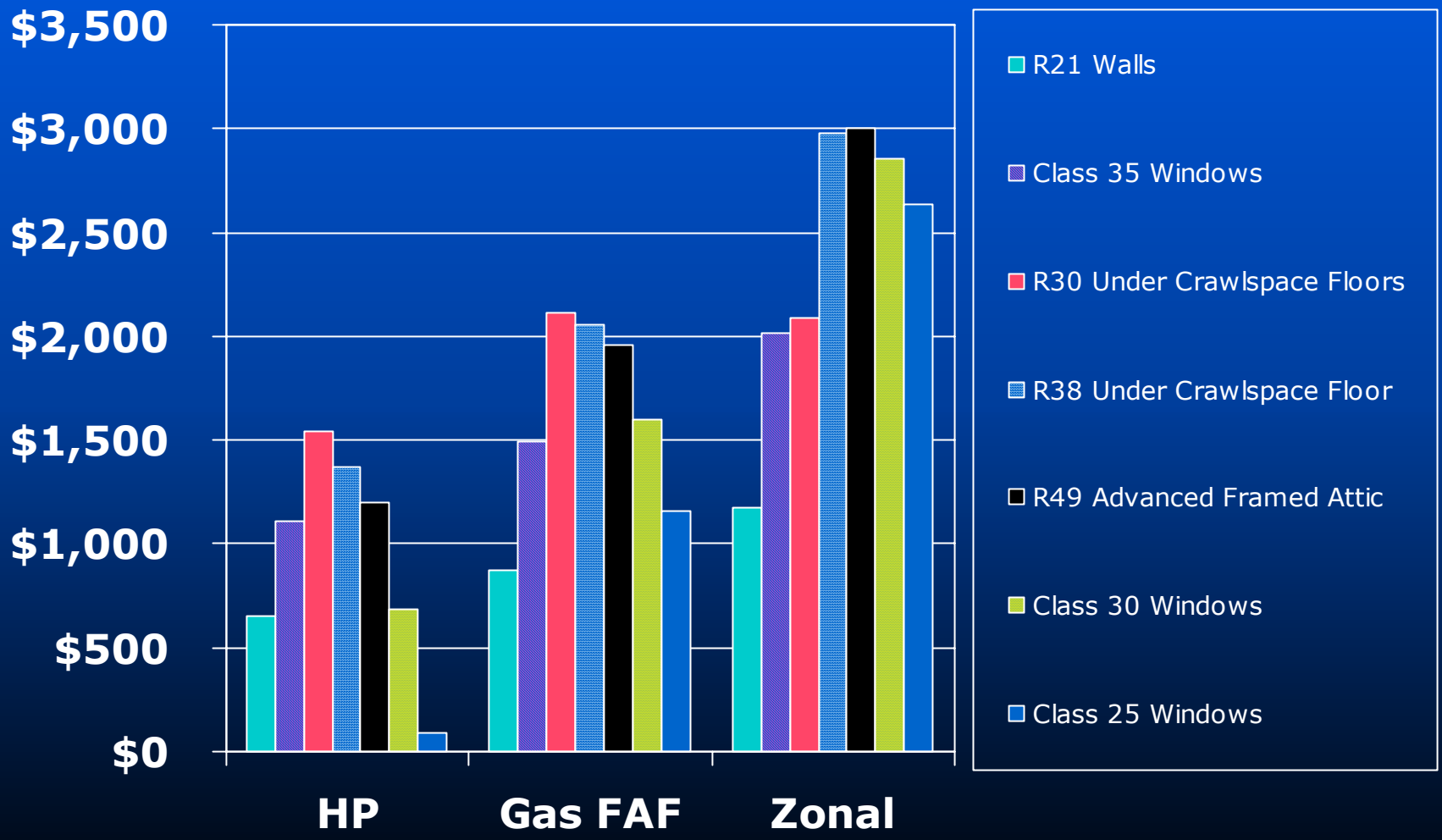


Mean Net Present Value for Zone 1 (1000 Cases)

Measure	HP	Gas FAF	Zonal
R21 Walls	$652	$873	$1176
Class 35 Windows	$1113	$1494	$2018
R30 Under Crawlspace Floors	$1546	$2117	$2092
R38 Under Crawlspace Floor	$1374	$2054	$2980
R49 Advanced Framed Attic	$1196	$1955	$3001
Class 30 Windows	$683	$1598	$2858
Class 25 Windows	$88	$1158	$2634
R26 Walls	-$117	$995	$2529
R30 Walls	-$1146	$114	$1854
R60 Advanced Framed Attic	-$2725	-$1302	$664

Maximum NPV = Lowest LCC

Mean Net Present Value by Measure
Zone 1

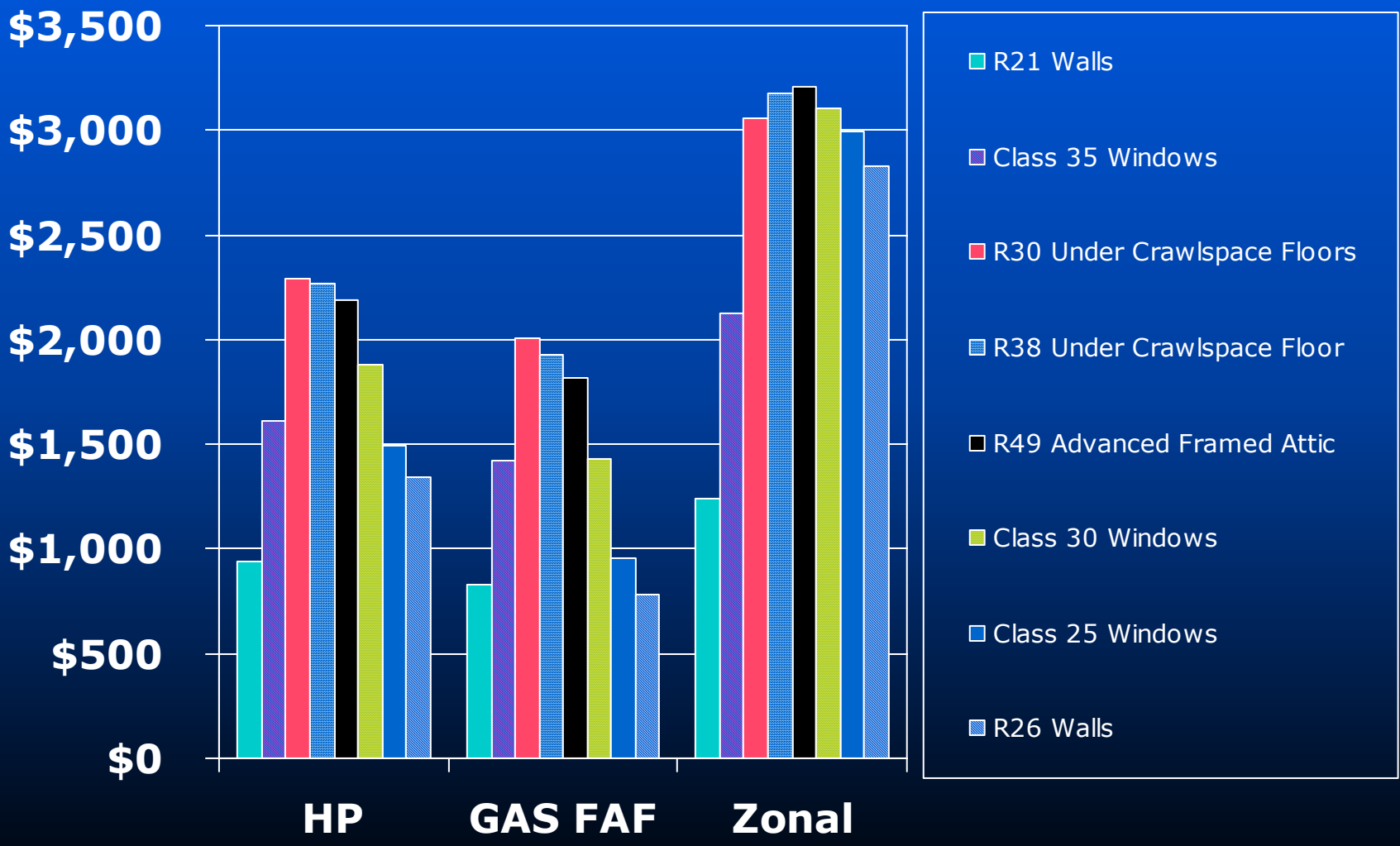


Mean Net Present Value for Zone 2 (1000 Cases)

Measure	HP	GAS FAF	Zonal
R21 Walls	$942	$832	$1237
Class 35 Windows	$1612	$1422	$2122
R30 Under Crawlspace Floors	$2294	$2010	$3057
R38 Under Crawlspace Floor	$2266	$1927	$3176
R49 Advanced Framed Attic	$2192	$1814	$3208
Class 30 Windows	$1882	$1427	$3107
Class 25 Windows	$1490	$957	$2992
R26 Walls	$1340	$786	$2829
R30 Walls	$504	-$123	$2191
R60 Advanced Framed Attic	-$862	-$1570	$1044

Maximum NPV = Lowest LCC

Mean Net Present Value by Measure
Zone 2

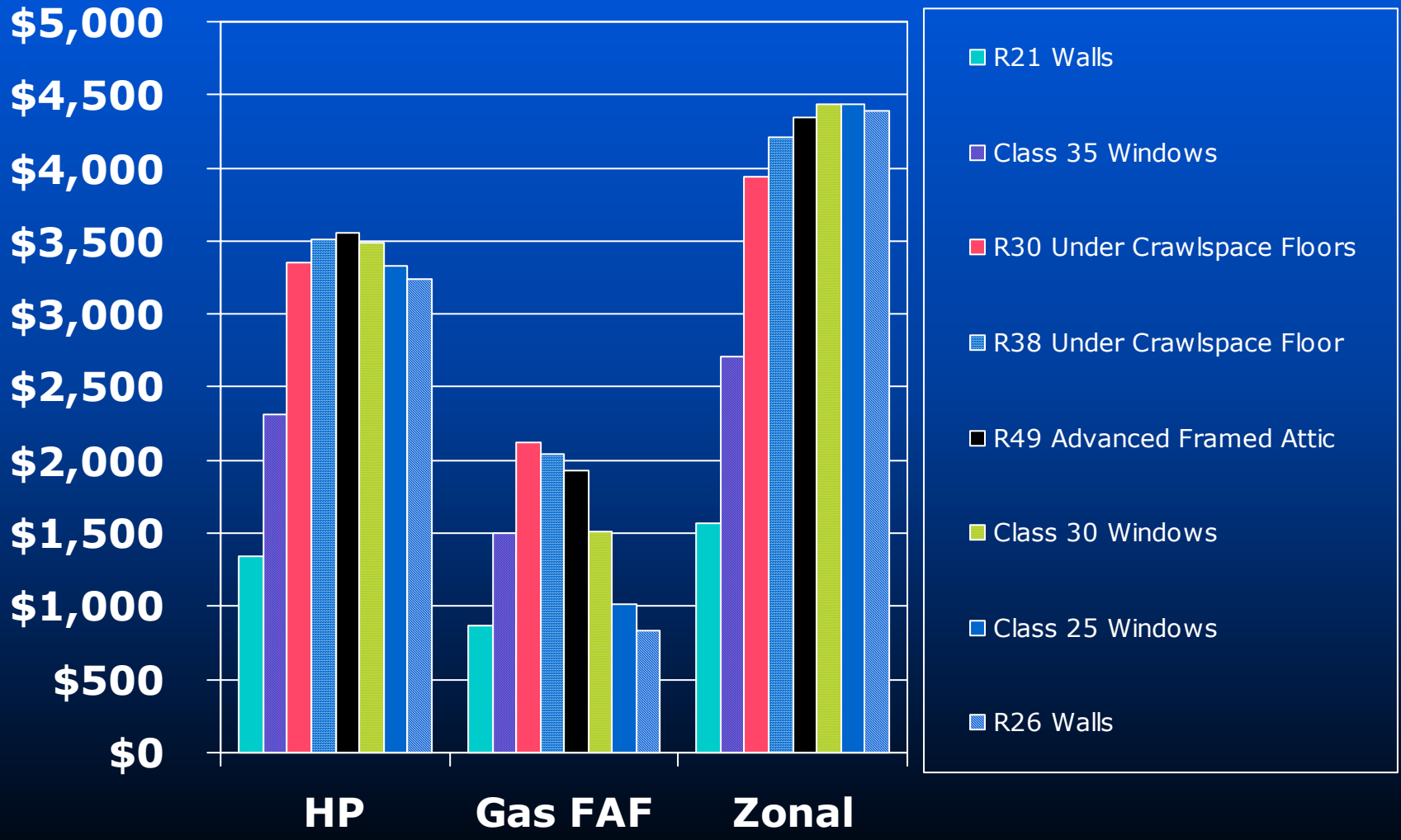


Mean Net Present Value for Zone 3 – Crawlspace Home (1000 Cases)

Measure	HP	Gas FAF	Zonal
R21 Walls	$1342	$872	$1569
Class 35 Windows	$2315	$1500	$2708
R30 Under Crawlspace Floors	$3352	$2127	$3942
R38 Under Crawlspace Floor	$3505	$2042	$4209
R49 Advanced Framed Attic	$3560	$1925	$4348
Class 30 Windows	$3491	$1518	$4441
Class 25 Windows	$3326	$1018	$4438
R26 Walls	$3234	$835	$4389
R30 Walls	$2592	-$137	$3891
R60 Advanced Framed Attic	$1391	-$1680	$2870

Maximum NPV = Lowest LCC

Mean Net Present Value by Measure
Zone 3 – Crawlspace Home

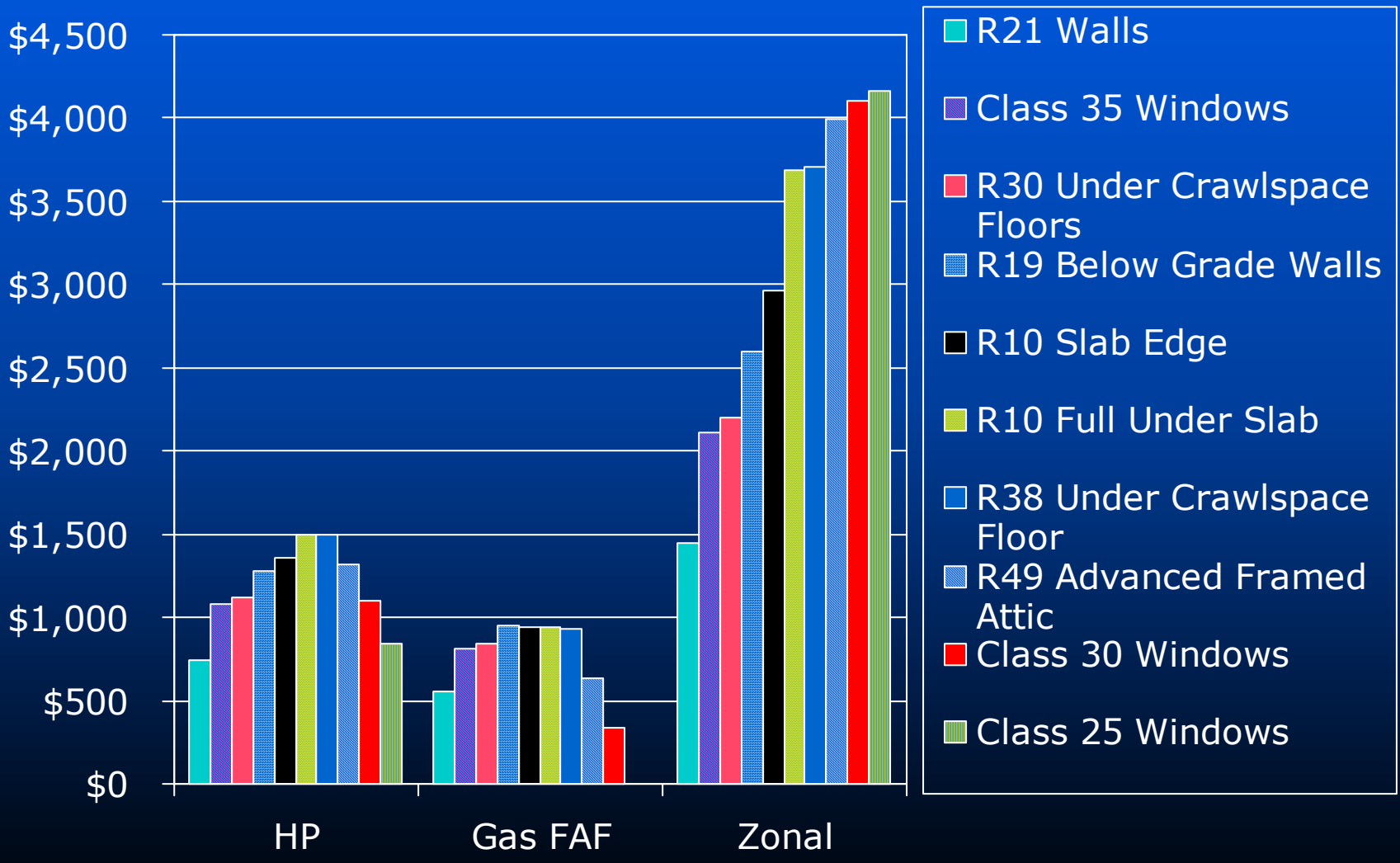


Mean Net Present Value for Zone 3 – Basement Home (1000 Cases)

Measure	HP	Gas FAF	Zonal
R21 Walls	$740	$560	$1445
Class 35 Windows	$1081	$815	$2116
R30 Under Crawlspace Floors	$1119	$842	$2198
R19 Below Grade Walls	$1283	**$947**	$2592
R10 Slab Edge	$1357	$946	$2959
R10 Full Under Slab	**$1500**	$939	$3688
R38 Under Crawlspace Floor	$1495	$928	$3708
R49 Advanced Framed Attic	$1321	$636	$3991
Class 30 Windows	$1103	$334	4101
Class 25 Windows	$840	$-14	**$4167**

Maximum NPV = Lowest LCC

Mean Net Present Value by Measure
Zone 3 – Basement Home



Summary of Findings

- Current Codes do not capture all "economically feasible energy savings" – for homes heated with either electricity or natural gas
- MCS performance requirements for heat pumps are also the lowest life cycle cost insulation level for gas heated homes in Zones 1 & 2 and have a lower life cycle cost than current codes in Zone 3